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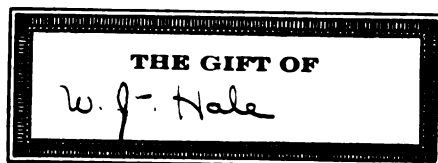
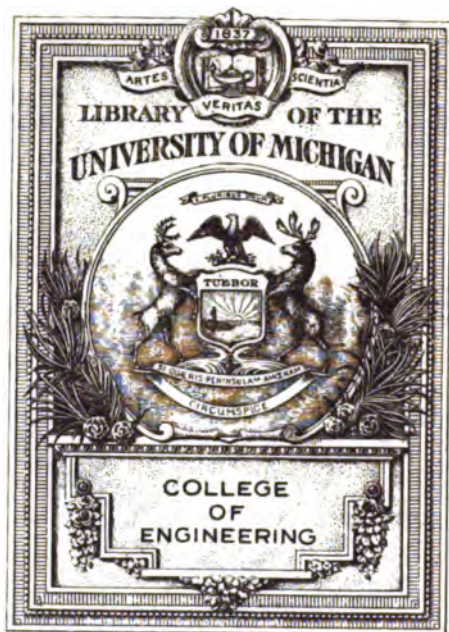
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CHEMICAL ABSTRACTS

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No. 1

I. APPARATUS.

L. C. JONES.

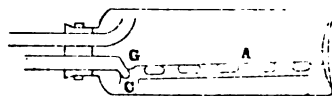
The Inertoid: an automatic apparatus for carrying out chemical reactions in inert atmospheres. RODOLFO FRITSCH. Vienna. *Chem. Ztg.* 39, 743(1915).—A wide-mouth dropping funnel with safety-tube discharge connected to a larger tube through a rubber stopper is mounted on a stand, the lower end of the larger tube ending in a beaker, or, if the products of the reaction are volatile or affected by the air, in a wide-mouth flask with condenser. Near the top the large tube branches, and 1 hole in a 3-hole stopper in the mouth of the funnel carries a tube for filling the app. with inert gas. This tube also branches and 1 arm connects with the branch on the large tube. The middle hole in the stopper carries a glass rod with a round flat inner end. The 3rd hole carries an exhaust tube. The reacting substances, one in a closed glass tube, are placed in the app. which is filled with inert gas and the reaction started by breaking the glass tube with the glass rod.

J. H. MOORE.

A safe automatic gas valve for preserving reduced solutions. PAUL VERBEEK. *Chem. Ztg.* 39, 840(1915).—Three Erlenmeyer flasks of 50-75 cc. capacity are connected with bent tubes, the tube connecting the 2nd and 3rd flasks extending nearly to the bottom of each. The 2nd hole in the stopper of the 1st flask carries a dropping funnel of 100-50 cc. capacity, with glass cock and narrow stem. The 2nd hole of the stopper in the 3rd flask carries a Kjeldahl trap connected with a tube reaching nearly to the surface of the reduced soln. in a larger flask. The 2nd hole in the stopper of this flask carries a tube and screw pinchcock to regulate the flow of CO_2 or other inert gas. The funnel contains HCl (1:1), the 1st and 3rd flasks contain broken limestone and the 2nd contains H_2O . After displacing the air with CO_2 the soln. is reduced and the pinch-cock closed, the cock in the funnel stem being left open to equalize the pressure as the soln. cools.

J. H. MOORE.

Improved form of gas washing bottle. F. R. v. BICHOWSKY AND H. STORCH. *J. Am. Chem. Soc.* 37, 2695-6(1915).—The app. consists of an ordinary bottle, or a square medicine bottle, fitted up as a common wash bottle which is laid on its side, and has a small side tube at C. The gas enters the bottle through the lower tube and forms bubbles at the bend G in the tube A. The advantages are: efficient washing, slight pressure head required, and negligible amt. of spray formed. Another model is shown in which the cork is replaced by a glass seal; it is for liquids which would corrode the stopper or absorb impurities from it.



E. B. MILLARD.

U-tube carbon dioxide indicator. E. A. CUNNINGHAM. *Iron Age* 96, 870-2 (1915).—App. consists of a chamber filled with KOH to which is attached a Hg gage for measuring diminution of pressure caused by absorption of CO_2 . A motor-driven cam arrangement opens and closes the various valves and records the analyses on a chart. The analyses made by the instrument agree with those by a Hempel app. to 0.5%.

F. L. GROVER. ✓

Evaporation of liquids at low temperatures. B. C. P. JANSEN. *Chem. Weekblad* 12, 482-3(1915).—An app. in which a small elec. fan pushes the air through a hot wire coil has been successfully used for the evapn. of liquids at low temps. J. T. FLOHL.

Standardization of the freezing-point thermometer. N. SCHOORL. *Chem. Weekblad* 12, 222-5(1915).—S. suggests the use of eutectic mixts. for the standardization of f. p. thermometers. The eutectic mixts. $\text{KNO}_3\text{-H}_2\text{O}$ and $\text{Ba}(\text{NO}_3)_2\text{-H}_2\text{O}$ are most useful as their eutectics lie near the f. p. of water, that of the former being -2.86° and that of the latter -0.71° . Prep. solns. of KNO_3 1:4 and $\text{Ba}(\text{NO}_3)_2$ 1:8 by heating slowly. These solns. are cooled in cold H_2O while vigorously shaken until crystd. and may be kept in stoppered bottles. Whenever big crystals appear, heat the mixt. slowly and cool as above. J. T. FLOHL.

A vacuum furnace for the measurement of small dissociation pressures. R. B. SOSMAN AND J. C. HOSTETTER. *Z. Elektrochem.* 21, 495-9(1915); see *C. A.* 9, 1557. E. H.

Automatic vacuum pump. OTTO MAASS. *J. Am. Chem. Soc.* 37, 2654-6(1915).—An arrangement of a Töpler pump with Antropoff's modification (cf. *C. A.* 5, 402) which, in conjunction with an aspirator, works automatically. The arrangement does not involve the use of a spring or valve, is simple to make, and can safely be allowed to run for an indefinite period. A portion of the pump was described by Johnson. Cf. *C. A.* 6, 2868. E. B. MILLARD.

Electrically operated vacuum pump. ANON. *Elec. World* 66, 1109-10(1915).—A high vacuum pump of the oscillating-ring type, consisting of 4 parts, the body, impeller, cover and shaft, is described. Moisture and liquid will pass through it. Displacement of free air per min. is 930 cu. in.; the max. vacuum obtained is 0.25 mm. It is being manufd. by the May-Nelson Mfg. Co., Washington, D. C. Diagrams are given. I. C. MATTHEWS.

Making a chemists' balance. F. W. SALMON. *Power* 42, 617-9(1915).—Describes how a balance, such as is used in coal analysis, may be cheaply and easily constructed. Hard maple and hard white cedar are used for the base and beam and smoothly ground-knife files for knife edges. C. G. F.

Viscosimeters. R. F. MACMICHAEL. *Met. Chem. Eng.* 13, 767-9(1915).—All viscosimeters operate on one of two general principles: (1) the time required to produce a definite relative movement of the fluid particles under a given force; (2) the force required to produce a definite relative movement of the fluid particles in a given time. The most prominent examples of instruments based on the second principle are those of Couette, Clark and MacMichael. In each of these instruments a cylinder or disk is suspended in a cup of fluid and either the disk or the cup is revolved, and the torsional force noted. M. points out the advantages of the MacMichael viscosimeter over the other instruments of this class as follows: In the MacMichael viscosimeter, the force exerted by the rotation of the fluid itself on the stationary member is measured. The construction is simple and durable. The fluid to be tested is heated in place, no other heating device being required. The temp. during the test may be controlled within a small fraction of 1°F . The readings are in degrees of angular deflection, 300 degrees to the circle, designated as deg. M. The practical working unit is $1/1000$ of the absolute unit. As H_2O at 20°C . has exactly $1/100$ of the absolute unit of viscosity, H_2O at this temp. reads 10 deg. M. Readings are taken directly from the dial, no intermediate calcn. being required. As the time required for a reading is extremely short detns. may be made of suspensions, such as clay slips, which settle rapidly. Colloidal solns. like glues, gums, starch solns., gelatin, etc., may also be handled successfully. Likewise, the viscosity of complicated mixts. such as catsup, food materials,

etc., may be readily detd. Straining is unnecessary as small particles of foreign material do not in any way affect the accuracy of the detn. The instrument with its thermometer and pipet is complete in itself. Skilled labor is not required in its use. The personal equation is small. C. A. NOWAK.

Making and using thermocouples. F. G. COBURN. *Am. Machinist* 43, 643-4 (1915).—C. discusses the importance of using wires of uniform compn. throughout, the construction of Pt-Rh and of base metal couples, and maintenance of cold junctions. C. G. F.

Electrical heating and the Schoop metal spraying process. LACH. *Elektrotechn. Z.* 36, 270-3(1915).—New elec. heating units are described and illustrated. With the aid of the Schoop "gun" a thin ribbon of metal is squirted on to unglazed porcelain, clay, etc., tubes or plates. For high temp. heaters a Cr-Ni alloy is "squirted;" for lower temp., German silver or a similar alloy is used. C. G. F.

Filter. J. J. LASSEN and V. F. HJORT. *Brit.*, 16,185, July 7, 1914. A filter comprising a series of filtering layers through which the liquid passes upwards is fitted with a longitudinal conduit or trough common to each of the filtering compartments, and with means for directing the liquid into the trough to throw any desired filtering layer out of action.

Blowpipe burner. CHEM. FABRIK GRIESHEIM-ELEKTRON. *Brit.*, 15,763, July 1, 1914. A blowpipe burner, of the kind in which the O supply pipe is arranged coaxially with the mixed gas and O pipe and the cutting-O supply is taken by way of a sep. conduit branching from the main O supply pipe, is constructed with the terminal of the main O supply pipe arranged in a closed pressure chamber near the outlet for the heating gas pipe, and the outlet from this chamber for the cutting-O supply as remote as possible from the main supply pipe.

Apparatus for drying and cooling granular material. TOPF & SOEHNE. *Brit.*, 3,375, Feb. 9, 1914.

Mixing liquids. B. GOLDMAN and GALVINISCHE METALL-PAPIER FABRIK AKT.-GES. *Brit.*, 24,588, Oct. 29, 1913. The app. comprizes rotary stirrers co-acting with wings or blades extending inwards from the walls of the vessel; the wings or blades are arranged so as just to clip into the liquid, thereby causing a downward flow of liquid without preventing the formation of a vortex or eddy.

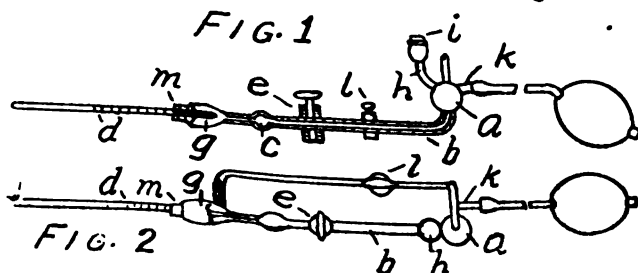
Acetylene generator. T. H. LEWIS. *Brit.*, 16,120, July 6, 1914. The container for the solid is provided with 1 or more apertures in the base, between which and the clamping member is placed absorbent material which serves to distribute the H_2O to the solid and also, in conjunction with the clamping member, to regulate the flow of the H_2O .

Kilns. W. RENNER and C. HOCKE. *Brit.*, 16,030, July 4, 1914. A discharging device for a shaft kiln comprizes a pair of oppositely rotating rollers preferably mounted on parallel shafts; these rollers serve to break up and discharge the clinker and also to set the lower contents of the kiln chamber in rotation in a horizontal plane.

Rotary furnace. W. ENGELHARDT. *Brit.*, 29,911, Dec. 29, 1913. The fuel is projected at a high velocity against some resistance in the furnace. Eddies are thus formed which result in a thorough mixing of the fuel and air. The resistance may take the form of projections from the furnace wall; or, it is stated, the slowly moving column of gases escaping from the furnace may act as the resistance. The fuel may be injected in a number of parallel or intersecting streams, preferably through slots in a plane inclined to the axis of the furnace.

Crucible furnaces. A. C. IONIDES. Brit., 15,778, July 1, 1914. In the operation of crucible and like furnaces heated by the combustion of a self-burning gaseous mixt. in a combustion chamber surrounded by a flue through which the combustion products pass downwards to an outlet below the level of the furnace, preheating one or both constituents of the mixt.

A pipet. P. SCHMIDT. Ger., 284,589, Feb. 19, 1914. Fig. 1 shows the app. in longitudinal section. Fig. 2 is a plan view, partly in section. The liquid to be measured is run into the container *a* through the branch tube *h* from the funnel top which is stoppered tightly with the stopper *i*. The liquid may be delivered through the tube *b*, connected with the container *a* and provided with the pear-shaped enlargement *c* which can be isolated from the container *a* by means of the stopcock *e*. The extension of tube *b*, beyond the chamber *c*, is enlarged to form the air chamber *g*, which encloses the end of the pipet *d* which passes through the stopper *m* (air-tight), to connect, by contact, with the



connect, by contact, with the tube *b*. The enlargement *g* communicates with the container *a* through a branch tube which passes through the cock *l*. When a definite amt. of liquid is to be withdrawn from the container *a* and measured, the cock *e* is opened while the cock *l*, in the

side tube, is in the closed position. The liquid in the container *a* is then subjected to air pressure, produced by compression of the bulb, and exerted through the section *k*. The liquid is thus forced into the enlargement *c*, charging it in such manner that when the app. is set up the air pressure forces the liquid has entered the pipet, as shown by the scale thereon, the cock *e* is closed and the cock *l* is opened, thereby cutting off the supply of liquid and forcing the measured column out through the pipet.

Device for delivering measured quantities of liquids. B. THURAU. Ger., 283,939, May 28, 1914.

Device for measuring vapor, gas, and liquid. J. H. REINEKE. Ger., 284,780, July 18, 1914.

Construction of discharge mechanism for multiple condensers and pumps for gas. AKT.-GES. DER MASCHINENFABRIKEN ESCHER, WYSS & CIE. Ger., 283,984, June 17, 1913.

Regulator for multiple step condensers for gas and air. ALLGEMEINE ELEKTRIZITÄTS-GES. Ger., 284,768, Sept. 12, 1914.

Regulating the feeding of ball mills. GEBR. PFEIFFER. Ger., 284,154, July 1, 1914. The charging device is automatically regulated by the flow of the ore, slag, etc., in such manner that as the flow increases the supply is cut down, and as the flow slackens the supply is increased.

Spraying device. H. RABE. Ger., 284,857, Sept. 16, 1913.

Crystallizing apparatus. E. KRÜGER GEB. KOWING. Ger., 284,696, Aug. 18, 1912. In a counter-current cooling app. a number of cooling tube systems are disposed in series with projections attached to the several tubes upon which the crystals form and grow while scrapers keep the tubes themselves clean.

Drying drums. MASCHINENFABRIK PETRY & HECKING, G. M. B. H. Ger., 283,954, May 25, 1913. Drums, through which the material is conducted, are arranged one within the other.

Cover for charging bells. H. STÄHLER. Ger., 284,668, Oct. 28, 1913. Constructional details of a cover for bells for cupola furnaces and the like.

Apparatus for separating water from flowing compressed air. R. POTH. Ger., 284,011, Dec. 23, 1913. The chamber traversed by the compressed air is completely filled with pieces of quartz, which remove the H_2O . The inclined bottoms of the chambers have openings to permit the passage of compressed air from chamber to chamber. The dry air leaves the app. through a vertical shaft.

Automatic lubrication of gas condensers. AKT.-GES. DER MASCHINENFABRIKEN ESCHER, WYSS & CIE. Ger., 283,959, June 13, 1913.

Sealing vacuum vessels. SIEMENS-SCHUCKERT-WERKE G. M. B. H. Ger., 284,047, June 14, 1914. The seal is especially designed for metal vessels and electrodes for metal vapor app. One or more sealing surfaces consist of metal deposited elec. on the parts to be sealed.

Roasting furnace. A. ZAVELBERG. Ger., 284,607, Feb. 5, 1913. The furnace is provided with mechanical raking devices, with the operating arms secured to a frame outside of the furnace.

A built-up stirring shaft for mechanical roasting furnaces. NICHOLS COPPER CO. Ger., 284,586, Mar. 10, 1914. Cf. C. A. 9, 782.

2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS.

Assistants: E. B. MILLARD AND A. B. CARTER.

Progress of microchemistry in 1913 and 1914. F. EMICH. *Chem. Ztg.* 39, 789-92, 838-40(1915).—A review with 159 references. J. H. MOORE.

Valence theory of J. Stark from a chemical standpoint. D. A. HAHN AND M. E. HOLMES. *J. Am. Chem. Soc.* 37, 2611-26(1915).—Abstract of "Die Valenzhypothese von J. Stark von Chemischen Standpunkt," by Paul Ruggli, Stuttgart, 1912 (cf. C. A. 7, 1439). E. B. MILLARD.

Conductivity and dissociation of some rather unusual salts in aqueous solution. CHAS. WATKINS AND H. C. JONES. *J. Am. Chem. Soc.* 37, 2626-36(1915); cf. C. A. 8, 3735; 9, 993.—The exptl. methods are described in *Publ. Carnegie Inst. Washington*, 230(1915). Tables are given of mol. conductivities expressed in Siemen's units, for 0, 15, 25 and 35°. The % dissociation has been calcd. from the relation $\alpha = 100\mu_9/\mu_0$, where μ_0 is the highest value of μ_9 measured. This "greatest diln." was $V = 4096$ in some cases and $V = 1024$ in others. For $Na_2S_2O_8$, e. g., the mol. cond. was greater at $V = 2048$ than at $V = 4096$, so 100% dissociation was assumed for the former vol. of soln. and no value was calcd. for $V = 4096$. The substances studied were $NaBrO_3$, $NaSCN$, $Na_2S_2O_8$, $Na_2S_2O_4$, Na_3PO_4 , $Na_4P_2O_7$, NaH_2PO_4 , Na_2WO_4 , $HCOONa$, Na_2CrO_4 , $Na_2Cr_2O_7$, $K_3Fe(CN)_6$, NH_4IO_3 , $NH_4H_2PO_4$, $(NH_4)_2CrO_4$, NH_4SCN , Li_2CrO_4 , and RbI . The conductivities for the chromates were in the order K , NH_4 , Na , Li , though NH_4 salts usually have higher conds. than K salts. Ions with the largest hydrating power generally have the largest temp. coeffs. of cond. At higher dilns. the temp. coeffs. of cond. for a given substance are greater than at lower dilns. E. B. M.

Construction of compound molecules with theoretical atoms, especially the systems of growth of the organic compounds of carbon and hydrogen. ALBERT C. CRRHORE.

Columbia Univ. *Phil. Mag.* 30, 613-23(1915).—An application of the inter-atomic force fields previously calcd. (*C. A.* 9, 2473). In the structure of a crystal the axes of revolution of the atoms are not parallel but take such positions that the turning moment of the force due to all the other atoms in the crystal on each atom is zero. But with the small number of atoms present in a simple mol. the equil. of turning moments demands that all the axes be parallel. That the edge of the elementary tetrahedron in the diamond is 2.5×10^{-8} cm. while the distance between the atoms in a compound mol. is near 10^{-10} cm., involves forces vastly greater, though of the same kind, in the latter case. Graphs are given showing the forces at all angles and a range of distances between two H atoms and between one C and one H atom. These are applied to mol. structures. The H_2 mol. is an isosceles triangle with one atom free to revolve about the line between the other two as an axis. CH_2 is stable as an isosceles triangle but readily takes up more H. CH_4 requires a tetrahedron with the C in the center and symmetrical with respect to the axis of the C atom, yet greater in height than in length or breadth. The H atoms are similarly located with respect to each other. C_2H_2 requires a lengthened hexagon with the two C atoms at the ends of the longest axis. The satd. rings are combinations of these hexagons; the hydrocarbon chains are rows of the CH_2 tetrahedrons. Benzene is a lengthened hexagon of C atoms with the H atoms near the shortest diam. In all these mols. each atom acts effectively on all the others; the function of the H is invariably to hold the mol. together and to counteract the repulsion between the C atoms.

G. L. WENDT.

Molecular weights of gases by an evaporation method. H. L. TRUMBULL. *J. Am. Chem. Soc.* 37, 2662-7(1915).—A 3-cc. flask of H_2O was connected with an atm. of dry air, H, or CO_2 in an Erlmeyer flask, and the rate of evapn. detd. from loss of wt. of the flask. The rate was assumed to depend only on the relative rates of diffusion of the atm. and H_2O vapor, if stirring effects were eliminated. The rates of evapn. were nearly proportional to the inverse squares of the densities of the gases. Theory requires the ratio 3.79 for H_2 /air; 3.39 was found. This different rate of evapn. into different gases is suggested as a means of detg. the mol. wt. of the gas.

E. B. MILLARD.

✓ Critical constants of normal butane, iso-butane and propylene and their vapor pressures between 0 and 120° . F. M. SEIBERT AND G. A. BURRELL. *J. Am. Chem. Soc.* 37, 2683-91(1915); cf. *C. A.* 9, 2583, 2614.—The gases were purified by fractional distn., sometimes under pressures as low as 1 mm. of Hg, until the vapor pressures were independent of the relative vols. of liquid and vapor. The plot of log. pressure against log. $1/T$ gave a straight line. The crit. phenomena were normal and different samples of the condensed liquid gave identical results. All the vapor in the exptl. tube could be condensed without a perceptible rise of pressure. The data are as follows:

Substance.	Temp. $0^\circ C.$	Press. mm. Hg.	Press. atms.	a.	b.
Normal butane.....	153.2	27113	35.67	0.02883	0.005470
Isobutane.....	133.7	27771	36.54	0.02562	0.005096
Propylene.....	92.6	34463	45.34	0.01668	0.003692

a and b are the corrections in the van der Waal equation.

E. B. MILLARD.

Vapor pressures of sulfur dioxide and nitrous acid at temperatures below their normal boiling points. G. A. BURRELL AND I. W. ROBERTSON. *J. Am. Chem. Soc.* 37, 2691-4(1915); cf. preceding abstr.—For SO_2 the vapor pressures range from 760 mm. at -11.0° to 0.5 mm. at -94.4° ; and for N_2O , from 760 mm. at -88.7° to 1 mm. at -144.1° . The data are shown in tables and curves.

E. B. MILLARD.

Equilibria in the systems of the higher alcohols, water and salts. G. B. FRANKFORTH AND STERLING TEMPLE. *J. Am. Chem. Soc.* 37, 2697-716(1915); cf. *C. A.* 7,

2176.—The PrOH (Kahlbaum's best) was further purified by treating with KF , CaO , CuSO_4 , Mg-Hg and finally Na-Hg ; it then $b_{760} 97.3-7.5^\circ$, has $d_{20} 0.8032$, $n_{20} 1.39023$, 1.37651 and 1.36786 for the H lines α , β and γ , resp. The purified iso- PrOH $b. 82.5^\circ$, has $d_{20} 0.7881$, $n_{20} 1.37960$, 1.36550 and 1.35584 for H , α , β and γ . Into a weighed Erlenmeyer flask, provided with a ground-glass stopper and a side tube carrying a thermometer, was introduced the salt, the flask weighed again, enough H_2O to just dissolve the salt added, the flask weighed, enough alc. added to cause a sepn. into 2 layers, a weighing again made, then H_2O added drop by drop until the mixt. became homogeneous and a final weighing made; successive points on the curve were then detd. by alternately adding enough alc. to produce a turbidity and H_2O to clear the soln. The readings were made at a temp. of $20^\circ \pm 0.2^\circ$. With KF and NaCl as the salts, spirit blue was used as the indicator; with K_2CO_3 and Na_2CO_3 , phenolph. The 7 systems containing, in addition to H_2O , PrOH and Na_2CO_3 , iso- PrOH and KF or K_2CO_3 , and allyl alc. and KF , K_2CO_3 , Na_2CO_3 or NaCl were studied. KF was found to be the most satisfactory dehydrating agent on account of the ease with which the end point can be detd. with widely varying compn. of solvent, and because it causes sepn. into 2 phases only, both liquid over a relatively large range in compn. of the solvent, and finally because of the large amt. of H_2O with which it combines to form its lowest hydrate. K_2CO_3 also works very satisfactorily. No evidence was found relating the salting out effect to the chem. constitution of the salts or alcs.; the salting out efficiency of a salt seems to depend rather on its solubility in the H_2O and the alc., on the amt. of H_2O with which it combines to form its lowest hydrate and on the ability of the alc. to replace the H_2O of hydration.

C. A. ROULLER.

Viscosities of solutions of cesium salts in mixed solvents. P. B. DAVIS AND H. C. JONES. *J. Am. Chem. Soc.* 37, 2636-42 (1915); cf. *Publ. Carnegie Inst.* No. 230 (1915).—The expts. are on the viscosities of solns. of CsCl and CsNO_3 in H_2O and binary mixts. contg. 25, 50 and 75% of MeOH , EtOH and Me_2CO with H_2O at 15, 25, and 35° , usually at 3 concns. of salt in each mixt. A 0.5 N soln. of CsCl in 75% Me_2CO could be prepd., but with a partial sepn. of the acetone from the solvent. On cooling below 10° a perfectly homogeneous mixt. was obtained which again sepd. into 2 layers on warming. The nitrate at this concn. merely remained partly undissolved. Both of the Cs salts lower the viscosity of H_2O and the 25% mixt. of all the solvents, and increase the viscosity of the 75% mixts. In 50% MeOH the chloride showed an increase in viscosity at all temps. for the most dil solns., and a tendency of the more concd. solns. to pass over into negative viscosity change, while the nitrate in the same solvent showed a decided negative viscosity effect. Expts. are in progress on the effect of these salts in glycerol and mixts. of it with H_2O .

E. B. MILLARD.

Electrical synthesis of colloids. H. T. BEANS AND H. E. EASTLACK. *J. Am. Chem. Soc.* 37, 2667-83 (1915).—The first part of this paper is a review, with bibliography, of the work on elec. formation of colloids, and the "complex" theory of their formation. Expts. were performed on the increase in elec. cond. accompanying the formation of a colloid in an arc of the metal under H_2O . This increase was 8 times greater for Pt than for Au , on account of a greater oxidation of the Pt , and the Pt sols were invariably more stable than the Au . Thus earlier evidence relating the stability of the sols and the presence of small amts. of certain electrolytes was confirmed. The sp. cond. due to the colloid proper is of an order 10^{-10} mhos, or 0.01% of that of conductivity H_2O . The presence of chloride, bromide, iodide, or OH^- ion in concns. from 0.0005 to 0.005 N has a marked stabilizing effect on Au sols, and furnishes a quick and reliable method of prepg. these sols. This effect is not produced by dispersion of the Au in pure H_2O and subsequent addition of the electrolyte. The particles in all these red sols have been shown by electrophoresis to be negatively charged. The

above stabilizing effect is not produced with fluoride, nitrate, sulfate or chlorate ion in similar concn., and seems to be related to the ability of the ion to form stable compds. with Au. No Au was ever obtained in the filtrate, however. Elec. synthesis of colloids is considered to consist of a thermo-mechanical dispersion of the metal, followed by the formation of a colloidal complex between the dispersed metal and certain ions present in the medium.

E. B. MILLARD.

The drop-weight method for determining surface tensions. ALLAN FERGUSON. Univ. Coll., North Wales, Bangor. *Phil. Mag.* 30, 632-7(1915).—A discussion of the influence of the "contact angle" on the wt. of a falling drop, based on the work of J. L. R. Morgan (*C. A.* 9, 1713). Since drop-weight and capillary rise measurements are proportional and the latter are always uncertain on account of the contact angle, the former may suffer also. If not, then at least the 30 results of M. which vary inexplicably are in error from this cause. F. recommends measurements by all methods on the same samples, especially of ether and of turpentine, which are known to have contact angles with glass of respectively 16° and 17° .

G. L. WENDT.

The action of certain colloids on ions during electrolysis. A. MUTSCHERL, M.D., German Hospital, New York. *Met. Chem. Eng.* 13, 353-7(1915).—The relative migration velocity of the ions of N $AgNO_3$ soln. was first detd. with the Hittorf app. A Ag anode and a Pt cathode were used, and concn. changes were measured after a 1-1.5 hr. run. The migration ratio was calcd. by Hittorf's method from the Ag deposited and the concn. change at the cathode. In the pure soln., the migration ratio for NO_3^- was found to be about 0.562. With the addition of 1% gelatin soln., the NO_3^- migration ratio decreased, the decrease being directly proportional to the amt. of added gelatin. The ratio finally became practically zero (0.053) with the addition of 2 cc. of 1% gelatin to 40 cc. of electrolyte, and further addition of gelatin caused the anions to assume a negative migration velocity; i. e., they migrated toward the cathode instead of toward the anode. Upon the addition of 5 cc. gelatin soln. to 40 cc. of the electrolyte, a migration ratio of -0.665 was attained. When the migration velocity was practically zero, a white, well-adhering Ag deposit was obtained at the cathode. In the presence of less gelatin than that required for this effect, the deposit was loose, brittle, and in the form of trees and striae, and the gelatin gathered around the anode in a slimy layer. When gelatin sufficient to cause negative anion migration was present, the deposit was gray or black, but firmly adherent. Such deposits when strongly heated changed color, indicating a loss of deposited organic matter. A second series of expts. was carried out in which the gelatin concn. remained const. at 2 cc. of 1% soln. per 40 cc. of electrolyte and the $AgNO_3$ concn. varied from 0.1 N to 0.3 N . With 0.1 N soln. the NO_3^- migration ratio was 0.240. Increasing $AgNO_3$ concn. was accompanied by decreasing NO_3^- migration ratio up to a concn. a little above 0.1 N , where the curve passed through zero as a minimum. Beyond this point, increase in $AgNO_3$ concn. caused an increase in NO_3^- migration ratio, which reached 0.328 for 3 N soln. With concns. below N , the Ag deposit was gray or black and contained gelatin. With N soln. a pure deposit was obtained, while with concns. above N , the deposit, although pure, was striated and badly adherent. Expts. with N $CuSO_4$ were next carried out in an H-shaped tube with one electrode in each leg. The concn. changes in the soln. around each electrode were examd., and the deposited Cu weighed. As in the previous expts., any gelatin present in the cathode deposit was weighed and expressed as metal, thus causing a slight error when the gelatin concn. was high. The curve obtained by plotting migration ratio against gelatin concn. for $1/2$ SO_4^{--} was a straight line as in the case of NO_3^- . The migration ratio decreased steadily from 0.650 for the pure soln. to -0.896 for a soln. containing the equiv. of 200 cc. of 1% gelatin soln. per 40 cc. of electrolyte. (In order to avoid excessive diln., an equiv.

amt. of concd. soln. was used instead of 1% gelatin where the amt. to be added was great.) The amt. of gelatin required to affect the migration of $\frac{1}{2}\text{SO}_4^{--}$ was 45 times as great as the amt. required to produce an equal effect upon NO_3^- . This indicates that the effect of gelatin upon electrolytes is due to selective adsorption, since Freundlich (C. A. 4, 2764) has shown that the pptg. power of univalent ions upon colloidal $\text{Fe}(\text{OH})_3$ is to the pptg. power of bivalent ions as 1 to 40 or 50. The migration ratios of $\frac{1}{2}\text{Cu}^{++}$ also gave a straight-line curve, increasing from 0.380 with the pure soln. to 2.042 with a soln. containing the equiv. of 200 cc. of 1% gelatin per 40 cc. of electrolyte. The curves for $\text{SO}_4^{--}/2$ and $\text{Cu}^{++}/2$ are parallel lines when plotted with migration toward the cathode as +, and toward the anode as -. This is to be expected, since it can be shown mathematically that whatever velocity is lost by one ion must be gained by the other in order that the total current may be carried. Evidently at the deposition optimum the charge of the anions is exactly neutralized by the colloid. The "isocolloid" formed does not migrate, and accumulates in the electrolyte. At the anode in this case, the Ag^+ ion, instead of combining with NO_3^- , releases H^+ ions from the HNO_3 present. The H^+ in turn reacts with the gelatin- NO_3 complex to form HNO_3 and releases the + charged gelatin which is again available to combine with more NO_3^- . But since the isocolloid complex does not migrate, it must be brought close to the anode by stirring. Theoretically, there should be no loss of gelatin or acid, but actually the gelatin does break down slowly. The expenditure of gelatin is considerably greater when the anion charge is overbalanced by an excess of gelatin, causing the complex to migrate to the cathode and be deposited there. Conversely, if insufficient gelatin is added, it migrates to the anode and separates out as a slimy layer. The neutralizing effect of gum arabic and starch upon anions was investigated (no data given); and the relative values of gelatin, gum arabic and starch were found to be inversely proportional to the "Goldzahl" or "gold numbers," viz., 200, 5, and 0.04, resp., assigned to these colloids by Zsigmondy on the basis of their protective action upon colloidal gold.

F. A. STRAUSS.

The relative migration velocities of the ions in complex electrolytes. A. MURSCHELLER. *Met. Chem. Eng.* 13, 439-42 (1915); cf. preceding abstr.—The migration velocities of the ions in a few common plating solns. containing double salts were detd. A $\text{KAg}(\text{CN})_2$ soln. was first examd. The anion here is $\text{Ag}(\text{CN})_2^-$, which, when a Ag anode is used, gives up its charge there and forms $\text{AgAg}(\text{CN})_2$. The cation is K^+ . Ag is not deposited directly at the cathode, but only after the secondary reaction, $2\text{K} + 2\text{KAg}(\text{CN})_2 = 4\text{KCN} + 2\text{Ag}$. The K^+ merely frees Ag^+ ions which require new electrical energy for their deposition; hence the equiv. of the Ag^+ ions which originate at the anode are not deposited at the cathode, and an increase in Ag concn. is to be expected around the cathode. This conclusion was verified exptly. by electrolyzing a $\text{KAg}(\text{CN})_2$ soln. containing a slight excess of KCN in an H-tube with Pt cathode and Ag anode, and detg. the increase in the Ag concn. in the cathode compartment. Solns. containing metal- NH_3 double salts, viz., the solns. commonly used for Zn and Ni plating were next examd. Here the metallic ion and the NH_4^+ ion migrate together to the cathode, where the NH_4^+ after being liberated breaks down giving NH_3 , which forms complex ions of the type $\text{Ni}(\text{NH}_3)_4^{++}$ with the metal present. This complex ion forms an intermediate product which dissociates in turn, forming with the anions a salt by means of which the anions are withdrawn from the function of transporting the current. Hence the cations alone must transport the current, and the full equiv. of the metal deposited must migrate toward the cathode. If the ratio between metal and NH_3 salt is correct, there should be no decrease in the metal ion concn. at the cathode during the run. This theory was investigated by electrolyzing Zn and Ni plating solns. in the app. already described. The Ni soln. contained 46 g. $\text{Ni}(\text{NH}_4)_2(\text{SO}_4)_2$ per l. and 5

drops H_2SO_4 . The Zn soln. contained ZnSO_4 50, $(\text{NH}_4)_2\text{SO}_4$ 10, ZnCl_2 2.5, and H_2O 250 g. On electrolysis, in each case the total metal concn. in the cathode compartment was found to decrease by about 10% of the weight of the metal deposited. This may be explained by the fact that while the initial NH_4 required for the formation of complex ions is being formed by the discharge of NH_4^+ ions, the anions are carrying a part of the current, and the cation velocity is correspondingly decreased. M. concludes that smooth deposits from solutions of metallic salts are formed only when the cations migrate toward the cathode as fast as they are deposited, thus keeping the cation concn. at the cathode const. This condition can be realized by the addition of the proper amt. of a + charged colloid, or by the use of electrolytes containing suitable complex ions.

F. A. STRAUSS.

Electrical transference in amalgams. G. N. LEWIS, E. Q. ADAMS AND EDITH H. LANMAN. *J. Am. Chem. Soc.* 37, 2656-62(1915).—A A-shaped tube carries heavy Pt wires fused in the ends of the branches, and an arrangement for filling with amalgam after the tube had been heated and exhausted to 0.0001 mm. Hg. The tube is 2 mm. in internal diam., and 20 cm. long. A current of 4 to 8 amps. was passed through the app. for several days, so as to give approx. 1000 amp.-hours. The current was read with an ammeter. Fluctuations were negligible in comparison with other exptl. errors. At the conclusion of the expt. the amalgam (generally contg. 0.3 to 0.4 milli-equivs. of dissolved metal) was withdrawn and analyzed by titration with 0.01 N HCl, and detn. of the excess acid with NaOH, using rosolic acid as an indicator. The titrations were performed in the absence of CO_2 . The number of equivs. carried per faraday is 2.9×10^{-8} in Na amalgam of 3.24 atomic %, and 0.29×10^{-8} in Na amalgam of 0.577 atomic %. In K amalgam of 2.16 at. % it is 3.6×10^{-8} . To explain this motion of Na it may be assumed that a dil. amalgam is composed of small regions whose centers are Na atoms, embedded in a mass which has all the properties of Hg. Then an electron, on meeting one of these regions, will be retarded, and the region will be impelled in the direction of the negative current. Expts. are now in progress on the e. m. f. of concn. cells consisting only of metals, as a possibly more exact means of detg. transference numbers of amalgams.

E. B. MILLARD.

Flow of air and steam through orifices. A. L. WHITCOTT. *Power* 42, 515-6(1915).—Results of exptl. detns. of coeffs. applicable to Fleigner's formula and to the theoretical formula for the flow of a fluid through an orifice.

C. G. F.

The kinetic theory of gases. II. SAUL DUSHMAN. *Gen. Elec. Rev.* 18, 1042-9 (1915).—D. considers the deductions from the theory of molecular collisions. Tables of values are given of the av. free path and mol. diameter for some of the more common gases.

C. G. F.

The electron theory of metallic conduction. V. G. H. LIVENS. Univ. Sheffield. *Phil. Mag.* 30, 549-59(1915); cf. C. A. 9, 881, 1576, 2733.—An amplification of the theories of Lorentz, Drude, Thomson, Jeans, Wilson and Bohr, considering mainly the effect of collisions on the velocity of the electrons. The Lorentz analysis is considered the more fundamental.

G. L. WENDT.

The electron theory of the Hall effect and allied phenomena. G. H. LIVENS. Univ. Sheffield. *Phil. Mag.* 30, 526-48(1915).—A detailed mathematical restatement of the theory of Drude (*Ann. Physik* 1, 566; 3, 369) and of J. J. Thomson. It is suggested that the effective magnetic field for the phenomena is not a continuation of the external field but is augmented by the addition of a purely local field within the metal due to the polarization in the immediately surrounding molecules. In the ferromagnetic metals this effect preponderates.

G. L. WENDT.

Cases of ionization of the atmosphere. J. A. FLEMING. *Electrician* 75, 348-50 (1915).—A discussion of the manner in which a permanently charged layer in the upper atm. may be formed by the arrival and presence of light impelled particles from the sun. The existence of such a layer is shown to be possible, but is not proved.

A. B. GLADDING.

Controlling infra-red emission. W. W. COBLENTZ. *Elec. World* 66, 1155-6 (1915); cf. U. S. Pat. 1,135,663(1915).—A preliminary paper. C. briefly describes his new glower. The light-producing part of the glower consists of a thin thread of a complex Al silicate, such as feldspar, which is attached to a thin rod of Al_2O_3 for a support. The luminous efficiency of this glower is considerably greater than that of the Nernst glower since the radiation of energy in the infra-red is decidedly less (curves are shown). The glower emits a banded spectrum similar to that of a gas. Cf. C. A. 3, 614; 4, 1262.

C. G. F.

The critical field at a discharging point. A. M. TYNDALL. *Phil. Mag.* 30, 637-44 (1915).—Measurements of the mechanical force on hemispherical points of varying radius on bifilar suspensions during an elec. discharge confirm Townsend's deduction from the theory of ionization by collision that the product of the critical field and the radius of the point is const. when the pressure of the gas is so varied that its product with the radius is also const. An additional supply of ions from a smaller discharging point reduced the critical field by a large fraction.

G. L. WENDT.

Mutual electromagnetic mass. J. W. NICHOLSON. *Phil. Mag.* 30, 659(1915).—A discussion of priority.

G. L. WENDT.

The calculation of series in spectra. W. M. HICKS. Univ. Sheffield. *Phil. Mag.* 30, 734-7(1915).—A suggestion on the procedure.

G. L. WENDT.

The calculation of series in spectra. H. G. SAVIDGE AND J. W. NICHOLSON. *Phil. Mag.* 30, 563-8(1915).—Reference tables are presented from which the wave number of a third line in a suspected series may be found from the difference in wave number of two successive lines. They are calculated from Rydberg's formula but are equally applicable to Fowler's enhanced line series.

G. L. WENDT.

A relation between natural and magnetic rotatory dispersion. JOSEPH DAHLEN. Univ. Münster. *Z. wiss. Phot.* 14, 315-42(1915).—Wiedemann (1851) formulated a much quoted law to the effect that the ratio of the natural optical rotation and the magnetic rotation of various substances, R_n/R_m , did not depend upon the wave length of the light used. This law of late has been so qualified by exceptions that its validity for any case is questionable. In the present work the law was tested for crystals of right and left handed quartz, $NaClO_3$, $NaBrO_3$, $Sb_2S_3 \cdot Na_2S + 9H_2O$, $SrS_2O_6 + 4H_2O$, $C_{12}H_{10}O_{11}$, and several organic liquids. The law was not found valid for optically isotropic crystals, or for the org. liquids tested. The law may hold for uniaxial crystals, but the exptl. proof is not sufficient to establish this fact definitely.

PAUL D. FOOTE.

The dispersion of carbon dioxide in the infra-red region of the spectrum. C. STARESCU. Tübingen. *Phil. Mag.* 30, 737-43(1915); cf. C. A. 9, 3022.—A search through the region $\lambda = 0.8\mu$ to $\lambda = 13\mu$ shows a marked absorption band at $\lambda = 4.270\mu$ and the tendency toward another band at $\lambda = 14.7\mu$. The formula for the dispersion of CO_2 is still to be found.

G. L. WENDT.

The ultra-violet spectrum of elementary silicon. J. C. McLENNAN AND EVAN EDWARDS. Univ. Toronto. *Phil. Mag.* 30, 482-4(1915).—Beyond the spectrum measured by Crookes (C. A. 8, 3394) are 17 lines, lying between 2124.4 and 1842.2 Å. They were measured by means of a fluorite spectrograph and compared with Zn and Al spectra.

G. L. WENDT.

The absorption spectra of mercury, cadmium, and zinc vapors. J. C. McLENNAN AND EVAN EDWARDS. Univ. Toronto. *Phil. Mag.* 30, 695-700(1915).—Absorption bands were measured as follows: For Hg: $\lambda = 1849.6 \text{ \AA. U.}$, strong, symmetrical; 2338, diffuse, complex; 2536.72, asymmetrical. For Cd: 2288, strong, symmetrical; 3260.17, narrow, sharply defined. For Zn: 2139.3, strong, symmetrical; 3075.99, very narrow, sharply defined. With the exception of the band λ_{2338} , each of these is the first member of a series. G. L. WENDT.

The infra-red emission spectrum of the mercury arc. J. C. McLENNAN AND RAYMOND C. DEARLE. Univ. Toronto. *Phil. Mag.* 30, 683-95(1915).—Thirteen lines in the Hg arc spectrum are recorded lying between $\lambda = 1.00\mu$ and 3.02 , including the disputed lines at 1.04 and 3.02 , as well as three new lines: 1.067 , 1.090 and 1.270μ . Their series relationships are discussed. G. L. WENDT.

A further study of the fluorescence produced by ultra-Schumann rays. C. F. MEYER AND R. W. WOOD. *Phil. Mag.* 30, 449-59(1915); cf. *C. A.* 5, 1019; 8, 2521.—The passage of a spark between a Cu point and a Cu plate is accompanied by a radiation which excites fluorescence in the surrounding atmosphere. Through a slit in the plate a "jet" of the rays was admitted to a dark chamber and the spectrum of the fluorescence was photographed by a quartz spectrograph. The water band was always present when the gases contained moisture but could be interrupted when a thin stream of dry air or N was blown across the jet. The N_2 lines (3369, 3556, and 3778) are strong in pure N but are extinguished if O is present. I vapor gives visible as well as ultraviolet fluorescence. Fluorite and cryst. quartz are only slightly transparent to the exciting radiation, which shows the latter to be in the ultra-Schumann region. The rays which excite the water band pass more readily through fluorite than do those exciting the N lines; the reverse obtains with quartz. Fused quartz and mica are opaque. The index of refraction of the rays in quartz is 1.75 ± 0.08 . The rays which excite the water band were reflected from a deposit of Si on glass. G. L. WENDT.

Light absorption and fluorescence. III. E. C. C. BALY. Univ. Liverpool. *Phil. Mag.* 30, 510-26(1915); cf. *C. A.* 8, 3749; 9, 1001.—In part II it was shown that if ν be the characteristic vibration frequency in the ultraviolet or visible bands, pairs of absorption lines are found whose frequencies are equal to $\nu + \nu_s$, where ν_s stands for the frequencies of the short-wave infra-red bands. If Bjerrum's relationship (cf. *C. A.* 8, 859) holds throughout the spectrum the values of ν_s must represent certain values of $hn/2\pi^2I$, where I is the moment of inertia, h Planck's constant, and n a series of whole numbers, 1, 2, 3, etc. The abnormal intensity of certain bands in the infra-red spectra is attributed to the convergence frequency of two or more such series in which I has different values. On this principle the "basis constants" of H_2O , NH_3 , C_2H_4 , and aliphatic hydrocarbons were calcd. Using the 4 basis constants for C_2H_4 , the frequencies of about 90 lines in the ultra-violet absorption band of C_2H_4 are calcd. and agree closely with the measurements of Grebe and of Hartley. The infra-red spectrum of a compd. is shown to be an additive function of the spectra of its constituent radicals, certainly in the case of phenol, aniline, myrcyl alc., and triethylamine. The wave-lengths of the lines in the ultraviolet absorption bands of phenol and of aniline were calcd. from the basis consts of C_2H_4 and H_2O and of C_2H_4 and NH_3 with excellent agreement with observed values. G. L. WENDT.

The use of phosphorescing calcium sulfide in the bacchanalian rite. W. P. JORISSEN AND J. H. WIETEN. *Chem. Weekblad* 12, 768-73(1915).—A chem. and historical hypothesis, in which the authors try to explain the mysteries of Bacchus, as described by Livius and Pausanias. The use of phosphorescing CaS is supposed to account for the unextinguishability of the torches carried by the bacchantes.

J. T. FLOHLL.

Ionic mobilities in hydrogen and nitrogen (HAINES) 3. Ionization of hydrogen by X-rays (SHEARER) 3.

3. RADIOACTIVITY.

WILLIAM H. ROSS.

The mobilities of ions in air at high pressures. J. C. McLENNAN AND DAVID A. KEYS. Univ. Toronto. *Phil. Mag.* 30, 484-91(1915); cf. *C. A.* 6, 1400, 2205.—The ionic mobilities calcd. by Rutherford's formula from the current between two plate electrodes, one of which was covered with Po, showed that for pressures not much above 67 atms. the mobility varies inversely as the pressure, but for higher pressures (up to 181.5 atms.) the mobility decreases less rapidly. The mobilities of the positive and negative ions approach each other at higher pressures. It is surmized that in liquid air they are equal. G. L. WENDT.

The delta radiation emitted by zinc when bombarded by alpha rays. J. C. McLENNAN AND C. G. FOUND. Univ. Toronto. *Phil. Mag.* 30, 491-502(1915).—A freshly scraped plate of Zn exposed to bombardment by α -rays from Po in a high vacuum emits 3 slowly moving electrons for each α -ray impact. The electron emission decreases if the plate remains in the vacuum. A fresh surface deposited from Zn vapor in a high vacuum emits no electrons at first but the emission grows with the absorption of air by the Zn. Cf. Küstner, *C. A.* 8, 1382. G. L. WENDT.

Ionic mobilities in hydrogen and nitrogen. W. B. HAINES. *Phil. Mag.* 30, 503-9 (1915).—The persistence of negative ions with mobilities of 367 cm./sec. per v./cm. in N at atmospheric pressure was proved, but these electrons are very sensitive to some impurities. Traces of I, Cl, SO₂, N₂O, CS₂ and CHCl₃ remove them completely; 0.05% of O removes half; 2% of CO₂ removes only a third. The effect of H is very small, and in pure H electrons with mobilities of 170 cm./sec. exist in the free state. The higher the mobility of the ion, the greater its sensitiveness to impurities. G. L. WENDT.

The relation between the life of radioactive substances and the range of the rays emitted. F. A. LINDEMANN. Farnborough. *Phil. Mag.* 30, 560-3(1915).—Both the disintegration law, $X = X_0 e^{-\lambda t}$, and the rule of Geiger and Nutall, $\log \lambda = A + B \log R$, can be deduced mathematically from 2 assumptions: (1) the nucleus of a radioactive element, supposed to contain particles in movement, becomes unstable when N independent particles all pass through some unknown critical position within the short time τ ; and (2) the time τ is of the order of the time taken by a strain to traverse the nucleus. If each particle passes through the critical position ν times per sec., the disintegration const. λ can be shown to equal $(\tau \nu)^N$. The const. $B = \frac{1}{N} \log N$, and N is therefore 80 and a const. for all the radioelements. The const. λ takes the form R^{80} , whence the explosion of an atom requires the fortuitous coincidence of some 80 independent events. G. L. WENDT.

The decrease of velocity of swiftly moving electrified particles in passing through matter. N. BOHR. Univ. Manchester. *Phil. Mag.* 30, 581-612(1915).—The distribution of velocities in a beam of α - or β -rays on passage through matter is developed on the basis used in a former paper (*C. A.* 7, 936). Using Rutherford's nucleus atom, the loss of kinetic energy of a penetrating particle depends on the number of electrons in the atom and the frequency of their characteristic vibration. In the case of α -rays the probable variation from the mean rate of velocity decrease is small, less than 1% varying more than 5% from the mean. For β -rays there is a sharp max. in the rate of decrease at a unit electron concn. The thus calcd. ranges of α -rays in H and He agree

closely with the observed. When the at. number of air is taken as 14.4 the velocity curve is very near that observed by Marsden and Taylor (*C. A.* 7, 3270) so that the velocity curve is an independent means of detg. the at. number. That Marsden and Taylor could observe no α -particle after its velocity had been reduced to 0.42 of the original is attributed to a lack of homogeneity in the beam. For absorption in Al and the heavier elements the calcns. by this theory are only approximate. The theory for β -rays agrees with the data of Varder (*C. A.* 9, 1875), which seems to vindicate both the premise that the electromagnetic mass increases with the velocity and the principle of relativity that the longitudinal mass is not equal to the transversal mass, since both are used effectively in the calcns. It is further shown that recent measurements on the ionization produced by α - and β -rays agree well with Thomson's theory of the mechanism (*C. A.* 6, 1873), provided allowance is made for secondary ionization by the electrons ejected from the atoms in the primary ionization. G. L. WENDT.

The decrease in velocity of beta particles in passing through matter. W. F. RAWLINSON. Univ. Manchester. *Phil. Mag.* 30, 627-32(1915).—A measurement of the radius of curvature of a narrow beam of β -rays under a const. magnetic field and of the decrease in the radius with the interposition of thin absorbing screens. According to Bohr's theory the decrease in velocity is inversely proportional to the cube of the velocity of the β -ray and is less the higher the at. wt. of the absorber. These relations were verified, but only roughly on account of the diffuseness of the beam after absorption. The velocity decrease is less in Sn than in mica. G. L. WENDT.

The ionization of hydrogen by X-rays. GEORGE SHEARER. Univ. Edinburgh. *Phil. Mag.* 30, 644-58(1915).—The ionization of H by the characteristic X-rays from Cu was found to be 0.0018 of the ionization in air, but when X-rays from Sn, which have a greater frequency, were used the value rose to 0.0035. This may be due to a characteristic radiation of H of such a wave-length that it can be excited only by rays of a frequency of the Sn rays or greater, but it is more probably due to AsH_3 or other impurities which radiate under the influence of the rays of higher frequency. When the less pure H from Zn and H_2SO_4 was used in place of electrolytic H the ionization increased markedly. The existence of such a high frequency radiation in H is improbable on the basis of Bohr's calcn. of the H spectrum, which predicts that the highest frequency possible is 3.26×10^{15} , in the extreme ultraviolet, and the same figure is obtained from extrapolation of the values for the K series spectra of the elements, as well as from the ionizing potential in H. The fact that H is practically incapable of ionization by X-rays is attributed to the wide difference between the wave-length of the exciting radiation and its known characteristic radiation. Their ratio is 2000 for Sn rays in H but only 50 in air. G. L. WENDT.

A comparison of radium standard solutions. J. MORAN. *Phil. Mag.* 30, 660-4 (1915).—The weak Rutherford-Boltwood standard soln. at McGill Univ., with 1.57×10^{-9} g. Ra per cc. was found 2% lower than the Washington standard; the strong standard soln., 100 times as strong, is 4% lower than the Washington standard. The measurements were made by the Em method, the Em being driven from the soln. by boiling and measured in a gold-leaf electroscope. On successive boilings the solns. lose their emanating power and give results 10% too low, but the full value is restored by the addition of HCl soln. (19%). No explanation of this is offered. G. L. W.

The production of wave-movements by impulses with special reference to the space-lattice effects with Röntgen rays. L. ZEHNDER. Berlin. *Verh. deut. physik. Ges.* 17, 336-42(1915).—If only the principal angle of reflection from a three-dimensional lattice system is considered, $2d \cos \alpha$, where d is the spacing of the lattice and α is the angle of incidence of the wave on the plane of the lattice, gives only the distance between the units of the lattice which are concerned in the reflection, and this

may be a multiple of the wave-length reflected and not the true wave-length as is assumed in X-ray measurements. The true length can be obtained only by observing the reflection at other angles, where the lattice, acting as a diffraction grating, throws a spectrum which will contain an intense line at the true wave-length. G. L. W.

The phenomena occurring on the illumination of edges with Röntgen rays. J. LAUB. Buenos Ayres. *Verh. deut. physik. Ges.* 17, 354-6(1915); cf. *C. A.* 8, 3529, 3754; 9, 174, 552.—X-rays passed through a narrow slit are partially refracted and on striking a photographic plate show lines and bands surrounding the central line. Passage through a narrow circular diaphragm forms a series of concentric rings. The material forming the edge has no influence on the phenomena, but these depend on the hardness of the X-rays and the material of the anti-cathode. When the X-rays are focused on the edge, the lines on the plate form a close two-dimensional rectangular lattice. With a strong source of rays the refracted lines can be seen on a phosphorescent screen. The lines are entirely unlike those due to scattering when rays have passed through thin plates. If the ray is passed through a thin Pt foil after traversing the slit, the refracted lines disappear though the central image is bright. Heating a slit sheet of steel to redness has no effect on the refraction. G. L. WENDT.

The adsorption and precipitation of the radioelements. FRITZ PANETH. Radium Inst., Vienna. *Sitzb. kais. Akad. Wiss., Wien, Abt. IIa* 123, 2349-61(1914); cf. *C. A.* 9, 553, 1875.—The radioelements are readily pptd. by adsorption on ppts. with whose anion the radioelement forms an insol. compd., even though the concn. is far below the solubility limit for the radioelement. In the case of isotopes, as Th B adsorbed on PbSO_4 , this is explained by the kinetic exchange of PbSO_4 mols. between the soln. and the solid phase. Among the mols. entering the solid phase during the equil. are some of $(\text{Th B})\text{SO}_4$, which impoverishes the soln. with respect to the radioelement although the total concn. of the isotopes in soln. is unchanged. The efficiency of the adsorption depends on the relation between the number of mols. of the adsorbent in the surface layer and in the soln. and is therefore greater the more insol. is the adsorbent. For the low concns. of the short-lived elements the amt. adsorbed should be proportional to the concn. To explain the efficient adsorption by similar though not isotopic ppts., such as Th B by BaSO_4 , P. assumes that even in the solid state the ions are dissociated and separate and the valence bonds extend not only to the consort ion but to all in the vicinity and are essential to the cohesion of the solid state. This view is based on the evidence from W. L. Bragg's X-ray spectrometer (*C. A.* 8, 1236) that in the NaCl crystal Na and Cl are separate. An insol. salt is therefore one whose ions have a greater attraction for each other than for H_2O and so tend to coagulate in the solid state. $(\text{Th B})\text{SO}_4$ is insol. and so a Th B ion will be held by the SO_4 ions in the solid Ba-SO_4 ionic mass nearly as firmly as a Ba ion is. The efficiency of the adsorption depends then on the solubility of the $(\text{Th B})\text{SO}_4$ only as it affects this adsorptive attraction and without direct regard to the solubility product. No chem. similarity between the radioelement and the cation of the adsorbing ppt. is necessary beyond the mutual attraction for the anion. G. L. WENDT.

4. ELECTROCHEMISTRY.

COLIN G. FINK.

Contributions of the chemist to the electrochemical industry. W. S. LANDIS. *J. Ind. Eng. Chem.* 7, 944-5(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc. E. H.

Electric furnace power loads. F. T. SNYDER. N. E. L. A. convention, June, 1915, San Francisco. *Elec. World* 65, 1527(1915).—At present about 1,000,000 h. p. is

used in elec. furnaces, principally in the manuf. of Al, CaC_2 , steel and N products. The central station power load from these industries may be developed greatly, if low rates are given. They furnish a very desirable load because they can be shut down for several hrs. at the time of peak load. The cost of repairs and replacements depends greatly upon the number of electrodes. This will favor the development of a one-electrode furnace for single-phase power.

A. B. GLADDING.

Electric furnaces in Italy. ANON. *Elec. Rev. West. Elec.* 66, 1159(1915); *Z. Elektrochem.* 21, 295-6(1915).—Statistics of elec. furnaces and elec. furnace products in Italy during 1913.

A. B. GLADDING.

Commercial application of resistance furnaces. C. W. BARTLETT. N. E. L. A. convention, June, 1915, San Francisco; through *Elec. World* 65, 1526-7(1915).—A general review of the applications of elec. furnaces. A number of special furnaces are described in the original.

A. B. GLADDING.

The electric furnace in the foundry. J. H. GRAY. *Iron Age* 96, 798-800(1915).—G. distinguishes between the arc and induction types and then discusses the arc furnace. Acid furnaces should be lined throughout with SiO_2 , while basic bottoms consist of magnesite brick covered with layers of sintered grain magnesite. A mixt. with 10-20% of open-hearth slag admits of better sintering and fritting. This mixt. is added in layers and each layer is heated white by the arc before the succeeding one is applied. Dolomite repairs corrosion above the slag-line. Roofs are always made of SiO_2 . The walls may be made of SiO_2 , magnesite-, or Cr-brick and should be 13-18 in. thick. The roof should be 9 in. thick. The electrodes consist of graphite or amorphous C in sections of convenient length and joined by nipple or screw thread. Graphite has a higher cond., less breakage and is more easily handled, but costs more; it is a better conductor of heat and electricity, minimizing its advantages. The consumption in kw. per ton steel is greater where the heat radiates from the arc upward and downward. The number of electrodes depends upon the kind of current and whether or not elec. connections through the bottom are used. With bottom connections single phase requires 1 electrode, 2-phase 2, 3-phase 3, while without bottom connection single phase requires 2, 2-phase 4 and 3-phase 3. The 3-phase system is most prevalent in America. Grouping of electrodes and a table of sizes are given. The electrode holder should form good elec. connection with the electrode, be easily tightened and loosened and water-cooled to prevent arcing. A water-cooled collar or other cooler causes fumes to condense on it and form smut which seals the opening between electrode and collar, making the furnace more nearly air-tight. *Ibid* 878-81.—Linings, roof, electrodes, elec. connections and mechanism of the furnace suitable for foundry use are described. Fundamental consideration of all parts of their operation is given. Tables show the size of Cu conductors and electrodes for furnaces of different capacities.

W. H. BOYNTON.

Details of Stassano furnace at Warman Steel Casting Co., Redondo, Cal. W. M. MCKNIGHT. N. E. L. A. convention, June, 1915, San Francisco. *Elec. Rev. West. Elec.* 67, 13(1915); see *C. A.* 8, 465.

A. B. GLADDING.

New installations of Héroult furnaces. ANON. *Iron Age* 96, 937(1915); cf. *C. A.* 2, 2487.—New 6-ton furnaces are in course of erection at Lockport, N. Y., Baltimore, and Wellend (Ont.). These bring the total up to 30 H. furnaces in the U. S. and Canada.

C. G. F.

Steel electrically produced directly from ore. ANON. *Elec. Rev. West. Elec.* 67, 904(1915).—An elec. smelter at Belleville, Canada, utilizes the heat from waste gases by preheating the charge which is passed through two wrought-iron pipes 8 ft. long and increasing from 14 to 18 in. in diameter. These are enclosed in the preheater stack

which is provided with baffles to facilitate circulation. The charcoal, limestone and ore are all crushed to pass a 1 in. mesh. Two-phase current, connected by the Scott connection, is introduced through 3 in. electrodes threaded to feed continuously. The plant has been in operation for about 2 months and has produced sound ingots of high-C steel for ore containing 7.5% Ti. A 3-ton furnace is soon to be erected.

W. E. RUDER.

The fixation of atmospheric nitrogen. Discussion. J. W. RICHARDS, *et al. Proc. Am. Inst. Elec. Eng.* 34, 2656(1915).—R. points out that of the total of 250,000 h. p. available at Rjukanfos, Norway, only 3500 h. p. or 1.4% is actually utilized. The cyanamide process reaches 6%. The Serpek process produces Al_2O_3 as a by-product. The efficient conversion of NH_3 to HNO_3 is an important consideration. J. L. R. HAYDEN reports that his expts. with arcs of different temps. seemed to show no direct relation of the NO concn. to the arc temp. as depending upon the arc stream material. He concludes that the NO production by the elec. arc is essentially a dissociation phenomenon. A table of arc stream materials arranges itself, with the exception of Cu, in their efficiency of NO production approx. inversely to their b. ps. D. B. RUSHMORE said that the effect of the elec. field has been given little consideration and might be of extreme importance. F. B. WASHBURN shows that a great mfg. industry should be located where deep water can be reached rapidly on the Atlantic or Pacific coast. The tonnage ratio of raw material to finished product would be about 4 to 1. L. L. SUMMERS dwells upon the elec. effect of the arcing system with its ionizing element. The reason why a large arcing system is not more effective is that at the temps. involved, dissociation is so active that, even though the elec. effect is sufficient, the product cannot be removed rapidly enough.

W. E. RUDER.

Electrical precipitation. Discussion. S. DUSHMAN, *et al. Trans. Am. Inst. Elec. Eng.* 34, 2646-52(1915).—D. describes a simple device for rectifying currents at high potential called the "kenotron" (cf. C. A. 9, 1008). This device is particularly adapted to elec. pptn. W. W. STRONG does not believe that the influence machine has any future in this work. Referring to the application of elec. pptn. to steam locomotives, the chief difficulty is that the source of power is usually d. c. It is also impossible to treat gases flowing at a high speed. It is being applied, however, when fires are being started. Pptn. by means of polarization is impracticable because a max. corona current between the electrodes is necessary. The insertion of inductance in the high tension d. c. circuit has been found at times to be an advantage. There is a preferred design of precipitator for any given gas problem. Expts. have shown a 4 ft. pipe to be feasible and practicable and 200,000-250,000 v. have been used satisfactorily. It is also possible to have too great a potential for the most economical operation. H. P. HILL describes tests on rectifying device and decided that a positive contact switch commutating the entire wave was the most practical and efficient device.

W. E. RUDER.

The uses of colloids in plating solutions. E. S. THOMPSON. *Brass World* 11, 251-2(1915).—Deposition of Pb and Sn in cryst. form from caustic baths is prevented by addition of gelatin, glue, etc. The colloid acts as a filter preventing cryst. substances from passing through it to reach the cathode. The metal in soln. is deposited as a secondary reaction. Glue takes up O at the anode and carries it to the cathode.

W. H. BOYNTON.

Alternating current service from battery. J. A. WALTON. *Elec. World* 66, 975-6 (1915).—A storage battery has been installed in a sub-station to carry the a. c. load whenever the normal supply is interrupted. The battery is floated on d. c. busbars, normally energized by motor-generator sets, and providing control equipment which will in emergencies allow the battery to feed back into these sets, hence maintaining

a. c. service in the distribution system connected to the same busbars as the motor generators. The battery consists of 344 H-29 Exide cells, 72 of which are end cells. When discharged at the 1 hr. rate the battery has a rating of 1350 kw. and at the 20 min. rate a rating of 2700 kw. Diagrams of circuit connections are shown.

I. C. MATTHEWS.

The effect of porosity on the capacity of lead battery plates. C. HEIM. *Elektrotechn. Z.* 36, 281-2(1915); see C. A. 9, 2839.

C. G. F.

The overshooting in tungsten lamps. A. G. WORTHING. Nela Res. Lab. *Lighting J.* 3, 256-7(1915).—By means of a pendulum device the eyepiece of a Lummer-Brodhun photometer could be exposed at any desired instant following the closing of the circuit containing the lamp under investigation. A diagram of connection is shown. A high degree of accuracy was not possible. In vacuum W lamps a small amt. of overshooting was observed, due to the central portion of the filament reaching its max. steady temp. before the portions near the end. In N-filled W lamps the overshooting was found to be about 6% in c. p. Curves are shown. The results of J. B. Taylor (1908) are discussed.

C. G. F.

Results obtained with nitrogen-filled lamps. RAY PALMER. *Elec. J.* 12, 225-6(1915).—N-filled W lamps (325 watt) with compensators have been used satisfactorily to replace white flame arc lamps (465 watt). The c. p. of each is about 600. It is estimated that 15000 W lamps will have been installed by the end of 1915. The total cost per year for maintenance and operation is \$50.32 for the 465 watt flaming arc lamp and \$40.66 for the 325 watt N-filled W lamp. Details of cost and advantages are given.

A. B. GLADDING.

Arc lamp versus half watt tungsten lamps. A. CHEVALIER. Bremen. *Elektrotechn. Z.* 36, 269-70(1915).—Cost figures are given to show that for street lighting the modern arc lamp is cheaper than the N-filled W lamp.

C. G. F.

The new gas-filled tungsten lamps. M. PIRANI AND A. R. MEYER. Berlin. *Elektrotechn. Z.* 36, 492-6, 507-10(1915).—Detailed description of the new N- and A-filled W incandescent lamps. Numerous cuts and curves are shown. From 14 to 22.8 lumens per watt are obtained with these new lamps as compared with 3.2 lumens for the C filament, 6.0 for the Nernst lamp and 9.3 for the 1 w. p. c. vacuum W lamp.

C. G. F.

Manufacture of tungsten wire. St. *Elektrotechn. Z.* 36, 477-8(1915).—A review of present patented processes, in particular the Siemens and Halske Ni-alloy process, and the General Electric process.

C. G. F.

Electrical porcelain. Discussion. A. O. AUSTIN, *et al.* *Proc. Am. Inst. Elec. Eng.* 34, 2622-45(1915); cf. C. A. 9, 2035.—A. discusses methods of testing insulators as now applied and considers the weak field alternator method to be the best high frequency or impact method for commercial work. Photographs of various types under load are given. The short-time test at a higher voltage was considered best. The mechanical stresses are more to be feared than the elec. CROSBY FIELD-FRANK recommends the use of the oscillatory transformer as giving the most satisfactory and definite tests. P. W. SOTHEMAN recommends that more tests be made during mfg. and in the unglazed condition. The relation between flash-over and puncture must be very carefully considered. L. L. ISRAEL says that the dielec. hysteresis in material is of prime importance and that accidental flaws are secondary. R. P. JACKSON gives results of tests of the comparative value of the Tesla coil scheme, the high voltage impact scheme and the test under oil at normal frequency, all compared with ordinary flash-over test at normal frequency. A reasonably good insulator which will stand the 60-cycle test will stand up for a long time at high frequency which does not flash

over the insulator. There is apparently some residual mol. stress that lasts an appreciable time after the main stress is applied. Owing to a similar stress in the same direction a few secs. later, the torque or resisting power is already braced to receive it and the insulator stands. If the stress reverses this mol. stress, the insulator fails. J. C. SMITH, H. J. RYAN and J. S. LAPP also discuss the paper dwelling upon the nature and application of various tests. W. E. RUDER.

Electrical characteristics of solid insulations. F. W. PECK, JR. *Gen. Elec. Rev.* 18, 1050-7(1915).—Among the solid insulations used in practice are varnished cambric, oiled and varnished press board, treated paper, treated wood, mica, micanite, soft and hard rubber, synthetic resins, glass and porcelain. The actual resistance of the insulating material is very high but practically all solid insulating material absorbs moisture to a greater or less extent. The capillary tubes and microscopic interstices, etc., in the structure become filled with moisture and gases; these afford conducting paths through the insulation. The result is, in effect, a complicated arrangement of resistances and capacities in series and multiple. With a. c. the effective resistance varies with the frequency. With solid insulations loss appears as soon as the voltage is applied. This loss (ρ) may be due to so-called dielectric "hysteresis" or lag of the flux behind the e. m. f. due to some mol. action or it may be due to conduction through the absorbed moisture. Equations are derived and curves are shown for loss in good and in poor insulation. Plotting $\sqrt{\rho}$ against the gradient, kilovolts per mm. (effective) results in a straight line, showing that the square law is followed. The puncture ρ varies greatly with the time of application. This variation is due principally to heating where the time of application is comparatively long. Other factors, such as mechanical design, operating temp., etc., are considered at length. C. G. F.

Insulator performance from operating viewpoint. E. P. PECK. *Elec. World* 66, 1077-9(1915).—P. cites a number of cases due to defective insulators. He describes tests for weeding out faulty units, interpretation of high frequency effects and practical features of testing insulators. C. G. F.

Comparison of calculated and measured corona loss curves. Discussion. J. B. WHITEHEAD, *et al.* *Proc. Am. Inst. Elec. Eng.* 34, 2620; cf. *C. A.* 9, 2487.—W. argues that the losses on smooth wires would begin at E_s not with a sudden increase to a value represented on one of F. W. Peek's curves but gradually from 0 on a smooth curve. The difference between this theoretical curve and Peek's is due to weathering and surface irregularities. Peek shows that the disruptive critical voltage E_0 was not detd. by a single reading on an unstable part of the curve but from readings extending over the whole curve. W. E. RUDER.

The discharge tube used as a wireless valve. G. W. WHITE. *Electrician* 76, 103(1915).—A "gas valve" is described which consists of two ordinary electrodes fixed opposite one another and maintained at a high p. d. in a rarefied gas. To obtain the big current necessary for convenient values of p. d. a large vessel is employed and an intermediate electrode introducing only a low resistance. A glass tube 20 cm. long and 5 cm. diam. was used with an Al wire anode and an Al disk cathode fixed 6 mm. below the intermediate electrode. The Cu disk used for the intermediate electrode filled the cross-section and was provided with 3 holes of 1.3 cm. diam. The valve was effective up to 3 mm. pressure, but was best when the pressure was such that the edge of the "cathode dark space" was just 6 mm. from the cathode. Although the best conditions of operation have not yet been worked out, this app. has the advantage of dispensing with the heating filament and battery and is not sensitive to small pressure changes. W. E. RUDER.

Estimation of amount of nickel deposited on nickeled objects (PONTIO) 7. Controlling infra-red emission (COBLENTZ) 2. Gaseous-conductor lamp for color matching (MOORE) 25. The action of certain colloids or ions during electrolysis (MUTSCHELLER) 2. The relative migration velocities of the ions in complex electrolytes (MUTSCHELLER) 2.

Accumulator cells. VAN RADEN & Co. and M. METZ. Brit., 2,548, Jan. 31, 1914. The cells consist of Pb containing from 3.5 to 7.5% of Sb, and have glass covers. They may be cast, the smaller sizes in one piece and the larger and odd sizes in standard-sized halves, which can be burnt together after being cut down if necessary.

Electric liquid resistance. H. HERAPATH and M. J. RAILING. Brit., 15,798, July 1, 1914. In a liquid resistance, a conical electrode is provided with an insulated projection which enters a hole in the fixed electrode to prevent swaying. The projection may be of ebonite, or may be integral with the conical electrode and covered with ebonite.

Supports for incandescent filaments. G. LUDECKE and BRIMSDOWN LAMP WORKS. Brit., 27,157, Nov. 25, 1913. The supports consist of a Ni-W alloy, which may contain up to 50% of W.

Tungsten. BRITISH THOMSON-HOUSTON CO. Brit., 15,961, July 3, 1914. In the agglomeration of powdered W for the manuf. of wires and filaments, a mixt. is used of different varieties of substantially pure metal obtained from different chem. compds. The metal may be extd. from different tungstates, or a mixt. of different varieties of tungstic oxide prepd. in the following manner may be used. W_2O_5 is mixed with K_2CO_3 and Na_2CO_3 and KNO_3 and $NaNO_3$, and H_2O , to form a paste which is heated on an Fe plate to about 500–600°; it is then worked with a spatula and heated to about 900° directly by a gas flame. The product is dissolved in H_2O , and the soln. filtered, and W_2O_5 is pptd. by HCl and then dissolved in NH_4OH . From 1 part of this soln., NH_4 tungstate crystals are formed either by neutralizing with concd. HCl, or by playing a gas flame directly upon the soln., and the crystals are dried and ignited at about 450° to produce W_2O_5 . From the other part of the soln., W_2O_5 is pptd. by neutralizing with HCl, and then adding the whole to hot HCl. The 2 varieties of oxide thus obtained are mixed and reduced to W powder, which may be worked into wire in the manner described in 21,513, 1906, and 23,499, 1909; or a compressed mixt. of the oxides is heated in an elec. furnace to about 900–1100° and then powdered and reduced by H at about 900°, the product being suitable for making filaments in which the tendency towards offsetting is reduced.

Tungsten. PINTSCH AKT.-GES. Brit., 16,620, July 11, 1914. A rod, wire, ribbon, filament, or the like of a metal, *e. g.*, W or a W alloy, consisting throughout its whole length of a single crystal or of several crystals lying side by side and each extending through the whole length of the body, is obtained by passing the filament, etc., through a short zone of very high temp. at a speed not greater than that at which a crystal can grow and absorb or dissolve the succeeding portions of the material. The temp. of the hottest zone may be about 2400°, and the speed about 15–16 ft. per hr. for filaments suitable for incandescent elec. lamps. App. is specified.

Smelting furnace. F. J. MACHALSKE. Brit., 15,455, June 27, 1914. The hearth and lower parts of the side walls of the furnace are lined with artificial graphite which is not attacked by molten Fe, while the upper parts are lined with magnesite.

Smelting furnace electrode. F. J. MACHALSKE. Brit., 15,456, June 27, 1914. The electrode is movable and consists of 1 or more longitudinal C rods enveloped by a

refractory basic slag-producing compd. of Mg becoming conductive when heated. The total cross-sectional area is large in comparison with the area of C.

Smelting iron ore. F. J. MACHALSKY. Brit., 15,457, June 27, 1914. The ore is smelted with lime and artificial graphite, a metal free from C being obtained. The process is carried out in an elec. furnace, preferably lined with artificial graphite as described in 15,455, 1914 (*supra*), and electrodes composed of C rods surrounded by a filler of MgO or dolomite, as described in 15,456, 1914 (*supra*). Cf. C. A. 9, 2488.

Carbon-zinc element with manganese dioxide as depolarizer. COLUMBUS-WERKE, G. M. B. H. Ger., 284,144, May 10, 1914. In elements wherein the C electrode is imbedded in a graphite-MnO₂ mixt., the voltage falls rapidly during discharge. A marked improvement in the discharge curve is secured by an admixt. of CuO with the graphite-MnO₂ mixt. Experience indicates that the best action is obtained by an addition of 0.25-0.3% of CuO.

Electric accumulator. BRUCE FORD. Ger., 283,833, Apr. 28, 1914. The accumulator is provided with tubular insets for charging and removing gas.

Positive electrodes of alkaline accumulators. SVENSKA ACKUMULATOR AKTIEBOLAGET JUNGNER. Ger., 284,044, July 25, 1913. See Brit., 1,062 (C. A. 9, 1721).

Regenerating positive electrode masses. SVENSKA ACKUMULATOR AKTIEBOLAGET JUNGNER. Ger., 284,567, July 26, 1913. See Brit., 72 (C. A. 9, 1585).

Securing electric heating resistances on vessels. THERMOS AKT.-GES. Ger., 284,942, Dec. 6, 1914.

Alkali metals and their alloys. BADISCHE. Ger., 284,742, Jan. 6, 1914. In the electrolysis of alkali metal hydroxides, the alkali at the anode, which has taken up H₂O, is removed from the app. by the introduction of freshly dehydrated caustic alkali. The process is carried out with the use of a cell which is divided at the top into 2 or more compartments by 1 or more sepg. walls dipping in the electrolyte to a slight extent only. One of the resulting chambers serves to hold the products of the cathode, alkali metal and H, while the other chamber or chambers receive the O. The electrodes are opposed to each other under the sepg. wall, and they can be sepd. from each other by means of a wire gauze. The cell proper is provided with 2 nipples, of which the one on the cathode side serves for the introduction of the dehydrated alkali, while that on the anode side carries the H₂O-containing alkali from the cell, being traversed, therefore, by a current of alkali flowing from the cathode to the anode. The anode alkali, containing H₂O, cannot therefore enter the cathode chamber. The addition is regulated so that the current flowing in the cell is not strong enough to entrain the particles of metals rising from the cathode. The metal collects on the surface of the alkali in the cathode chamber. The accumulated metal either flows continuously from the cell, or is withdrawn from time to time. The fresh anhydrous alkali can be introduced through a nipple at the bottom of the cell, thereby effecting an exit at both the cathode and anode sides. NaOH or KOH or a mixt. of both may be employed.

Electrolytic deposits of iron and iron alloys. H. OTTINGER. Ger., 284,608, Dec. 1, 1912. The deposits are produced from baths containing alkali or alk.-earth carbonates or bicarbonates in amt. sufficient for neutralization. Attempts to obtain Fe ppts. heretofore have been attended with considerable difficulties, with the production of friable, porous, or off-color ppts. containing oxide. Better results are obtained now by the addition of H₃BO₃ to baths which have been neutralized in the usual manner by MgCO₃. Such baths yield, from the first, bright uniform ppts. By the addition of metal salts, alloys of Fe with Ni, Co, and other metals may be obtained of a good quality and of any desired thickness.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

Nitrogen compounds of gold. ERNST WEITZ. Univ. Strassburg. *Ann.* 410, 117-222(1915).—The 1st drop of NH_3 gives a permanent ppt. with HAuCl_4 . To complete the pptn. of the Au, 4 mols. NH_3 are necessary. The compn. of the ppt. is approx. $\text{Cl}:\text{Au}:\text{NH}_3$ or $\text{Au}:\text{N}:\text{Cl} = 1:1:1$. With 5 mols. NH_3 one obtains "fulminating gold" (A), in which the $\text{Au}:\text{N}$ ratio is 1:1.5, but which contains less Cl. More than 5 mols. NH_3 gives the same $\text{Au}:\text{N}$ ratio but continually decreases the Cl content. A is a mixt. of 2 compds., *sesquiammineauric oxide*, (B), $\text{Au}_2\text{O}_3 \cdot 3\text{NH}_3$, and *diamido-imidodiamineauric chloride*, or *imido-bis-amidoauric chloride*, (C), $\text{NH}(\text{AuNH}_2\text{Cl})_2$. B probably has the composition $2\text{Au}(\text{OH})_3 \cdot 3\text{NH}_3$ when air-dried. When A is treated with HCl it becomes considerably lighter in color, which may be due to the reaction with the acid, but no compds. could be isolated. The continued action of HCl leads to a product containing more Cl and less $\text{N} \cdot \text{NH}_4\text{Cl}$ has the same effect. Conc'd. NH_4Cl finally gives a soln. of NH_4AuCl_4 . A cold, fairly conc'd. soln. of NH_4CNS dissolves A in the cold. KI dissolves A slowly, in the cold, more rapidly when heated. *Diamido-gold chloride*, $\text{Au}(\text{NH}_2)_2\text{Cl}$, is obtained by treating 100 cc. of $\text{NH}_2 \cdot \text{NH}_4\text{Cl}$ soln. (100 cc. sat'd. NH_4Cl is treated with NH_3 until the vol. is about 150 cc.) with 40 cc. 0.2 N AuCl_3H containing 12 g. NH_4Cl , filtering after 2 days and drying without washing, yellowish red powder, containing 1 H_2O when air-dried. The dried product is not explosive. When washed with H_2O , more NH_3 is lost than Cl. The washed product is slightly explosive. The hydrated product may be $\text{AuOCl} \cdot (\text{NH}_3)_2$. B, in the hydrated form, is obtained by the action NH_3 upon A or D. It is very explosive, especially when dried at $105-110^\circ$ (loss of H_2O). If the product is mixed with 5 parts K_2SO_4 it is rendered non-explosive and can be dried at 105° . B is not affected by shaking with cold H_2O . Hot H_2O splits off $\frac{1}{2}$ of the N giving monoammineauric hydroxide (see below). Conc'd. NH_4OH has little effect. HCl dissolves it, forming AuCl_3 . Dil. H_2SO_4 and HNO_3 produce little effect in the cold; warmed, these acids split off NH_3 giving explosive products. Alkalies behave in the same way. B, dried to $115-120^\circ$, loses H_2O and gives *diamminetriaurous oxide*, $\frac{1}{2} \text{Au}_2\text{O}_3 \cdot 2\text{NH}_3$, black, very explosive. Heated with H_2O this slowly evolves N, giving metallic Au. *Monoammineauric oxide*, $\text{Au}_2\text{O}_3 \cdot 2\text{NH}_3$, is obtained by the action of hot H_2O upon B or better from AuCl_3 and excess NH_3 by digesting the pptd. B on the H_2O -bath with H_2O for 25 hrs.; it is a yellowish brown product which explodes when air-dried by simple rubbing. With NH_3 it gives B. By boiling with dil. HNO_3 all the NH_3 is gradually split off. HCl decomp. it into AuCl_3 , but the presence of a definite intermediary product was established. The action of NH_3 upon $\text{Au}(\text{OH})_3$ gives products with a $\text{Au}:\text{N}$ ratio of about 1:1, the amt. of N increasing with the time of reaction. *Tetrammineauric nitrate*, $\text{Au}(\text{NH}_2)_4(\text{NO}_3)_3$, is prepd. by passing NH_3 gas into a mixt. of 50 cc. sat'd. NH_4NO_3 and 20 cc. 0.2 N AuCl_3 soln. containing 40 mg. solid NH_4NO_3 until the liquid is only slightly yellow or until crystals begin to separate. After 24 hrs. the product is filtered, washed once with H_2O and dried with alc. and Et_2O . It forms glistening needles, which decomp. when heated. One g. H_2O dissolved 0.0288 g. at 25° . One g. 0.1 N KNO_3 soln. dissolves 0.0197 g. at 25° . A soln. of the nitrate gives cryst. ppts. with nearly all nitrates, which consist largely of the unchanged nitrate. With K, Na and NH_4 double salts are obtained. *Potassium salt*, with 1 KNO_3 , fine, long needles. *Sodium salt*, by mixing 0.8 g. nitrate in 25 cc. H_2O and 30 g. NaNO_3 in 25 cc. H_2O , fine, short needles. *Ammonium salt*, long needles. *Phosphate*, $\text{XPO}_4 \cdot \text{H}_2\text{O}$ (X = $\text{Au}(\text{NH}_2)_4$), fine white ppt. obtained by treating the nitrate in H_2O with $\text{Na}_2\text{P}_2\text{O}_7$ or Na_2HPO_4 , very difficultly sol. in H_2O , easily in dil. HCl or HNO_3 . *Oxalate nitrate*,

$X(\text{COO})_2\text{NO}_2$, is pptd. by $(\text{COONH}_4)_2$ as a fine difficultly sol. ppt. A normal oxalate could not be prepd. *Perchlorate*, $X(\text{ClO}_4)_3$, compact prismatic needles; 1 g. dissolves in 0.35 g. H_2O at room temp. *Oxalate perchlorate*, $X(\text{COO})_2\text{ClO}_4$, very fine leaflets. *Chlorate*, $X(\text{ClO}_3)_2 \cdot 2\text{H}_2\text{O}$, from the perchlorate and KClO_3 , very thin leafy needles, easily sol. in H_2O . *Iodate*. *Sulfate*, $X(\text{SO}_4)(\text{NO}_2)\text{H}_2\text{O}$, 4-sided tables. A 2nd product with 2 H_2O was also obtained. An *acid sulfate*, $X_2(\text{SO}_4)_4(\text{SO}_4\text{H})$, was obtained by the use of concd. H_2SO_4 . With the perchlorate 2 further sulfates were obtained, the *sulfate perchlorate*, $X_2(\text{SO}_4)_4(\text{ClO}_4)_2 \cdot 4\text{H}_2\text{O}$, leaflets, and the *sulfate perchlorate*, $X(\text{SO}_4)(\text{ClO}_4) \cdot 2\text{H}_2\text{O}$. *Chromate*, $X_2(\text{CrO}_4)_2$, light yellow. By warming the aq. soln. to 100° these salts decompose, giving a very explosive, dark brown product which contains less than 1.5 NH_3 to 1 Au. The salts are sol. in alkali but attempts to isolate the base were not successful. With acids the salts gradually deposit a light yellow fulminating gold, which contains NO_2 , and is probably a mixt. of B with imido-bis-amidogold nitrate, $\text{NH}(\text{Au}(\text{NH}_2)\text{NO}_2)_2$. Salts of the halogen acids give mixt. of products containing the halogen and B. The constitution of these compds. and the cause of their explosive properties are discussed at length. C. J. WEST.

Some new rare earth compounds. A. J. GRANT AND C. JAMES. *J. Am. Chem. Soc.* 37, 2652-4 (1915).—*Terbium pyromucate*, $\text{Tb}(\text{C}_4\text{H}_7\text{COO})_3 \cdot 3\text{H}_2\text{O}$ was obtained by neutralizing an aq. soln. of the acid with $\text{Tb}(\text{OH})_3$. When the soln. was evapd., radiating crystals were formed which were very sol. in H_2O . *Terbium 1,2,4-bromonitrobenzenesulfonate*, $\text{Tb}(\text{C}_6\text{H}_2\text{BrNO}_2\text{SO}_3)_3 \cdot 10\text{H}_2\text{O}$, was obtained in a manner similar to the pyromucate, except that the soln. was evapd. to dryness, the residue treated with alc., and the remaining solid recrystd. from H_2O . It was a heavy white compd. made up of very fine crystals contg. 15.59% Tb_2O_3 (theory demands 15.49%). *Cesium-ceric chloride* was formed from CeCl_4 mixed with CsCl in aq. EtOH . A yellow ppt. formed, but did not appear to be any definite compd. A double nitrate of La with $\text{Fe}(\text{NO}_3)_3$ was obtained as flat, green, hexagonal crystals which were fairly stable in the absence of air, but formed a reddish brown basic ferric salt when exposed. Analysis corresponded to the formula $3\text{Fe}(\text{NO}_3)_3 \cdot 2\text{La}(\text{NO}_3)_3 \cdot 24\text{H}_2\text{O}$. *Lanthanum pyromucate*, $\text{La}(\text{C}_4\text{H}_7\text{O.COO})_3 \cdot 2\text{H}_2\text{O}$, and *yttrium pyromucate*, $\text{Yt}(\text{C}_4\text{H}_7\text{O.COO})_3 \cdot 3\text{H}_2\text{O}$, were also prepd. as above. *Terbium propionate*, $\text{Tb}(\text{C}_3\text{H}_7\text{COO})_3 \cdot 2\text{H}_2\text{O}$, was prepd. from the hydroxide and the acid, and formed thin, white, powdery voluminous crystals. The % of the normal oxide agreed fairly well with a formula contg. 2 mols. of H_2O . The citraconate and quinate were found to be very sol. substances. E. B. MILLARD.

Separation of yttrium from the yttrium earths. III. J. P. BONARDI AND C. JAMES. *J. Am. Chem. Soc.* 37, 2642-3 (1915); cf. C. A. 8, 1928, 2996.—Details of several further attempts to sep. Yt from the Yt earths by fractional pptn. methods. The only reagent which gave much success was $\text{K}_2\text{Co}(\text{CN})_6$. In a 2-fraction sepn. a quite pink fraction with an at. wt. of 97.2 and a nearly white one with an at. wt. of 91.3 were obtained. When 4 fractions were pptd. with the Co reagent and the 5th by adding $(\text{COOH})_2$ to the last filtrate, the first 2 fractions had at. wts. of 98.7 and 95.1, resp., and the others, in order, were 90.8, 88.2 and 90.5. The high at. wt. of the 5th portion may have been due to Nd, which was shown to be present by the spectroscope. This fraction, and also fraction 4, showed an entire absence of Er bands. Some difficulty was encountered in controlling the quantity of ppt.; further work with this reagent is in progress. E. B. MILLARD.

Derivatives of perceric oxide. II. C. C. MÜLCHER. *J. Am. Chem. Soc.* 37, 2645-52 (1915); cf. C. A. 9, 2844.—The prepn. of *perceric potassium carbonate* has already been described, but the method used in its prepn. could not be applied to the corresponding Na compd. By treatment of *perceric ammonium carbonate* soln. with solid Na_2CO_3 in excess and evapg. in a vacuum a compd. can be obtained which differs

in many respects from the K compd. Cerous ammonium nitrate is dissolved in an excess of satd. $(\text{NH}_4)_2\text{CO}_3$ to which H_2O_2 has been added and the mixt. stirred with a current of air or CO_2 until a max. depth of red color is obtained. The soln. and any undissolved residue are treated with solid Na_2CO_3 and transferred to a vacuum desiccator for 48 hours and evapd. Extn. of the paste with small portions of H_2O and subsequent cooling of the aq. ext. gave crystals of *perceric sodium carbonate* as much as 10 mm. long. The large crystals appear black and the smaller ones dark red. It is only sparingly sol. in cold H_2O , differing markedly in this respect from the K compd.; it effloresces in air more readily than the K compd., forming a light brown opaque compd. which retains the external form of the original crystals. Contact with moisture above 0° causes hydrolysis, and with large quantities of H_2O the compd. is completely decomposed, and a gelatinous orange-red ppt. is formed. Analysis showed the formula $\text{Ce}_2\text{O}_4(\text{CO}_3)_2 \cdot 4\text{Na}_2\text{CO}_3 \cdot 30\text{H}_2\text{O}$. An interesting relation is shown by writing the Na and K compds. as follows: $\text{Ce}_2\text{O}_4(\text{CO}_3)_2 \cdot \text{K}_2\text{CO}_3 \cdot 3(\text{K}_2\text{CO}_3 \cdot 4\text{H}_2\text{O})$ and $\text{Ce}_2\text{O}_4(\text{CO}_3)_2 \cdot \text{Na}_2\text{CO}_3 \cdot 3(\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O})$. *Rubidium perceric carbonate* and *ammonium perceric carbonate* may be prepd. by methods analogous to that for the K compd. (C. A. 9, 2844), though the latter compd. was not isolated in a pure condition. In the double perceric compds. prepd. so far, the metallic constituent other than Ce is a strong base and the acid radical is that of a weak acid; the simple salt which unites with the perceric complex is very sol. In cases in which analyses have been made the Ce is in the state of oxidation corresponding to CeO_2 ; half of the O combined with the Ce is available for wet oxidation under restricted conditions; $\frac{2}{3}$ of the total available O is peroxide O. E. B. M.

Reduction of nitric oxide by contact action of metals and metallic oxides. B. B. ADHIKARY. *Chem. News* 112, 163-4(1915).—On heating Au (prepd. by reduction of AuCl_3 by FeSO_4) in a tube in a KNO_3 -bath and passing a mixt. of NO and H (1:3 in all expts.) over it, traces of NH_3 began to form at 280° , and the action became quite perceptible at 290° ; with the bath at 335 – 345° the action was very rapid, the yield of NH_3 being almost quantitative. Passing the same mixt. over Au foil gave only traces of NH_3 . The same mixt. with reduced Ag gave traces of NH_3 at 390° , decided action at 400° ; at 430° the yield of NH_3 is quite large. Instead of Ag, silverized asbestos (asbestos soaked in AgNO_3 soln. and ignited) may be used. With reduced Fe the mixt. gave traces of NH_3 at 300° , the action being very rapid at 350° . On passing the mixt. over Mg powders (Merck) in a tube-heater only traces of NH_3 were obtained; with Zn-dust (Merck) the yield was almost quant. When the same mixt. was passed over Hg, heated to about 400° , no NH_3 was obtained. With Al powders (Merck) only traces of NH_3 were obtained; with Sn powders (Merck) the yield of NH_3 was almost quant. Pb foil melted and NH_3 was obtained only in small amts. Pb powders obtained by the reduction of PbO gave better yield of NH_3 ; the Pb, though melted, remained in the form of a number of sep. globules. Sb powders (Merck) gave NH_3 , but larger quantities were obtained when Sb powders were freshly prepd. by the reduction of Sb oxides by H. With powdered Bi the metal melted and no NH_3 was obtained, but when Bi powders were prepd. by the reduction of Bi_2O_3 and the mixt. passed over it, large quantities of NH_3 were obtained. With ZnO or CdO large quantities of NH_3 were evolved, but in the case of other oxides of Group II of Mendeleeff's table (e. g., BaO , MgO , etc.), no trace of NH_3 was obtained. When HgO was used it volatilized and no NH_3 was evolved. With the oxides of Al, B, and Si no NH_3 formed, but with the oxides of Pb, Sn, Bi, and Sb large amts. of NH_3 were evolved. When the mixt. was passed over Cr_2O_3 ammonia was produced; with MnO or MnO_2 large amts. of NH_3 formed, the MnO_2 being converted into MnO during the reaction Cf. C. A. 5, 1031; Sabatier and Senderens, *Compt. rend.* 114, 1429(1892); 135, 278(1902).

F. W. SMITH.

The question of the existence of a mono-ammoniacal silver nitrate. A. REYCHLER. *Bull. soc. chim. belg.* 28, 198-200(1914).—R. has detd. the amt. of AgOH which is pptd. when varying amts. of NH_3 are added to 1 mole AgNO_3 in soln.; the results are given in tabular form. The following balanced reactions are indicated on the assumption that AgNO_3 forms the complexes $\text{Ag}(\text{H}_2\text{O})_2\text{NO}_3$, $\text{Ag}(\text{NH}_3)(\text{H}_2\text{O})\text{NO}_3$ and $\text{Ag}(\text{NH}_3)_2\text{NO}_3$ in the dilns. investigated: (1) $\text{Ag}(\text{NH}_3)(\text{H}_2\text{O})\text{NO}_3 \rightleftharpoons \text{AgOH (pptd.)} + \text{NH}_4\text{NO}_3$; (2) $2\text{Ag}(\text{NH}_3)(\text{H}_2\text{O})\text{NO}_3 \rightleftharpoons \text{Ag}(\text{H}_2\text{O})_2\text{NO}_3 + \text{Ag}(\text{NH}_3)_2\text{NO}_3$. The 1st equil. formula is $[\text{Ag}(\text{NH}_3)(\text{H}_2\text{O})\text{NO}_3] = K\pi(\text{NH}_4\text{NO}_3) = Cp$ in which p is the number of moles of AgNO_3 which are transformed into AgOH. If the remaining available moles of AgNO_3 and NH_3 are indicated by $I - p - Cp$ and $n - p - Cp$, resp., then $(n - p - Cp)/2$ moles $\text{Ag}(\text{NH}_3)_2\text{NO}_3$ and $(n - p - Cp)/2$ moles $\text{Ag}(\text{H}_2\text{O})_2\text{NO}_3$ may be formed. The 2nd equil. formula is $[\text{Ag}(\text{NH}_3)(\text{H}_2\text{O})\text{NO}_3] = K[\text{Ag}(\text{NH}_3)_2\text{NO}_3][\text{Ag}(\text{H}_2\text{O})_2\text{NO}_3]$. The results indicate the existence of an aquo-ammoniacal AgNO_3 . H. S. PAINE.

7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Soda lime as an energetic general reagent and its great chemical activity. I. GUARIESCHI. Extract from *Suppl. ann. all'enciclopedia di chimica*, Aug., 1915.—In a review of the literature of soda lime, G. discusses its history and uses in full. Expts. made by G. show that it is an excellent absorbent for Cl_2 , Br_2 , HCl , HBr , NO_2 and COCl_2 . It is most active as a reagent when freshly prepared and must be kept well sealed. H_2S is absorbed with evolution of heat, so much so that when diluted with air and passed over freshly prepared soda lime the latter becomes incandescent. Fresh soda lime absorbs 80-90 cc. of CO_2 in 10 min. Expts. show that soda lime prepared from CaO and a solution of NaOH is best for the absorption of CO_2 . Thus prepared, it is a much better absorbent for CO_2 than solid KOH . Expts. carried out with CO , pyrrole, indole, aldehydes, Et bromoacetate, benzyl bromide, chloroacetone and a number of ethers and nitriles indicate that, with the exception of the first two named compds., absorption occurs more or less completely. Because of its activity, G. concludes that soda lime is probably not simply a mixture but a definite compd.

having the formula $\text{Ca} \begin{array}{l} \text{OH} \\ \text{ONa} \end{array}$ or $\text{Ca} \begin{array}{l} \text{ONa} \\ \text{O} \\ \text{ONa} \end{array}$. Traces of Fe, Mn, etc., apparently act

as catalysts. Soda lime containing these as impurities is superior to c. p. soda lime as an absorbent for H_2S and CO_2 .

L. T. FAIRHALL.

Acidimetric titrations with phenolphthalein. FERRARO ANNIBALE. Genoa. *Boll. chim. farm.* 54, 257-8(1915).—The reddish coloration produced in aq. exts. of flour and alimentary pastes by the addition of N alkali solns. and phenolphthalein persisted for a considerable period, while the color produced in alc. exts. (prepd. by extg. with neutral alc. at 90°) faded quickly; the reddish coloration reappeared (even more distinct than at first) when distd. H_2O free from CO_2 was added to the alc. ext. which had been treated as above. Alkali phenolphthalate is apparently less stable in alc. than in aq. soln. Alc. exts. such as the above should, therefore, be dild. with approx. twice the vol. of H_2O before titrating with phenolphthalein as indicator.

H. S. PAINE.

Methylene blue and its use in analytical chemistry. I. F. W. ATACK. *J. Soc. Dyers Colourists* 31, 183-90(1915).—Methylene blue is characterized (1) by great

fastness to light, (2) by the stability of its acid soln. and that of its leuco compd., (3) the relative ease by which it is converted quant. into its leuco compound by reducing agents in acid solns. and *vice versa* by oxidizing agents, and (4) its high tinctorial power, 0.002 *N* solns. being sufficiently colored for titration. A description is given of various salts of methylene blue, methylene blue hydrochloride and base, also of leuco methylene blue and its prepn. II. *Ibid* 203-8.—The use of methylene blue in qualitative analysis depends on one of 3 processes: (1) Reducing agents are detected by the manner in which they reduce methylene blue soln. to the colorless leuco compd. (2) Oxidizing agents are detected by the production of methylene blue on their addition to the colorless solns. of leuco methylene blue obtained by adding titanous chloride to luke-warm solns. of methylene blue until it is just decolorized. (3) Neutral salts of certain inorganic acids give characteristic precipitates with methylene blue solns. Less than 0.01 mg. of a titanous salt and 0.002 mg. of a molybdenum salt may be detected by methylene blue soln., also vanadous, chromous, tungstous, stannous and cuprous salts. Methylene blue is reduced by the salts of all of the lower sulfur acids, and by hydrazine hydrate, phenylhydrazine and alkali pyrogallate but not quant. in any of these cases. Oxidizing agents destroy methylene blue, the color not being regenerated by reducing agents. Chlorates but not perchlorates oxidize leuco methylene blue. On account of the slow end point in the cold and the fact that it is destroyed by free Cl, the use of methylene blue as an indicator is somewhat limited. It may be used in place of starch. 0.02 *N* methylene blue soln. is generally used for quant. purposes. It must be free from a reddish violet product which makes the end point indefinite, leading to an error of two or more drops in titrating. Methods for standardizing are given and its use in the following estimations is discussed: reducing agents, oxidizing agents, potassium, dissolved oxygen, nitroso compounds, quinones, azo compounds, diketones and oximes. L. A. OLNEY.

Gas analysis with the Bunte buret. ANON. *Z. Beleuchtungsw.* 20, 334(1914).—Ab-der-Halden has made expts. which indicate that appreciable amts. of CH_4 , C_2H_6 and higher homologs are absorbed by Cu_2Cl_2 soln. For this reason the eudiometric method is recommended for the detn. of CO and CH_4 . The analysis of a sample of illuminating gas by both methods shows CO 8.4% by absorption in Cu_2Cl_2 soln. and 5.1% by the eudiometer. The corresponding values for CH_4 are 28.3% and 30.6%, indicating that some CH_4 is absorbed by the Cu_2Cl_2 soln. and counted as CO.

A. B. GLADDING.

The determination of hydrogen in gas mixtures by catalytic absorption. E. BOSSHARD AND E. FISCHLI. *Z. angew. Chem.* 28, I, 365-6(1915).—As a substitute for the expensive Pd absorption process in technical gas analysis, the authors propose a method based on the principle of the hydrogenation of unsatd. oils with Ni as the catalyst. Using the Hempel app., absorb CO_2 , unsatd. hydrocarbons, O_2 , and CO as usual, avoiding yellow P for O_2 since it poisons the Ni. For the absorption of H_2 use two pipets filled with concd. Na oleate containing 3% Ni, prepared by reducing Ni_2O_3 in a stream of H_2 at 340° . Shake the sample (15-20 cc.) in the first pipet for 3 min. under diminished pressure, pass it to the next which contains 1 cc. EtOH to prevent foaming and again shake for 3 min. N_2 and CH_4 do not interfere. The latter is detd. by explosion. Comparative tests show the method to be highly accurate.

H. L. OLIN.

Estimation of traces of carbon monoxide in air. A. GAUTIER. *Bull. soc. chim.* 17, 256-60(1915); *Analyst* 40, 451(1915).—In view of a recent paper by Graham and Winmill (*C. A.* 9, 183) on the detn. of CO, G. states that he used the I_2O_5 method for the purpose in the year 1890, and that the reaction has been described by Ditte (*Bull. soc. chim.* 13, 318(1870)). G. found that the reaction between CO and I_2O_5

commences at 35°, and is rapid and complete at 75°; further, C_2H_4 , C_2H_6 , and the vapors of C_2H_5 and alc., when present in air to the extent of 1 part per 1,000 of air, are oxidized partially by I_2O_5 , and at the same time interfere with the oxidation of the CO. When the gases mentioned are present in quantity not exceeding 1 part per 100,000 parts of air, they do not affect the oxidation of the CO, nor are they themselves oxidized to any appreciable extent. Cf. *C. A.* 7, 1460 (Gautier), 8, 1938 (Seidell), 1939 (Moser), 2173 (Herman), 2474 (Sinnatt); 9, 1287 (Proboese). F. W. S.

Rapid estimation of amount of nickel deposited on nickered objects. M. PONTIO. *Compt. rend.* 161, 175-7 (1915).—**Reagent:** 50 cc. H_2O , 10 cc. HNO_3 (36° Bé.), 20 cc. HCl (22° Bé.), and 20 cc. of H_2O_2 (12 vol.). **Method:** Immerse the object for a few sec. in a bath of concd. H_2SO_4 , wash thoroughly, dry with a cloth, and place 1 drop of reagent on the surface; let stand exactly 2 min., then add 1 drop of NH_4OH (22° Bé.), let stand 1 min., and pour on a porcelain plate. A blue color indicates Cu as the base metal; brown or mauve indicates Fe. In doubtful cases, due to the color of the double salt of Ni, add 1 drop of $K_4Fe(CN)_6$ soln. The time of contact (3 min.) corresponds to a minimum of 1 mg. of Ni per sq. cm. for Cu objects, and to 4 mg. for Fe objects previously coppered. The necessary time of contact for other amts. of Ni on Cu or Fe may be detd. by expt., and the method may be applied to Ag on Cu or brass.

F. W. SMITHER.

Determining carbon in cast steel rapidly. W. L. MORRISON. *Foundry* 43, 151 (1915).—In order to control the C in elec. furnace steel a rapid method for the detn. was worked out. Color C does not work on alloy steels, so gravimetric detn. was necessary. Burn the steel in O by direct combustion and pass the CO_2 into an absorption bulb ~~connected~~ connected to the combustion train by a very pliable light-walled tube. The bulb ~~is~~ tube passing through the balance case. The tube droops a little so as to allow free swinging of the balance without exerting much torsional strain. A cheap grade of balance is used so that this slight torsion will not depress the balance pan. Take a half ~~factor~~ ^{weight} of drillings, place on granular alundum (90-mesh) in an alundum boat, ~~det.~~ The bulb weight and run in slowly with the elec. combustion furnace at 940° to 1000°. As soon as the steel begins to burn the O_2 flow is increased to the limit set by bubbling in the bulb. The burning takes 1 to 2 min., according to the C content; 1 1/2 to 2 min. is required for complete absorption of the CO_2 . Weighing is done to a standstill on a slight swing. The detn. can be made in 4 to 6 min., depending on the content. The app. is run 24 hours per day, in 3 shifts of 8 hours. Combustions can be made in 8 hrs. The av. error is within 1 to 2 points of carbon. The balance is sensitive to 1/2 point. The app. has been used 2 years. H. W. G.

Detection and estimation of traces of phosphoric acid, especially in potable water. P. MURONGEA. *Luxemburg. Chem. Ztg.* 39, 781-2 (1915).—The reagent is prepared by adding a satd. aq. soln. of strychnine nitrate (about 80 cc.), little by little, to a filtered soln. of 40 g. $NH_4 molybdate$ in 100 cc. distd. H_2O in a 500 cc. Erlenmeyer flask, with violent shaking, until a slight turbidity remains. This soln. is then poured, with constant shaking, into 180 cc. concd. HNO_3 (1.4 sp. gr.), let stand overnight and stored in dropping bottles. To use: put 20 drops of the reagent in a clean test tube, add quickly 10 cc. of the H_2O to be tested and swirl quickly once. A cloudiness should appear in 30 sec. with very impure or hard H_2O containing 0.25 mg. P_2O_5 per l. more than 10 cc. H_2O is taken, 2 drops of reagent should be used for each cc. H_2O , drops if the H_2O is very hard. The limit of sensitiveness for ordinary H_2O is about mg. P_2O_5 per l., or 0.05 mg. P_2O_5 per l. if dissolved in distd. H_2O . None of the constituents of H_2O affect the test if the observation is made within 30 sec. To be "mineral" P_2O_5 in sweet wine ~~take~~ 0.33 cc. wine to 100 cc. with distd. H_2O

e. g., from proteins rich in cystine or tyrosine, peptones were obtained also rich in these substances and *vice versa*.

F. W. SMITHER.

Picramic acid as reagent for albuminous substances (OSTROMUISLENSKII) 11B. New indicator for determining hydrogen-ion concentration (LUBS) 11B. The action of certain colloids on ions during electrolysis (MUTSCHELLER) 2. The relative migration velocities of the ions in complex electrolytes (MUTSCHELLER) 2.

8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

Pressure as a factor in mineral and rock formation. JOHN JOHNSTON. *Geophys. Lab.*, Washington. *Neues Jahrb. Min. Geol.* 1915, II, 89-108.—A discussion of this problem is presented, and it is concluded that the importance of pressure as a factor in so-called physical changes, as for instance m. p. of a pure substance, has been over-estd., as contrasted with its influence on chem. changes, in systems of several components. Change of pressure affects the fields of stability of a system just as change of temp. or of total compn., and the extent of its influence is detd. by the compressibilities of the phases. In the discussion of the crystn. relations of a complex magmatic system the pressure as well as the manner of cooling must therefore be considered. Changes of pressure as well as of temp. can change the sequence and even the character of crystn., unless all the soly. curves are affected alike.

E. T. W.

Note on the colors of some alluvial diamonds. F. P. MENNELL. *Mineral. Mag.* 17, 202-5 (1915).—Alluvial diamonds found in gravels and sandy clays from the borders of the Somabula Forest in southern Rhodesia are almost invariably of a green shade in the rough state. This color is entirely lost in the process of cutting and polishing. Recently some yellowish and brownish stones were found, suggesting a relationship between the color of the diamonds and the matrix in which they were embedded. The coloration seems to be due to infiltration or permeation from without (presumably Fe compounds) after the stones were deposited in the gravels. The color is not the result of an incrustation as no effect is produced by prolonged immersion in HF, or by fusion with a mixt. of KNO_3 and $\text{Pb}(\text{NO}_3)_2$.

W. F. HUNT.

Note on the color and alteration of pyrrhotite. F. P. MENNELL. *Mineral. Mag.* 17, 205-7 (1915).—The "bronze-yellow" color usually assigned to pyrrhotite does not seem to be the original color of the unaltered mineral. Specimens from Rhodesia possessing a tin-white color assumed after several months the bronze-yellow color. Originally this mineral was formed under conditions of great heat and pressure, and the difference between these conditions and those prevalent at the surface may have caused the color change after its extn. Upon exposure to air and moisture pyrrhotite alters very readily to FeSO_4 . The formation of this salt in Au ores containing pyrrhotite prevents the use of the cyanide process on the raw ore, owing to absorption of O and the repptn. of the dissolved Au.

W. F. HUNT.

Origin and occurrence of certain crystallographic intergrowths [of copper sulfides]. J. SUGALL. *Econ. Geol.* 10, 452-62 (1915).—A microscopical study with polished sections showing the relationship between chalcocite and bornite. The latter is secondary and derived from the former. Photomicrographs are given.

A. A. KLEIN.

A critical discussion of the crystal forms of calcite. H. P. WHITLOCK. *Proc. Am. Acad. Arts Sci.* 50, 289-352 (1915).—In the discussion the method of developing normal series proposed by Goldschmidt has been adopted as a basis of comparison. W. concludes that the neg. rhombohedron $05\bar{3}1$ and the series of pyramids $11\bar{2}3$, $22\bar{4}3$,

4483 are more common than heretofore recognized, and that the portion of the principal zone Z_4 lying between the poles $p(10\bar{1}1)$ and $P(32\bar{5}1)$ is completely known.

A. WANDTKE.

Crystals of albite from Alp Rischuna, and pericline twins from La Fibbia, Switzerland. W. J. LEWIS. *Mineral. Mag.* 17, 178-89(1915).—Largely crystallographic; the results differ considerably from the measurements on Swiss albites recorded by Des Cloizeaux. Multiple twins according to both the Manebach and Pericline laws were noted. Analysis gave: SiO_2 68.28, Al_2O_3 19.95, CaO 0.45, Na_2O 11.35, K_2O 0.06, loss on ignition 0.10. sum 100.19.

W. F. HUNT.

The dispersion phenomena of albite from Alp Rischuna, Switzerland. S. KÖZU. *Mineral. Mag.* 17, 189-93(1915).—The Abbé-Pulfrich total reflectometer and Hilger's wave-length spectrometer were used to obtain the indices for different wave-lengths. $n_D = 1.5289$; $n_F = 1.5330$; $n_D = 1.5392$. Optic axial angle computed = $78^\circ 30.5'$; observed, $78^\circ 39'$. Five tables record observed critical angles and the corresponding n s and birefringences, and the dispersion of the optic axial angle.

W. F. H.

Quantitative study of certain perthitic feldspars. CHARLES H. WARREN. Mass. Inst. Tech. *Proc. Am. Acad. Arts Sci.* 51, 127-54(1915).—W. presents the results of a quant. microscopic and chem. study of 6 perthitic feldspars from granite pegmatites, and adds for comparative purposes the chem. and mineralogical compn. of 2 granite pegmatites reported by Mäkinen (*C. A.* 8, 1078). The optical and petrographic characters of the group and of the individual specimens are discussed at length, and a table given showing the results of micrometric measurements made to det. the relative amts. of microcline and albite in these specimens. In the following table of chem. compn., the localities of the specimens are: I. Perth, Ontario; II. Westfield, Mass.; III. Bedford, Ontario; IV. Mineral Hill, Penn.; V. Pike's Peak, Colo.; VI. Grafton, N. H.; VII. Tammela, Finland (Härkäsaari); VIII. Tammela, Finland (Pakkalanmäki).

	I.	II.	III.	IV.	V.	VI.	VII.	VIII.
SiO_2	66.50	65.00	65.10	65.30	65.00	65.34	65.05	64.96
Al_2O_3	18.40	19.50	19.13	18.83	19.21	19.08	19.19	18.91
Fe_2O_3	1.05	.35	.32	.15	.20	.18	.28	.43
MnO	tr.	tr.	tr.	tr.	tr.	tr.	tr.	tr.
MgO	.07	.05	.06	.05	.03	.06	—	—
CaO	.30	.30	.24	.28	.35	.27	.41	.32
K_2O	8.77	12.36	12.98	13.60	13.62	13.05	11.19	12.09
Na_2O	5.40	3.03	2.53	2.20	2.20	2.56	3.57	3.31
H_2O	.20	.26	.16	.30	.12	.20	.15	.18
Total	100.69	100.85	100.52	100.71	100.73	100.74	99.84	100.20
Sp. gr.	2.597	2.568	2.571	2.565	2.562	2.570	2.564	

Analyses I.-VI. are by W.; VII.-VIII. by Mäkinen. In addition a specimen of albite from Grafton, N. H., contained 1.78% K_2O and 9.98% Na_2O , its sp. gr. being 2.62. The mineral compn. of these alkali-feldspar intergrowths was detd. by chem. and micrometric analysis; the approx. compn. of the 2 mixed crystal phases—microcline and albite types—are given in tabular form. The origin of perthitic intergrowths is discussed at length. The older theory that the perthitic structure is due to the introduction of albite from without into a previously formed microcline or orthoclase crystal, is considered untenable, and the more recently proposed theory of Vogt, that the K and Na-Ca feldspars form a broken series of mixed crystals with a eutectic point between them, is held to offer a satisfactory basis on which to explain their relationships.

L. W. RUGG.

The alkali-free aluminous augites. H. E. BORKE. Frankfurt. *Centr. Min. Geol.* 1915, 422-31.—A continuation of the discussion (C. A. 9, 2045; Tschermak, C. A. 9, 2496). The equation $p = q + r$ ($Si = Ca + Mg$), regarded by Tschermak as characteristic of augites, is based on av. analyses, but B. here shows by a table of the actual analyses that it does not hold for the individual ones, the difference between p and $q + r$ ranging from + 11.85 to -5.0. Projections of the analyses into tetrahedral diagrams show clearly that these relations are due to the formation of mix-crystals.

E. T. W.

The origin of the nephrite and the "carcaro" of Harzburg. J. FROMME. Egelu. *Centr. Min. Geol.* 1915, 432-45.—An elaborate review of the phenomena of nephrite formation, with criticism of the work of Uhlig (C. A. 5, 1384; 9, 1160). The geological occurrences, microscopical structure, and chem. compns. of the various nephrites are described in detail, and the conclusion reached that the mineral forms from serpentine, in part through the intermediate rock known as carcaro. In other regions, however, formation from diallage and diopside has been demonstrated.

E. T. W.

Natrolite crystals from Hesse. O. R. S. POPOVICI. *Bull. sci. acad. roumaine* 3, 147-57; *Chem. Zentr.* 1915, II, 39-40.—Crystals from the collection of Ochsenius, found in basalt amygdules, agree with those described by Lacroix from Puy de Dome, which certainly are rhombic. Twinning may be present if the mineral, as has been suggested, belongs to the monoclinic system, but optical tests appear to exclude this.

W. B. JOHNSON.

Childrenite from Crinnis mine, Cornwall, and eosphorite from Poland, Maine. JULIEN DRUGMAN. *Mineral. Mag.* 17, 193-202 (1915).—Penfield has shown that the same general formula applies to both minerals— $2(Mn, Fe)(OH)_2Al_2O_3P_2O_5 \cdot 2H_2O$ —childrenite possessing Fe as the bivalent metal, while in eosphorite Mn predominates. Childrenite occurs as minute crystals on the walls of narrow cracks in killas, sometimes also on quartz. Color, pale buff to almost colorless. The mineral was freed from the adhering matrix by careful mechanical sorting followed by digestion for a short period in warm, concd. HCl. The P_2O_5 was pptd. after dissolving the ignited material in acid, and the analysis continued in the presence of the molybdate giving: P_2O_5 29.80, Al_2O_3 21.20, FeO 28.30, MnO 3.35, CaO 0.90, Na_2O 0.25, H_2O 15.30, insol. 0.95, sum 100.05. The crystals are not suitable for accurate measurements; however, 5 forms were noted. Eosphorite: Material is from the Holden Collection, now in the Harvard Mineralogical Museum, its matrix is largely rhodochrosite and a black oxidized Mn compound. It forms small, radiated aggregates of prismatic crystals. Color, pale pink. Crystallographically and chemically it is very similar to the Branchville, Conn. material. Six terminated crystals were measured. The calcd. axial ratios are $a:b:c = 0.7724:1:0.5126$. $a_p = 1.6430$, $\gamma_D = 1.6691$; $2E = 65^\circ 27'$.

W. F. HUNT.

New phosphates from Greifenstein near Ehrenfriedersdorf. F. SLAVIK. *Bull. intern. acad. sci. Boheme* 1914, 1-16; *Chem. Zentr.* 1915, I, 216-7.—Roscherite is a new monoclinic mineral occurring as short thick plates and also as slender prismatic and thin tabular crystals. Axial ratio $0.94:1:0.88$; $\beta = 99^\circ 50'$. The cleavage is perfect parallel to 001 and good 010 ; hardness = 4.5; sp. gr. = 2.916; $n = 1.625$; double refraction, medium. The childrenite-eosphorite group is most closely related. For the properties of jezekite and lacroixite cf. C. A. 9, 1160. Analyses of these minerals gave the following:

	P_2O_5	Al_2O_3	Fe_2O_3	FeO	MnO	CaO	H_2O	Na	Li	F	OH
Roscherite	38.00	13.75	.....	10.13	14.47	11.43	12.17	.....	.....	.....	.....
Jezekite	30.30	21.92	Trace	.....	.....	13.50	.....	18.17	0.86	8.15	7.26
Lacroixite	28.83	18.87	Trace	.....	8.43	19.46	.....	.....	.....	6.53	.....

In addition Lacroixite shows, MgO, Trace; Na₂O, 14.92; Li₂O, Trace; +H₂O, 5.46; SiO₂, 0.95.

A. WANDTKE.

Bassetite and uranospathite, new species hitherto classed as autunite. A. F. HALLIMOND. *Mineral. Mag.* 17, 221-36(1915).—No less than 3 distinct cryst. substances have been included under the name of autunite. Although the chem. comp. of the three is probably alike (apart from the H₂O of crystn.), on account of their crystallographic and optical differences they are not to be included in one species. The name autunite is retained for the Autun mineral; in addition the two following names are suggested: **Bassetite**: (after the Basset mines in Cornwall) hydrated Ca- UO_2 -phosphate. Monoclinic, with $a:b:c = 0.3473:1:0.3456$; $\beta = 89^\circ 37'$. Twinned by parallel growth of a and c axes so that the faces b are parallel. Sp. gr. = 3.10; biaxial, $2E = 110^\circ$; negative, Bx_a normal to b ; $\beta = 1.574$, $\gamma = 1.580$; pleochroic, $\beta = \gamma$ deep yellow, α pale yellow. In desiccator the extinction angle increases to about 20° . **Uranospathite**: (in allusion to the elongated tabular habit of the specimens) a hydrous UO_2 -salt. Orthorhombic, pseudo-tetragonal. Twin axis perpendicular to (110), in cruciform groups; sp. gr. = 2.50. Biaxial, $2V = 69^\circ$; negative, Bx_a normal to c . $\gamma = 1.521$, $\beta = 1.510$; pleochroic, $\beta = \gamma$ deep yellow, α pale yellow. Becomes uniaxial in desiccator.

W. F. HUNT.

Enrichment of silver ores. L. G. RAVICZ. *Econ. Geol.* 10, 268-89(1915).—If only a small amt. of Ag occurs in mineral waters, calcite cannot cause pptn., while alkali carbonates ppt. Ag salts. Sulfo-salts of Ag are unstable in presence of hot alk. sulfides. FeSO_4 acting on Ag_2SO_4 or Ag_2CO_3 readily ppts. Ag as follows: $\text{Ag}_2\text{SO}_4 + 2\text{FeSO}_4 = 2\text{Ag} + \text{Fe}_2(\text{SO}_4)_3$ and $\text{Ag}_2\text{CO}_3 + 3\text{FeSO}_4 = 2\text{Ag} + \text{FeCO}_3 + \text{Fe}_2(\text{SO}_4)_3$.

A. A. KLEIN.

Processes of mineralization and enrichment in the Tintic District. W. LINDGREN. U. S. Geol. Survey. *Econ. Geol.* 10, 226-40(1915).—Jasperoids along the deposits were formed by the replacements of limestones and dolomites by colloidal silica which later crystd. (first depositional phase). Contraction and crushing of silica caused its brecciation and colloidal silica of second phase was deposited, later crystg. Development of barite, galena and other sulfides accompanied both these phases and during deep oxidation chalcocite and covellite were formed together with oxy-salts. Au was concd. in places at all levels in Cu mines by secondary processes involving development of free Cl and AuCl_3 . The rich Ag sulfides are probably all secondary and were formed during the oxidation. A shoot opened near the water level shows a Ag-rich ore composed of galena, pearcite, zincblende and marcasite, which was deposited later than the other ores.

A. A. KLEIN.

Ores of Gilpin County, Colorado. E. S. BASTIN. U. S. Geol. Survey. *Econ. Geol.* 10, 262-91(1915); cf. C. A. 8, 2139; 9, 1290.—The ores consist of Au-Ag ores, U ores (source of Ra), W, Cu and Ti ores which are not commercially valuable. The ore-bearing solns. were apparently alk. or neutral and were rich in alkaline earths. During the early stages of mineralization they were rich in Fe and SiO₂ and during later stages in Pb and Zn carbonates and bicarbonates. They also carried smaller amts. of Cu, As, Sb, Au, Ag, and locally Mn, SO₄, Ba, Te, F, U, and V.

A. A. KLEIN.

Pocket deposits of the Klamath Mountains, California. H. G. FERGUSON. U. S. Geol. Survey. *Econ. Geol.* 10, 241-61(1915).—Au occurs in small calcite lenses between meta-andesite and slate, calcite and slate, and also in small specks without any gangue. Au was deposited later than calcite and replaces it. Its origin is in the pyrite of the low-grade manganese quartz veins found in meta-andesite. It was dissolved by nascent Cl formed by the action of H₂SO₄ upon a chloride in presence of MnO₂. Later the calcite neutralized the Au-bearing solns. and Au was deposited.

A. A. K.

Problems in iron ore geology in Sweden and in America. P. GRIJER. *Econ. Geol.* 10, 299-329(1915).—A comparison of the geology of American Fe ore deposits with those of Sweden touching on their similarity with reference to structure and origin.

A. A. KLEIN.

Oriskany iron ores of Virginia. C. M. WELD. *Econ. Geol.* 10, 399-421(1915).—The Fe ores include all forms of hydrated oxides intimately associated with sand, chert and clay. The origin of these deposits has been ascribed to replacement processes, with the overlying shale as the source of Fe. It is here suggested that the Fe has to a great extent originated in syngenetic bog-iron deposits in the Oriskany sandstone and that replacement processes have later served merely to conc. and enrich such original deposits or else to transport their Fe to new environments. The shale has, however, no doubt furnished a supplementary source of Fe.

A. A. KLEIN.

Iron ore deposits on the northwest coast of Lower California. E. WITTICH. Mexico. *Centr. Min. Geol.* 1914, 389-95.—A geological description of extensive Fe-ore deposits occurring toward the west coast of the peninsula south of Ensenada. The ores comprize hematite, subordinate magnetite and martite, and rarely pyrite, and are regarded as hot spring deposits, much silicious sinter and similar material being associated. In the vicinity of Webb's House Ranch fissures in diorite are filled with Fe ores, here associated with considerable Cu. Two analyses of the Fe ores are given, showing them to be of good quality, Fe being around 60% and P and S very low.

E. T. W.

Ancient sedimentary iron ores of British India. C. M. WELD. *Econ. Geol.* 10, 435-52(1915).—Fe ores occur here (1) among ancient unfossiliferous sediments, (2) disseminated through granites and schists, (3) as concns. within areas of basic igneous rocks, (4) in coal measures, (5) in the form of surface laterites. Only the first type offers deposits of economic value. The ores are hematite and magnetite. They have resulted from primary sedimentation, being deposited as the hydroxide, and later being dehydrated and consolidated.

A. A. KLEIN.

Oil pools of southern Oklahoma and northern Texas. J. H. GARDNER. *Econ. Geol.* 10, 422-34(1915).—A geological description of the Healdton and Wheeler pools. All the oil pools show structural conditions which are similar and which explain the concn. of oil and gas in those districts.

A. A. KLEIN.

Oil regions of northwestern Mexico. V. R. GARFAS. *Econ. Geol.* 10, 195-225 (1915).—A thorough description of this region. Petroleum here seems to be a product of decompn. of the animal matter furnished by a marine fauna which perished gradually with the oscillation of the region. The Cretaceous limestones are impregnated with unaltered petroleum, which originated from slow decompn. of their animal matter.

A. A. KLEIN.

The content of rocks in volatile substances. Preliminary communication on the gases and sublimation products of the eruptive rocks of the granitic massif of Greece. G. P. PAMFIL. *Bull. sci. acad. roumaine* 3, 72-81; *Chem. Zentr.* 1915, II, 45-6.—Wholly glass apparatus for freeing, evacuating, and analyzing gas from minerals is described. Results from plagioclase, granulite, granite, gabbro, and tonalite are tabulated. The temp. was carried to 1150°. Notable quantities of O were found, and NH₃ was always recognizable.

W. B. JOHNSON.

New type of alkaline granitic rock, inclosing eucolite. A. LACROIX. *Compt. rend.* 161, 253-8(1915).—This rock is found in N. W. Madagascar opposite Nosy bé, west of the village of Ampasibitika. An extended petrographic description of the locality is given. The mineral in question has a sp. gr. of about 2.97. A complete analysis of this mineral was not made on account of the difficulty of separating it from other minerals. It was attacked by HCl giving a jelly which, according to Pisani, had the fol-

lowing compn.: SiO_2 , 40.0; ZrO_2 , 16.4; $(\text{Ce La Di})_2\text{O}_3$, 22.5; FeO , 5.6; MnO , 0.1; CaO , 6.1; Na_2O , 6.6; total, 97.3. The deficiency is attributed to Cl, F, or H_2O which were undetd. These results point to a ceric eucolite distinguished from known species by less SiO_2 , CaO and Na_2O , and a much greater proportion of cerium compds. This is compared with analyses of aegirite, eucolite, a coarse-grained zirconiferous pseudomorph, riebeckite rich in eucolite, and rockallite, the latter from Rockall, Ireland. On the basis of this study L. suggests a new type, *fasibitikiite* for these granites containing eucolite; this completes the series of lujavrites.

L. W. ROGGS.

Sulfide-bearing rocks from Litchfield, Connecticut. E. HOWE. *Econ. Geol.* 10, 330-47(1915).—The rocks contain pyrrhotite, pentlandite and chalcopyrite. Most of the sulfides sepd. from soln. at an early stage of the cooling of the magma, and small amts. continued to sep. until the magma had nearly all crystd. The sulfide masses, however, remained liquid until all the silicates had solidified. The concn. of the sulfide is attributed to differentiation of the magma before its intrusion.

A. A. KLEIN.

The Wurzel region, in lower Veltlin. H. P. CORNELIUS. *Neues Jahrb. Min. Geol.* 40 (Beil. Bd.), 253-363(1915).—A geologic and petrographic description of the igneous and metamorphic rocks of this region.

E. T. W.

Contributions to the paleontology and geology of Palestine. III. The petrography of Palestine and the Hedschas Province. M. BLANCENHORN AND ERNST FUCHS. Marburg. *Neues Jahrb. Min. Geol.* 40 (Beil. Bd.), 533-82.—Comprises petrographic descriptions of a number of igneous and metamorphic rocks.

E. T. W.

The basalts of the Kamerun region and of that between the Kamerun Mountains and Elephant Lake. DOROTHEA MIESCH. Berlin. *Dissertation*, Berlin, 1914; *Neues Jahrb. Min. Geol.* 40 (Beil. Bd.), 457-532(1915).—The feldspar basalts and related limburgites are fully described, 8 analyses and their projections into Osann triangles being given.

E. T. W.

Metamorphic studies. Convergence to mineral type in dynamic metamorphism. C. K. LEITH AND W. J. MEAD. *J. Geology* 23, 600-8(1915); cf. *C. A.* 9, 1735.—The formation of slates, schists, and some gneisses, by rock flowage, requires both mineralogical and chem. changes, and there is a convergence, both chemically and mineralogically, toward a few platy or columnar minerals, which give these rocks their lamellar structure. Anamorphism tends to produce mica, chlorite, and hornblende at the expense of other minerals. Likewise chem. changes take place, principally by the elimination of substances, but also by additions from without, towards that necessary for the production of these schist-making minerals. Examples are cited where anamorphism has resulted in marked chem. changes in the original rocks. These changes have been sufficient to make it impossible to use chem. compn. as a conclusive criterion for the identification of origin of schists and gneisses.

W. F. HUNT.

The garnets and streaky rocks of the English Lake District. J. F. N. GREEN. *Mineral. Mag.* 17, 207-18(1915).—The garnets (almandite) occur sporadically in every variety of igneous rock of the district, while the "streaks" are mainly confined to the rhyolite and quartz-keratophyre. Crystals of almandite sepd. from a basic andesite were analyzed and gave: SiO_2 35.90, Fe_2O_3 6.12, FeO 27.48, Al_2O_3 20.20, MnO 3.84, CaO 1.42, MgO 3.28, TiO_2 1.53, alkalis and loss 0.23%. The "streaks" constitute numerous dark parallel, linear marks which, when best developed, contain macroscopic quartz or pyrite. These marks are sections of parallel lenses, the direction corresponding with the bedding and in a general way, with the flow surfaces. The streaks originate as fine contraction cracks which in the more advanced stage become veinlets. The conclusion reached is that the garnet, pyrite, and streaky alteration have been

formed by circulating solns. under high hydrostatic pressure, probably during the sulfataric stage of the Borrowdale volcanic period. W. F. HUNT.

Detrital andalusite in Cretaceous and Eocene sands. G. M. DAVIES. *Mineral. Mag.* 17, 218-21 (1915).—Andalusite is a frequent constituent of the Eocene and Cretaceous beds of southeast England. Therefore the presence of this mineral can no longer be regarded as evidence of the Pliocene or post-Pliocene age of the deposit in which it occurs. W. F. HUNT.

The artesian wells of Montreal. C. L. CUMMING. Canada Dept. of Mines. Geol. Survey, *Mem.* 7, No. 60 (Geol. Series) (1915).—The data were obtained from 179 artesian wells. The scheme of classification of the waters that C. has devised is similar to that of Palmer (*C. A.* 5, 3869) but instead of summarizing the waters according to their reaction properties, C. classifies them on the basis of the chem. values of the individual constituents detd. and considers each individual an important factor. A graphic representation of these values is devised by which all the constituents are compared with one another. C. attempts thus to refer the waters to their geological sources, being enabled to do this on account of the peculiar geology of the region. He classes the waters as (1) "pure types" and (2) "mixed types." The 4 kinds of "pure type" waters are those in which the predominating inorganic constituents are (1) Na_2CO_3 , (2) Na_2SO_4 and NaCl , (3) CaSO_4 and MgSO_4 , (4) CaCO_3 and MgCO_3 . A "mixed type" of water is regarded as a mixture of "pure type" waters. The geology of the region is discussed in detail. Montreal derives its waters from the Laurentian highland and the St. Lawrence lowlands, though to what extent each of these contributes its share is not known. Na_2CO_3 is the chief inorganic material of the water and it is probably derived from the dike rocks cutting the limestone. The strong-acid salts represented by NaCl , Na_2SO_4 , CaCl_2 and CaSO_4 are derived from the country rock, into which these salts were probably injected at the time of the intrusion of the igneous rocks of Mount Royal. CaCO_3 is derived partly by direct soln. of the rock and partly by double decompn. of some of the above salts when waters containing them mingle with one another. H_2S is assumed to have been formed by reduction of sulfates through the agency of organic matter which occurs commonly in the Trenton limestone. Certain areas are characterized by waters in which the different "pure types" predominate. At the boundaries of these areas, which are largely detd. by the presence of dikes, the waters sometimes become mixed, thus yielding waters of complex properties. Often such waters contain, not the most sol. of the constituents involved, but the least sol. ones. In an attempt to explain this anomaly, C. is compelled to resort to the physical process of absorption or adsorption. A chart shows the peculiar relation of Mg to Na and Ca that as the Na increases the Mg increases at the expense of the Ca. The K content, so far as is known, is from 2-30% of the alkalis. W. C. WHEELER.

New and little known mineral springs of southeast Mährens. R. SCHUBERT. *Metall. Rundschau* 7, 65-8; *Chem. Zentr.* 1915, I, 503.—These springs form a group of more or less pure H_2S and alkali chloride waters whose source is the Miocene andesite, the Mesozoic limestone, and the Tertiary salt-bearing shale. The mineral waters at times well out of the coarse Flysch sandstone. The S springs of the Prerau region are related to blue and dark gray clay-schist and issue along fissures that cut the clay schist at right angles to the strike. Traces of natural oils occurring in the Flysch rocks may be indicative of petroleum deposits. A. WANDTKE.

Heating tests and the cause of disaggregation of granite. W. A. TARR. *Econ. Geol.* 10, 348-67 (1915).—Expts. on Missouri granites show that disaggregation as a result of heating is due to differential stresses set up in each individual mineral. These stresses vary in different directions because of different rates of expansion and find relief in cracks and fractures. The stresses are cumulative and affect the rock as a whole,

but differ in parts of it. The presence of inclusions especially of liquids and gases whether in rows or disseminated is not regarded as having any effect upon the resulting disaggregation, except in so far as a series of inclusions of any nature arranged along a plane in a mineral would make that plane a line of weakness that might be followed by a crack.

A. A. KLEIN.

9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Contributions of the chemist to the iron and steel industry. ALLERTON S. CUSHMAN. *J. Ind. Eng. Chem.* 7, 934-5(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc.

E. H.

Contributions of the chemist to the steel industry. GEO. W. SARGENT. *J. Ind. Eng. Chem.* 7, 932-4(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc.

E. H.

The present state of the flotation process of ore concentration. ANON. *Russ. Min.* 43, 41-4(1915).—A review.

L. T. FAIRHALL.

Thermal principles of the blast furnace. J. E. JOHNSON, JR. *Mel. Chem. Eng.* 13, 718-20, 787-92, 833-40(1915).—J. discusses the application of the second law of thermodynamics to the operation of the blast furnace. For every set of furnace conditions there is a critical temp. (about 1500°), above which only certain necessary operations such as the formation and superheating of the cinder and the melting and carbonization of the Fe can be carried on. It is evident, therefore, that the greater the range between critical temp. and theoretical temp. of combustion, the greater is the effective heat. Preheating and drying the blast raise the efficiency of the finishing operations in the bosh by raising the combustion temp., thus widening the zone of effective heat. The relatively high fuel consumption of furnaces working on rich ores is the result of the small slag-volume available for removing S, making necessary an increase in lime which raises the fusion temp. and with it the critical temp. The low consumption in the charcoal furnace is due to the absence of S, making possible a highly siliceous and fusible slag. For max. fuel economy, the ratio $H_a/(H_t - H_a)$, where H_a is the available heat above critical temp. and H_t the total heat per unit of fuel, must be maintained constant, since with a disproportionate increase in H_a there is a deficiency of ore prepared for final reduction, while an increase in H_t which does not effect H_a results in the preliminary heating of a greater quantity of ore than the bosh can care for, and a subsequent cooling of the latter, with attendant fuel losses. In the case of a charcoal furnace of high fuel consumption, using an ore with 13-14% H_2O , J. found that the $(H_t - H_a)$ factor, or the heat of shaft and top, was reduced abnormally by the evapn. of H_2O . By drying the ore, fuel consumption was reduced 12%.

H. L. OLIN.

Liquid jets. C. T. DU RELL. *Mel. Chem. Eng.* 13, 714-6(1915).—A study of a phenomenon of importance in flotation and cyanidation. The term "liquid jet" is applied by R. to a stream of liquid projected through a gas into a liquid. The liquid may be injected (1) vertically upward, (2) vertically downward, or (3) at an angle. The physical phenomena accompanying each of these methods is described. R. shows that in either case a jet of liquid turned into a gas does not merely slide through that gas or a cylinder of that gas but carries the "gas cylinder" along with it. When a liquid is entirely satd. with a gas brought in with a jet, supersaturation has the effect of producing nascent gas, which collects in the form of bubbles. This fact is taken advantage of for flotation, but while liquid-jet phenomenon has not been recognized before by many cyanide metallurgists it has been the direct cause of many cyanide

plant failures. R. doubts the existence of a single case of difficult slime settlement due entirely to a true colloidal condition as most pulp solns. are so supersatd. with air that they are more nearly ready for a flotation plant than they are for a cyanide plant.

C. A. NOWAK.

Reclaiming brass foundry waste. A. W. LEMME. *Foundry* 43, 191(1915); cf. C. A. 9, 1738.—Details of cupola refining of the concentrate from brass foundry sweepings.

H. W. GILLET.

Oxy-acetylene welding practice. S. W. MILLER. *Machinery* 22, 2159-(1915); cf. C. A. 9, 3212.—M. describes welding of malleable Fe and Cu and Cu alloys, brass and bronze. The metallurgy of Fe and its relation to welding, heat treatment of welded steel, and other factors are discussed.

C. G. F.

Comparison of thermite and electric welding. J. F. PERRITT. *Reactions* 8, 42-6(1915).—For repairing locomotive frames and other heavy sections thermite welding is more practical and cheaper than elec. welding. The paper is profusely illustrated.

C. G. F.

Frederick W. Taylor and high-speed steels. C. SCHLESINGER. *Z. ver. deut. Ing.* 59, 394-5(1915).—Biographical.

C. G. F.

The heterogeneity of steels. H. LE CHATELIER AND J. LEMOINE. *Compt. rend.* 161, 373-8(1915).—The abnormal sepn. of pearlite in ordinary steels is generally attributed to the presence of P which lessens the soly. of C in Fe. But this effect of P is uncertain since it is not clearly shown that the sepn. of pearlite becomes normal in steels where the distribution of P is even. As a reagent for the direct detn. of the effect of P, a modified form of Stead's reagent was used; 100 cc. absolute CH_3OH , 18 cc. H_2O , 2 cc. concd. HCl , 1 g. CuCl_2 , 4 g. MgCl_2 . From this reagent Cu deposits on the portions poorest in P. Photomicrographs were obtained showing a remarkable striated structure. This banded structure can be obtained also in P-free steels containing Si, Mn, Ni and Cr; it is shown in nearly all steels, even those of good quality. The photographs show that the result of various treatments is not to destroy the banded structure but to render the structure more homogeneous and the bands narrower; this explains the advantages of tempering, etc.

DONALD BELCHER.

The constitution of brasses containing small percentages of tin. O. F. HUDSON AND R. M. JONES. Univ. Birmingham. *J. Inst. Metals* 12 (advance copy) 13 pp. (1915).—An account of work on that part of the ternary diagram for Cu-Zn-Sn alloys comprizing 50 to 70% Cu, 0 to 5% Sn and balance Zn. It cannot be briefly abstracted. Also in *Engineering* 100, 589-90(1915).

H. W. GILLET.

The comparison of the various tests for determining the hardness and wear of metals, and the development of a suitable machine for testing the wearing properties of cylindrical pins. T. E. STANTON AND R. G. C. BATSON. *Report Nat'l Physical Lab.* 1914-15, 101-2.—The relation between the Brinnell hardness number and the resistance to wear depends largely on the compn. of the steel. In ordinary C steels a resistance to wear 18-20 corresponded to a hardness number 720, while in Mn steels with resistance to wear 27-30 the hardness number was 241-286.

D. BELCHER.

Metallic crystal twinning by direct mechanical strain. C. A. EDWARDS. *Engineering* 100, 407-9(1915); see C. A. 9, 3202.

E. J. C.

Micrographic determination of surface decarburization in heat-treated steels. J. G. AYERS, JR. *Proc. Am. Soc. Testing Materials* 15, II, 80-8(1915); see C. A. 9, 3201.

E. J. C.

Protecting bright articles from rust (HASS) 26. The electric furnace in the foundry

(GRAY) 4. The chemist and the lead industry (THOMPSON) 26. Electrical heating and the Schoop metal spraying process (LACH) 1.

Cast iron. AKT.-GES. R. P. WAAGNER, L. and J. BIRÓ and A. KUTZ. Aust., 7,477, Oct. 31, 1914. Cast iron is manufd. in the cupola furnace by fusing together several kinds of Fe of varying C content. The furnace is charged, separately, with the different kinds of Fe, in order that the particular additions favoring the production of a definite special Fe and serving to lower the m. p., may be brought into reaction in the corresponding charges, whereby the melting process can be effected with a blast of a suitable vol. and under the most favorable pressure.

Concentrating ores. W. M. MARTIN. Brit., 15,442, June 27, 1914. The surface used consists of frosted or fluted or frosted fluted glass or other material such as brick tile or porcelain. When a fluted surface is used, it is stationary or has a continuous movement in the direction of the flow of the pulp.

Treating roasted ore with liquid. A. RAMEN. Brit., 15,254, June 25, 1914. The ore is delivered in a thin layer onto a bed moving below a perforated pipe which distributes the liquid evenly over the mass. The mixt. is removed from the bed for further treatment, and any gases, vapor, and dust resulting from the treatment are withdrawn to a wet condenser. The hopper which feeds the ore to a rotary table may be raised or lowered to vary the thickness of the layer. A casing enables the vapors, etc., to be led to a condenser, and the ore, after treatment, is discharged from the table by an inclined scraper. An endless belt, shaking-trough, cylinder, or other form of carrier, may be used.

Treating ore with liquid. A. RAMEN. Brit., 15,378, June 26, 1914. In spraying or mixing roasted ore with liquid on an impermeable moving bed, as described in 15,254, 1914 (*supra*), the quantity or quality of the liquid is chosen so that 1 or more components of the ore dissolve and form a soln. in admixt. with the other components. Sep. extrn. of the different values may afterwards be effected by a series of lixiviating operations. An ore containing Cu and Ag may be sprinkled after a chloridizing-roast and with a soln. of salt in sufficient quantity to dissolve the AgCl, and subsequent lixiviation with a chloride soln. will produce a concd. soln. of Ag with only a small amt. of Cu. Zn may be sepd. from Cu in a similar manner. The speed of the moving bed may be varied in order to control the quantity of liquid supplied to the ore.

Treating ores. H. W. C. ANNABLE. Brit., 15,962, July 3, 1914. Gang consisting mainly of the alk. earth carbonates is removed from ores, etc., by treatment with SO₂ under exclusion of air, and at a temp. not exceeding 40°. For this purpose, crushed ore is suspended in H₂O and a stream of SO₂ injected; or a soln. of the gas may be used. The Ni salt pptd. by means of MgCO₃ is ignited to form NiO and then treated with SO₂ to remove any Mg salt.

Steel and slag rich in soluble phosphates. DEUTSCH LUXEMBURGISCHE BERGWERKE-UND-HUTTEN AKT.-GES. and A. VOGLER. Brit., 27,868, Dec. 3, 1913. The process of manuf. by the basic open-hearth method comprizes the following stages: (1) the formation and removal of a slag containing part of the P, (2) the formation and removal of a second slag containing the remainder of the P, and (3) decarburizing. In the treatment of a silico-phosphoric pig, a silicious slag is formed during the first stage, the P being removed in the second stage. Cf. C. A. 9, 1299.

Steel. ROMBACHER HUTTENWERKE and J. I. BRONN. Brit., 2,385, Jan. 1, 1914. Alloys to be added to the metal bath are obtained by treatment of metal of similar compn. to the main body of metal, as described in 29,051, 1912, and are allowed to solid-

ify before use. Spiegel and Fe-C alloys are obtained by adding ferro-Mn, ferro-Si, carburite, etc., in solid form to a bath of refined Fe.

Copper-lead alloys. L. SAMPPELL. Brit., 28,492, Dec. 10, 1913. A molten bath of the metals is treated with HI gas to give a homogeneous product.

Casting metals. F. REICHARDT. Brit., 16,324, July 8, 1914. In a machine for charging under pressure, solid metal is fed in a continuous "string" to a completely closed melting pot and serves as a pressure piston for the molten metal. The melting pot is provided with electrodes and the inlet and outlet nozzles are Pt-lined.

Coating metals. F. J. DE LAET and S. COULIER. Brit., 15,566, June 29, 1914. The surfaces of metal plates to be cleaned and partly coated with metal are provided with a resist which will prevent the cleansing of the parts it is not desired to coat, and the protection of the resist or of its decompn. products may continue during the dipping. The resist may be composed of 1 or more of the following materials in their normal state, or in suspension or soln.: cellulose, amylaceous, albuminous, sugary, bituminous, or asphaltic substances, tars, gums, wax, resins, caoutchouc, fats or grease, gelatin, vaseline, paraffin, etc.; flour, starch, and paper are mentioned. The resist may be recovered before or during dipping. Plates may be partly covered with a layer of 1 metal, and the uncovered parts may subsequently be coated with another and more fusible metal; or plates may be coated with Sn and Pb on opposite sides.

Coating surfaces with metals. R. K. MORCOM. Brit., 15,960, July 3, 1914. In coating surfaces with metals and other fusible materials by spraying, the surface is preliminarily heated by 1 or more sep. leading jets and the deposit may be heated by a following jet for the purpose of effecting annealing or deoxidation. The spraying blowpipe and the jets are clamped to a cross bar so that their positions with regard to each other and to the surface may be adjusted; a combustible mixt. is supplied from a union. A flux, such as HgCl_2 or NH_4Cl , or a powdered reducing agent, may be used in connection with the leading jet. Cf. C. A. 9, 360.

Treating ore with nitric acid. H. BÜBLER DE FLORIN. Ger., 284,741, Oct. 22, 1912. The process is especially applicable to carbonate ores such as Cu carbonate and oxide ores containing lime and magnesia. N oxide gases, with or without H_2O , are used also, the ext. being evapd. to dryness and heated at a sufficiently high temp. to decompose a portion of the nitrates (*e. g.*, Fe and Cu nitrates, but not Ca and Mg nitrates). The partially decomposed dry residue is then extd. with H_2O for the purpose of obtaining a material rich in CuO and a $\text{Ca}(\text{NO}_3)_2$ lye. The HNO_3 lye can, however, be evapd. to dryness and the dry residue heated so long and at such a high temp. that all the contained nitrate is decomposed. The HNO_3 liberated upon decompn. of the nitrate is returned to the process. *E. g.*, the ore, ground to a fineness of at least 5 mm., is treated in extn. vessels with 7-12% HNO_3 , H_2O , and N oxide gases. The decanted or filtered lye, which may contain, besides $\text{Cu}(\text{NO}_3)_2$, also other sol. nitrates such as Zn-, Pb-, Ag-, Fe-, Al-, Ca-, or Mg-nitrates, can be worked further in various manners. *E. g.*, the nitrate lye is evapd., whereby a considerable portion of the Fe is pptd. and may be removed. Upon protracted heating to 300° , $\text{Cu}(\text{NO}_3)_2$ and any Fe- and Al-nitrates remaining in soln. are decomposed, while Ca- and Mg-nitrates remain unchanged and are extd. from the dry mass with H_2O . The residue now remaining, which contains all Cu as oxide together with Fe-, Al-, and other oxides, is suitable for smelting to metallic Cu and for the production of CuSO_4 . Or the evapd. nitrate lye is heated for a long time above 500° so that all nitrates, including those of the alk.-earth metals, are decomposed. The calcination residue may be smelted in the elec. furnace, by reduction, to metallic Cu. When Cu-free sulfide ores, such as Zn blende or galena, are to be smelted together with carbonate Cu ores free from S and rich in lime, the SO_2 -containing gases drawn

from the roasting furnace may be employed for evapg. and calcining the $\text{Cu}(\text{NO}_3)_2$ lye, or also, at the same time, for a partial decomp. of the lye before it is evapd. to dryness, so that any Ca, Pb, or Ag contained in the lye before calcination can be sepd. as sulfate. The Cu can be pptd. from the nitrate lye also by means of Fe, $\text{Fe}_2(\text{NO}_3)_6$ being obtained as a by-product, which decomposes, upon evapn. and calcination, into com. Fe_2O_3 and nitrous vapors. The $\text{Cu}(\text{NO}_3)_2$ can be subjected not only to cementation, but also to electrolysis, whereby metallic Cu and aq. HNO_3 result.

Mold. W. D. BRADFORD. Ger., 283,217, May 1, 1913. Structural features.

Zinc muffles. C. MEHLER, MASCHINENBAUANSTALT, G. M. B. H. Ger., 284,598, Nov. 13, 1913. Hydraulic press for their manuf.

Aluminium coating on lead. E. FRITSCH. Ger., 284,554, July 5, 1913. Addition to 282,899 (C. A. 9, 2378). In producing such coatings according to the parent process, Al powder is mixed with Sn, in equiv. wts., and in a finely pulverized state. An emulsion is then made with about 50 parts molten, pure, hard Manila and Borneo copal, to which 30 parts of linseed oil are added, so that a seedy mass results to which about 1% Mn and 0.5% Pb are added as a drier. Materials which upon heating oxidize or form slag cannot be added. The resulting emulsion is dild. with turpentine oil, alc., or the like. The metal powder specified above is stirred up with the emulsion and applied, by hand or machine, to the articles to be coated. The treated articles are then heated in a drying oven to about 200° . The added Sn also protects the Al from oxidation. Cf. C. A. 9, 2506.

Improving the magnetic properties of castings. LANGBEIN-PFANHAUSER-WERKE AKT.-GES. Ger., 283,670, Dec. 10, 1913. The articles are ignited in an atm. of H or of some gas containing H and not explosive.

Preparing manganese steel blocks for rolling. MANGANESE STEEL RAIL CO. Ger., 284,602, Nov. 26, 1908. The heat treatment to which this alloy is usually subjected fails to impart the required ductility, since the temps. have been below the upper critical point (between 1010 and 1050°). At this temp. the metal is resistant to a slight extent only, by reason of the sepn. of the eutectic alloy, which melts at 1125° and goes into soln. upon increase of temp. In order to prevent this, the blocks are heated, uniformly and by degrees, to a temp. above the upper critical point, until the eutectic alloy redissolves. Further heating, preferably to 1250° , is effected in a non-oxidizing atm. The highest temp. is fixed upon with reference to the analysis of the steel, the thickness of the block, and the mechanical process of working to which it is to be subjected (rolling, hammering, and the like). If a block is to be treated directly upon discharge from the mold and with the heat of casting, its temp. is increased or lowered in the soaking pit to the predetd. highest temp. The outer layer of the block is cooled, in a non-oxidizing atm., to the same or a lower temp. than that which prevails in the mass, in order to impart to the outer layer the resistance and toughness necessary for the mechanical working.

Burners for cutting metal. CHEM. FABRIK GRIESHEIM-ELEKTRON. Ger., 284,539, July 8, 1913. The gases are drawn from the same conduit.

Dies for drawing metal. ALLGEMEINE ELEKTRIZITÄTS-GES. Ger., 284,808, Feb. 7, 1913. The dies are manufd. from highly sintered, amorphous, difficultly fusible oxide such as Al_2O_3 . A formed mixt. of the difficultly fusible oxide is ignited with a binder which is volatilized at a temp. at which a slight sintering occurs (1300 – 1400° in the case of Al_2O_3), whereupon the stone is further shaped and ignited at a higher temp., below the m. p. (1800 – 2000° for Al_2O_3), at which temp. the product is completely sintered.

Cupola furnace. A. SAUER. Ger., 284,770, Dec. 12, 1913. The flue gases,

after leaving the melt, heat the fuel, in an extension of the shaft, wherein the fuel rests on a number of superimposed grates, the CO_2 being reduced to CO , with the production of water-gas.

10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

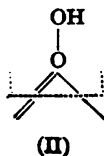
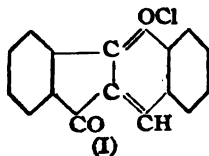
Ludwig Medicus. FRITZ REITZENSTEIN. *Ber.* 48, 1744-8(1915); *Chem. Ztg.* 39, 837-8(1915).—Died Oct. 11. Brief reviews of his work, chiefly in org. chemistry. J. H. MOORE.

Adolf von Baeyer's eightieth birthday. H. WIELAND. München. *Chem. Ztg.* 39, 829-32(1915).—Oct. 31. A review of his work in org. chemistry. J. H. M.

The recent development of stereochemistry. M. SCHOLTZ. Univ. Greifswald. *Ber. pharm. Ges.* 25, 225-55(1915).—An address. W. O. E.

The root bark of *Calotropis gigantea*. ERNEST G. HILL AND ANNODA P. SIRKAR. Allahabad. *J. Chem. Soc.* 107, 1437-42(1915).—The milk-like sap is much used in India as a medicine. 4 kg. root bark, broken up and extd. with boiling 98% alc. for 3 hrs., gave 78 g. oil, 90 g. white solid (A) which sepd. partly on cooling and partly on concn, and a residue, which, when extd. with Et_2O and digested with H_2O , gave 330.5 g. gutta-percha-like residue and a small amt. of a yellow bitter principle. A long series of fractional crystns. from alc. of (A), identical with Warden and Waddell's "madar-alban" (*Pharm. J.* 1885, 165), gave, as the less sol. portion, *akundarol isovalerate* (B), $\text{C}_{14}\text{H}_{24}\text{OCO}_2\text{C}_4\text{H}_9$, needles, m. 210° , $[\alpha]_D^{25}$ 119° in Et_2O , and as the more sol., *mudarol isovalerate* (C), $\text{C}_{20}\text{H}_{37}\text{OCO}_2\text{C}_4\text{H}_9$, nodules, m. 140° , $[\alpha]_D^{25}$ 128° in Et_2O . Sapon. of (B) gave *akundarol* (D), $\text{C}_{18}\text{H}_{34}\text{O}_2$, needles, m. 215° (*acetate*, needles, m. 222°), oxidized by CrO_3 in HOAc to *akundaric acid*, isolated as the *silver salt*, $\text{C}_{18}\text{H}_{32}\text{O}_2\text{Ag}$, faintly green, amorphous. Sapon. of (C) gave *mudarol* (E), $\text{C}_{26}\text{H}_{48}\text{O}_2$, hexagonal plates, m. 176° (*acetate*, needles, m. $195-6^\circ$), oxidized to *mudaric acid*, amorphous, m. 225° , purified through the *silver salt*, $\text{C}_{26}\text{H}_{46}\text{O}_2\text{Ag}$, faintly green, amorphous. (B), (C), and their alcs. gave color reactions very similar to those of cholesterol and phytosterol. A little (D), in 2 cc. CHCl_3 , treated with 20 drops Ac_2O and 1 drop H_2SO_4 , gave the usual violet-pink color, while (E) gave an intense blue. The resinous material evolved NH_3 and amines when boiled with concd. aq. KOH , and was finally purified to a hard, brittle mass of the comp. $\text{C}_{24}\text{H}_{47}\text{O}_{12}\text{N}$. M. HEIDELBERGER.

Condensation of aromatic hydroxyaldehydes with diketohydrindene. SOSALE G. SASTRY AND BROJENDRA N. GHOSH. London. *J. Chem. Soc.* 107, 1442-9(1915).—An attempt to obtain compds. structurally similar to the substances derived from brazilin, hematoxylin, and analogous compds. No definite products could be isolated from the action of PhNHNH_2 on 2'-hydroxy-1,3-diketo-2-benzylidenehydrindene (A) (Kostanecki and Saczkowski, *Ber.* 30, 2139(1897)); the *dibromo derivative* forms pale yellow needles, m. 122° . When HCl was passed through a soln. of 3 g. *o*- $\text{HOC}_6\text{H}_4\text{CHO}$ and 3.5 g. $\text{C}_6\text{H}_4(\text{CO})_2\text{CH}_3$ in MeOH 4'-keto-2,3-indeno-1,4-benzopyranol anhydrohydrochloride (I) sepd., orange-red crystals with 1 H_2O , brown when anhydrous, chars above 320° . The α -quinonoid bonds are assigned the positions given in (I), rather than as

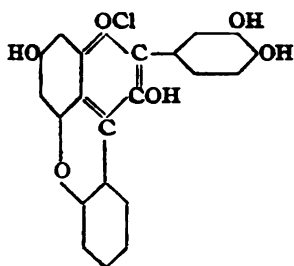


formulated in similar substances by Perkin, Robinson, and Turner (*C. A.* 2, 2781). (I) may also be prepd. by passing HCl through (A) in MeOH. In alc., with aq. NaOAc, it gives *4'-keto-2,3-indeno-1,4-benzopyranol* (II), $C_{18}H_{10}O_4 \cdot 0.5H_2O$, brown needles, chars on heating. Heated with 10% aq. NaOH, (I) yields (A), identified as the Ac deriv. 2 g. 2,4-(HO) $_2$ C $_6$ H $_4$ CHO and 2 g. C $_6$ H $_4$ (CO) $_2$ CH $_3$ in alc., heated 0.5 hr. with 3 g. KOH in 5 cc. H $_2$ O, gave *2',4'-dihydroxy-1,3-diketo-2-benzylidenehydrindene*, brown prisms, chars at high temps., sol. in NaOH with a red color, gives a brown ferric salt; the *acetyl derivative*, $C_{20}H_{14}O_4 \cdot 0.5H_2O$, brown prisms, changing color at 210° and m. 235° (decompn.); with 2 atoms Br in HOAc, yields a *dibromo derivative*, brownish needles, does not m. 320°. The corresponding *7-hydroxy-4'-keto-2,3-indeno-1,4-benzopyranol anhydrohydrochloride* was prepd. as was (I), red prisms, sol. in alkalis with a red-violet color; *7-hydroxy-4'-keto-2,3-indeno-1,4-benzopyranol*, dark brown, amorphous ppt. with a metallic luster. *2'-Hydroxy-1,3-diketo-2-naphthylidenehydrindene*, using 2-HOC $_6$ H $_4$ CHO, dark red plates, m. 298° (decompn.); the dull brown alc. soln. turns red on adding FeCl $_3$. Yield, poor. *4'-Keto-2,3-indeno-1,4-naphthopyranol anhydrohydrochloride*, dark brown prisms, shrinks 110°, decomps. above 130°; *4'-keto-2,3-indeno-1,4-naphthopyranol*, brown prisms, m. 125° (decompn.). M. H.

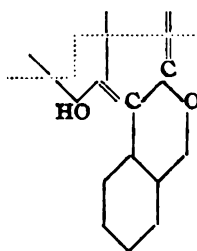
Behavior of nitriles towards organometallic derivatives of magnesium. EUSTACE E. TURNER. Univ. London. *J. Chem. Soc.* 107, 1459-64(1915).—de Bruyn's method (*Rec. trav. chim.* 2, 210(1883)) for the prepn. of 2,6-(EtO) $_2$ C $_6$ H $_3$ CN was improved by air-drying the black ppt. obtained on adding HCN soln. to an alc. soln. of *m*-C $_6$ H $_4$ (NO $_2$) $_2$ and extg. with Et $_2$ O in a Soxhlet. The nitrile was recovered unchanged in all expts. with RMgX, even when using high-boiling solvents. The effect of steric hindrance is thus very marked. In the prepn. of *p*-MeC $_6$ H $_4$ COCH $_2$ Ph(A) by the action of MeC $_6$ H $_4$ MgI on PhCH $_2$ CN the poor yield is ascribed to the weakening of the nitrile properties by the acidic CH $_2$ group. (A) is best prepd. from MeC $_6$ H $_4$ CN and PhCH $_2$ MgCl in Et $_2$ O; when C $_6$ H $_6$ is used as the solvent an oil is formed, which, dissolved in hot alc. and cooled, yields *p*-tolyl α,β -diphenylethyl ketone (B), MeC $_6$ H $_4$ COCHPhCH $_2$ Ph, needles, m. 90°, is not affected by ketone reagents, Br-H $_2$ O, KMnO $_4$ in acid or alk. soln., or concd. HCl at 160° for 4 hrs. Other products of the reaction were (PhCH $_2$) $_2$, a little (A), and small amts. of unidentified substances. (B) was synthesized from (A) and PhCH $_2$ Cl with Na in alc. Equal wts. of (A) in alc. and H $_2$ NCONHNH $_2$ ·HCl in a little H $_2$ O at 180° for 3 hrs. in a sealed tube gave a substance, C $_{21}$ H $_{22}$ N $_2$, yellow needles, m. 181°, yielding the ketone on hydrolysis. The absence of the CONH $_2$ group is indicated by the analysis and by the fact that no NH $_3$ is evolved on heating with KOH; Br in CHCl $_3$ has no action. M. HEIDELBERGER.

Conversion of the natural flavone coloring matters into pyranol dyes. EDWIN R. WARSON, KUMUD B. SEN AND VISHNU RAM MEDHI. Dacca. *J. Chem. Soc.* 107, 1477-89(1915); cf. *C. A.* 8, 1748.—In the previous paper the name "benzopyran" should be changed to "benzopyranol." The work therein reported is continued along the same lines. 3,5,7-Triethoxy-2-*m,p*-diethoxyphenyl-4-ethylbenzopyranol, from the anhydrohydriodide (A) in alc. and concd. aq. NH $_3$, followed by extn. with Et $_2$ O, colorless, viscous oil; *anhydrohydrochloride*, crimson; *chloroplatinate*, red needles with 2 H $_2$ O, m. 197°. (A) and AlCl $_3$ at 160° for 1 hr. give 3,5,7-trihydroxy-2-*m,p*-dihydroxyphenyl-4-ethyl-1,4-benzopyranol *anhydrohydrochloride triethyl ether*, C $_{18}$ H $_{16}O_7$ (OEt) $_3$ (OH) $_2$ EtCl·H $_2$ O, almost black powder, sol. in dil. HCl with a crimson color; the free base is violet and dyes alum-mordanted wool a fast blue shade; the same compd. is apparently formed by treating (A) with 33% H $_2$ SO $_4$ at 140°. If the reaction mass formed in the AlCl $_3$ expt. is extd. with dil. HCl and H $_2$ PtCl $_6$ added, there is formed in small amt. the *chloroplatinate* of 3,5,7-trihydroxy-2-*m,p*-dihydroxyphenyl-4-ethyl-1,4-benzopyranol *anhydrohydrochloride tetraethyl ether*, scarlet prisms with 1 H $_2$ O, m. 170-5°. Quercetin

tri-Me ether (B) and 5 mols. EtMgI gave unchanged (B) and 3,5,7-trihydroxy-2-m,p-dihydroxyphenyl-4-ethyl-1,4-benzopyranol anhydrohydriodide trimethyl ether, red needles m. 163-5°, dyes only terra-cotta shades, showing that the ether groups are in different positions from those in the tri-Et ether. 3,5,7-Triethoxy-4-phenyl-2-m,p-diethoxyphenyl-1,4-benzopyranol anhydrohydrochloride was obtained from quercetin penta-Et ether (C) and PhMgBr, forming red needles which were not freed completely from (C); boiled with HI (d. 1.7), it yields impure 3,5,7-trihydroxy-4-phenyl-2-m,p-dihydroxyphenyl-1,4-benzopyranol anhydrohydriodide, dark red prisms; the free base is violet, amorphous, and unstable, and dyes the same shades as quercetin. 3,5,7-Triethoxy-4-methoxyphenyl-2-m,p-diethoxyphenyl-1,4-benzopyranol anhydrohydrochloride, crimson crystals with 1 H₂O (chloroferrate, red needles, m. 190°); de-ethylated with concd. HCl at 150-80°, opening the tube after 6 hrs., resealing, and again heating 6 hrs., it forms a substance C₂₄H₂₂O₆Cl (I or II), dark red needles with a blue reflex, gives a green



(I)



(II)

color with KOH and dyes alum-mordanted wool a fast greenish blue; an Ac deriv. could not be prepd. Using morin penta-Et ether (colorless, m. 112-4°; cf. Perkin, C.A. 7, 2932) no cryst. derivs. could be prepd., but with the penta-Me ether and MeMgI, 3,5,7-trimethoxy-2-o,p-dimethoxyphenyl-4-methyl-1,4-benzopyranol anhydrohydriodide was obtained, yellow needles; the corresponding pentahydroxy derivative was prepd. by de-methylation with HI. Luteolin tetra-Et ether and EtMgI gave 5,7-diethoxy-2-m,p-diethoxyphenyl-4-ethyl-1,4-benzopyranol anhydrohydriodide, orange needles, m. 169-72°; the free base forms colorless needles, m. 116-7°; de-ethylation of the salt with HI yields 5,7-dihydroxy-2-m,p-dihydroxyphenyl-4-ethyl-1,4-benzopyranol anhydrohydriodide, gives a violet color with KOH and dyes alum-mordanted wool a mauve color. It is the fastest of the series. Apigenin trimethyl ether and EtMgI gave 5,7-diethoxy-2-p-ethoxyphenyl-4-ethyl-1,4-benzopyranol anhydrohydriodide, orange rhombs, m. 178-80°; chloroplatinate, red, amorphous, contains 2 H₂O; de-ethylated with HI it gives the corresponding hydroxy compound, needles, gives a crimson color with KOH and dyes alum-mordanted wool a brown-orange color. A table is given of the dyeing properties of the HO compds. and the absorption spectra of all are given. The multiplication of auxochromes moves the front of the band towards the red end of the spectrum. The curves of the salts of the ethers differ very little from those of the corresponding HO compds.

M. HEIDELBERGER.

Preparation of ethyl bromide. FRANK E. WESTON. London. *J. Chem. Soc.* 107, 1489-90 (1915).—The disadvantages of the present lab. methods of prepn. are discussed. The following method gives rise to no Et₂O and gives yields of 80-90% of EtBr, based on either the alc. or NaBr. Mol. amts. of abs. alc., H₂SO₄ (d. 1.84) 15% more used than the theory), and NaBr are used. The alc. is mixed with 5-10% of its wt. of H₂O and the H₂SO₄ added, with cooling. The NaBr, coarsely powdered, is then added, and the whole slowly heated on a H₂O bath, using a condenser whose outlet dips into cooled H₂O. The temp. is raised only as the formation of EtBr slackens;

above 100° a sand bath is substituted for the H₂O bath. Any HBr formed may be recovered from the H₂O in the receiver.
M. HEIDELBERGER.

Action of diazomethane on some aromatic acyl chlorides. DOUGLAS A. CLIBBENS AND MAXIMILIAN NIERENSTEIN. Univ. Bristol. *J. Chem. Soc.* 107, 1491-4 (1915).—An extension of the observations of Schlotterbeck (*C. A.* 1, 1266) and Hans Meyer (*C. A.* 1, 1410), who found that aldehydes, treated with CH₃N₂, yielded Me ketones. With ARTHUR GRAKE it was found that Ph₃COH, Ph₂CHOH, PhCH₂OH, and Bz-CH₂OH were unaffected by CH₃N₂; benzoic and mandelic acids, however, gave the Me esters. In the expts. described below, the acid chlorides were dissolved in dry Et₂O and treated with an Et₂O soln. of CH₃N₂ prepd. according to Standinger and Kupfer (*C. A.* 6, 1297). The Et₂O was removed and the residue fractionated *in vacuo*. A small amt. of a nitrogenous by-product was generally obtained as the last fraction. BzCl gave BzCH₂Cl (72% of the theory), while BzBr yielded BzCH₂Br (yield, 28%). PhCH₂COCl gave *benzyl chloromethyl ketone*, needles, m. 72-3° (yield, 84%), while PhCH₂CH₂COCl yielded *β-phenylethyl chloromethyl ketone*, needles, m. 84-5°; yield, 82%. *p*-MeOC₆H₄COCH₂Cl was formed in 86% yield. *o*-AcOC₆H₄COCl (Anschütz, *C. A.* 3, 2976) gave coumaranone in 92% yield, AcCl being eliminated. 2,4-(HO)₂C₆H₃-CO₂H was obtained in 92-5% yield by passing CO₂ through a hot soln. of *m*-C₆H₄(OH)₂ in aq. NaHCO₃ or KHCO₃. 2,4-AcO(MeO)₂C₆H₃CO₂H, m. 145-7°, not 140°. 2-Acetoxy-4-methoxybenzoyl chloride, from the acid and PCl₅, needles, m. 81-2°; 3-methoxycoumaranone, yield, 88%. 3,4,5-(MeO)₃C₆H₂COCl gave a nitrogenous product of high m. p.
M. HEIDELBERGER.

Studies in ring formation. I. The Kautler formula for derivatives of diphenyl. EUSTACE E. TURNER. Univ. London. *J. Chem. Soc.* 107, 1495-1500 (1915).—From the fact that 4,4-dihalodiphenyls do not react with Na as do the 2,2'-comps., K. concludes that these positions are spatially remote. With an excess of benzidine, AcCH₂Ac forms *diacetylisopropylidenebenzidine* (A), (C₆H₄N)₂CMech:CMech(OH)₂, pale yellow or brown crystals, m. 198°; with Br in CHCl₃ it gives a *tetrabromo derivative*, needles. (A), warmed with H₂SO₄ for 1 hr., gives 2,4,2',4'-tetramethyl-6,6'-diquinoyl. In boiling C₆H₁₀, (C₆H₄NH₂)₂ and AcCH₂Ac yield, if the ketone in C₆H₁₀ is added drop by drop during 1 hr., *monoacetylisopropylidenebenzidine*, H₂N-C₆H₄-C₆H₄-N:—CMech₂Ac, pale yellow crystals, m. 137°; a pure chloroplatinate could not be prepd.; condensation of the free CO group with the remaining NH₂ group could not be effected, although this possibility is indicated by Kautler's formula. For positive evidence as to K.'s formula, see Cain, *et al.*, *C. A.* 8, 3416.
M. HEIDELBERGER.

Composition, structure and properties of gynocardic acid and some of its derivatives. I. I. I. OSTROMUTSLENSKII AND A. M. BERGMANN. *J. Russ. Phys. Chem. Soc.* 47, 313-34 (1915).—Pure gynocardic acid, C₁₇H₃₃CO₂H (a), constitutes the largest portion of the com. product sold under this name. The impurities consist largely of isomers of (a). The pure acid may be obtained either by means of its Cu salt or by prolonged fractional recrystn. from alc.; colorless leaflets of a slight odor of coconut oil, m. 67.5-5.5°, readily sol. in most org. solvents; its combustion presented unusual difficulties, only Denstedt's method giving satisfactory results; it contains a double union, is isomeric with oleic and elaidic acids, and resembles them in many of its properties. The fact that it possesses specific therapeutic properties (in tuberculosis and leprosy) makes it worth while to look for other unsatd. acids of the aliphatic series which may turn out to have special medicinal value. The alkali salts of (a) are soaps little sol. in H₂O, the NH₄ salt is quite sol. in dil. alc. The Ba salt is colloidal and insol. in all solvents tried except aromatic hydrocarbons. From its C₆H₆ soln. the Ba salt seps. out on standing as an opaque amorphous mass almost as solid as a rock. Copper gynocardate, (C₁₇H₃₃CO₂)₂Cu, was obtained in 2 modifications designated as α and β.

The α -compd. is the direct product of interaction of (a) with $(\text{AcO})_2\text{Cu}$, has a green color and is insol. in H_2O , but sol. in fats and most org. solvents. On standing even *in vacuo* or by warming its soln. it gradually though incompletely changes to the β -modification which is insol. in all solvents tried. The α -salt readily unites with $(\text{AcO})_2\text{Cu}$ to form an insol. double salt $((\text{AcO})_2\text{Cu})_m \cdot [(\text{C}_{17}\text{H}_{33}\text{CO}_2)_2\text{Cu}]_n$, and with itself to form an insol. double salt or polymer $[(\text{C}_{17}\text{H}_{33}\text{CO}_2)_2\text{Cu}]_n$. The β -salt is doubtless such a polymer. With CaCl_2 , BaCl_2 or ZnCl_2 the α -salt also forms double salts. The α -salt m. $69.5-70.5^\circ$, the β -salt has a considerably higher m. p. The direct reconversion of the β - into the α -salt was not possible, but by liberating (a) from the former with 10% H_2SO_4 and treating it with $(\text{AcO})_2\text{Cu}$ the α -salt results. A satd. soln. of the α -salt in turpentine at 50° gelatinizes on cooling and assumes a dark green color. In fats or aliphatic acids the α -salt gives supersatd. solns. which keep for several days. On heating a soln. of the α -salt the green color changes to brown, but on cooling the original color gradually returns. *Methyl gynocardate*, $\text{C}_{17}\text{H}_{33}\text{CO}_2\text{Me}$, fluorescent oil of an agreeable odor, b. $320-30^\circ$, sol. in concd. H_2SO_4 , but the soln. gradually darkens, and upon diln. with H_2O develops a yellowish green fluorescence. *Hydroxygynocardic acid* (not analyzed), from (a) and H_2SO_4 , prisms of a stearic acid odor, gives a sol. *potassium salt*. The *dibromide*, $\text{C}_{17}\text{H}_{33}\text{Br}_2\text{CO}_2\text{H}$, by the action of Br on (a) in AcOH , heavy oil, crystg. at low temps., not volatile with steam, and decomp. when heated *in vacuo* at 100° .

H. M. GORDIN.

Saturated bicyclic hydrocarbons. S. S. NAMEŤKIN. *J. Russ. Phys. Chem. Soc.* 47, 405-9 (1915).—General remarks by N. on his work with collaborators on camphane, isocamphane and camphenylane (following 3 abstrs.), bringing out the following points: The nitration of these substances with dil. HNO_3 (Konovalov's method) gives secondary NO_2 compds. only, though they all contain also tertiary C atoms. While in the nitration of paraffins the NO_2 goes to a particular C, in the above bicyclic compds. it goes in the direction of both cycles, giving where possible (camphenylane) 2 isomeric NO_2 compds. The above hydrocarbons also have a tendency to form stereoisomeric NO_2 derivs. having different phys. properties. Owing to the ready interaction of HNO_3 with ketones, nitration as a rule gives only traces of the latter; since, however, the ketones of bicyclic hydrocarbons do not readily interact with HNO_3 , the nitration products of the above hydrocarbons contained considerable amts. of ketones. The latter are identical with the ketones obtained by oxidizing the NO_2 compds. with alk. KMnO_4 . Similarly the dibasic acids found in the nitration products are identical with the acids obtained by oxidizing these ketones.

H. M. GORDIN.

Action of nitric acid on camphane. S. S. NAMEŤKIN, M. K. DOBROVOL'SKAYA AND M. P. OPARINA. *J. Russ. Phys. Chem. Soc.* 47, 409-13 (1915); cf. preceding abstr. —The work of Konovalov and Kikina on the nitration of camphane (erroneously called by them anhydrocamphene) with dil. HNO_3 (*J. Russ. Phys. Chem. Soc.* 34, 935 (1902)) was repeated with purer material obtained by Kizhner's method (*C. A.* 6, 347). The results were as follows: The product consisted of *dl*-camphoric acid and

2 stereoisomeric α - and α' -nitrocamphanes,

$$\begin{array}{c} \text{CH}_2-\text{CH}-\text{CH}_2 \\ | \quad | \quad | \\ | \quad \text{CMe}_2 \quad | \\ | \quad | \quad | \\ \text{CH}_2-\text{CMe}-\text{CHNO}_2 \end{array}$$

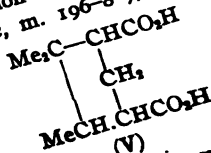
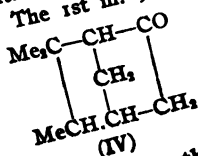
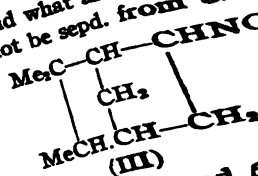
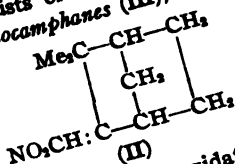
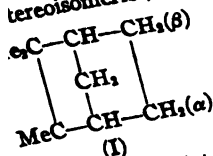
The 1st m. $128-30^\circ$, and is identical with K. and K.'s compd., the 2nd m. $140-5^\circ$, and is identical with Forster's compd. (*J. Chem. Soc.* 77, 257). Upon oxidation both gave *dl*- α -camphor, which gave a *semicarbazone* m. $232-3^\circ$.

H. M. GORDIN.

Isocamphane. S. S. NAMEŤKIN AND L. N. ABAKUMOVSKAYA. *J. Russ. Phys. Chem. Soc.* 47, 414-24 (1915); cf. preceding abstrs.—When isocamphane (I) is treated

Chemical Abstracts.

1 dil. HNO_3 the product consists of ω -nitrocamphene (II) and what are probably stereoisomeric β - and β' -nitroisocamphanes (III), which could not be sep'd. from each other. Their mixt. m. $48-9^\circ$, and gave upon oxidation 2 stereoisomeric β - and β' -isocamphors (IV). The 1st m. $91-2^\circ$ (semicarbazone, m. $196-8^\circ$), the 2nd m. $63-4^\circ$

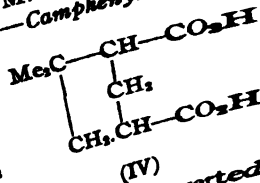
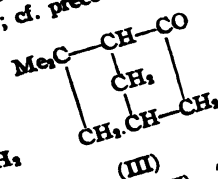
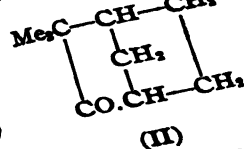
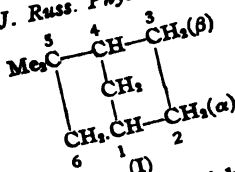


(semicarbazone, m. 195°). Further oxidation of both ketones gave the same *d*-isocamphoric acid (V), probably a mixt. of *cis-trans*-isomers, begins to cake 176° , m. $178-80^\circ$, in most respects resembles its isomer, camphoric acid.

H. M. GORDIN.

H. M. KHUKHRIKOVA.

Camphenylene and its derivatives. S. S. NAMETKIN AND A. M. KHUKHRIKOVA. J. Russ. Phys. Chem. Soc. 47, 425-34(1915); cf. preceding abstrs.—Camphenylene (I)



was prepd. by Kizhner's method from camphenylene (II). The latter was converted into the hydrazones $\text{C}_8\text{H}_{11}\text{NNH}_2$, m. $29-31^\circ$, and this into the azine $(\text{C}_8\text{H}_{11}\text{N})_2$, m. 148.5° . (I) m. 156° , b_{714} 142.5° , d_4^{20} 0.8547 , n_D^{20} 1.4555 , b_D $124-5^\circ$, d_4^{20} 1.077 , n_D 1.4835 , HNO_3 gave β -nitrocamphenylene (a), m. $18-20^\circ$, b_{714} $124-5^\circ$; semicarbazone, m. $192-3^\circ$. Further oxidation of (III) gave apofenchonecamphoric acid (IV), m. $145.5-5^\circ$. Reduction of (a) gave the corresponding β -camphenylamine, $\text{C}_8\text{H}_{11}\text{NH}_2$, m. $10-4^\circ$, b_{714} $189-9.5^\circ$, d_4^{20} 0.9278 , n_D 1.4822 ; benzoyl compound, $\text{C}_8\text{H}_{11}\text{NHBz}$, could not be obtained pure, probably on account of formation of stereoisomers.

H. M. GORDIN.

Diaminofluorenes. HERMANN RUDOLPH. Ztg. 30, 293-5(1915).—Of the possible sym. diamines of fluorene, only the 2,7-deriv., i. e., corresponding to benzidine, is known (cf. Schultz, Ann. 203, 101; Diels, Schill and Tolson, Ber. 35, 3284). Attempts to prep. the as yet unknown 3,6-diaminofluorene were unsuccessful. On reducing the products obtained by nitrating fluorene itself, several NH_2 derivs. resulted, from which a diaminofluorene, needles, m. 156° (acetyl compound, m. 269°), was isolated. W. O. E.

Some derivatives of urea. M. SCHOLTZ. Univ. Greifswald. Arch. Pharm. 253, 111-7(1915).—Continued heating of urea with BzMe and CHCl_3 . Attempts to prep. *diacetophenone urea*, $\text{CO}(\text{N}:\text{CMePh})_2$, AcOH and CHCl_3 . Similar treatment of BzEt leads to the formation of *dipropiophenone urea*, $\text{CON}(\text{CMePh})_2$, rods from alc. m. $196-7^\circ$. In the case of BzPh , a biuret deriv. results: *benzophenone biuret*, $\text{Ph}_2\text{C}:\text{NCONHCONH}_2$.

needles from alc. remaining solid at 300° but decomp. at higher temp. In this reaction the greater part of the urea is converted into cyanuric acid while much of the BzPh. remains unchanged. In the interaction of urea and $\text{AcCH}_2\text{CO}_2\text{Et}$, Behrend (cf. *Ann.* 229, 5) obtained the equimol. condensation product, the Et uramidocrotonate. On heating the above substances, however, at 170° , they react in the proportion of 3 mols. urea and 1 mol. $\text{AcCH}_2\text{CO}_2\text{Et}$ with the formation of the β -diureidobutyric ureide, $\text{MeC}(\text{NHCONH}_2)_2\text{CH}_2\text{CONHCONH}_2$, flakes from Et_2O , cryst. powder from alc., m. at no definite temp. At 200° , this substance loses NH_3 , thereby yielding the compd., 1,3-diketohexahydrokynidino-5-methyl-5-acetic ureide, $\text{NH}(\text{CONH})_2\text{CMeCH}_2\text{CONHCONH}_2$, cryst. powder softening at 170° , decomp. 200° . The corresponding compds. of urea with $\text{BzCH}_2\text{CO}_2\text{Et}$ are: β -phenyl- β -diureidopropionic ureide, $\text{PhC}(\text{NHCONH}_2)_2\text{CH}_2\text{CONHCONH}_2$, rods beginning to decomp. 195° but m. suddenly 213° ; 1,3-diketohexahydrokynidino-5-phenyl-5-acetic ureide, $\text{NH}(\text{CONH})_2\text{CPhCH}_2\text{CONHCONH}_2$.

W. O. R.

p-Anisidide and *p*-phenetidide of thioglycolic acid. H. BECKURTS AND G. FREUCHS. Tech. Hochschule Braunschweig. *Arch. Pharm.* 253, 136-55 (1915).—The anilide of carbaminothioglycolic acid is converted by NH_3 into that of thioglycolic acid, $\text{HSCH}_2\text{CONHPh}$, and CONH . This compd. is by virtue of its SH group capable of yielding a great variety of derivs., notably by substituting H of the SH group for alkyl and other groups. [In the following, $\text{R} = \text{CH}_2\text{CONHC}_6\text{H}_4\text{OMe}$.] On heating an alc. soln. of RCl with KCNS , carbaminothioglycolic *p*-anisidide resulted, NH_2COSR , needles, m. $160-1^{\circ}$, which with NH_3 yielded thioglycolic *p*-anisidide, RSH , needles, m. 116° . The latter is converted by FeCl_3 into dithioglycolic *p*-anisidide, $(-\text{SR})_2$, needles, m. 185° . Other *p*-anisidides prepd. were: methylthioglycolic MeSR , needles, m. 94° ; ethylthioglycolic, needles, m. 68° ; isopropylthioglycolic, needles, m. 58° ; isobutylthioglycolic, leaflets, m. 86° ; benzylthioglycolic, needles, m. 82° ; ethylenethioglycolic $(\text{CH}_2\text{SR})_2$, microscopic needles, m. $177-8^{\circ}$; propylenethioglycolic $\text{C}_3\text{H}_6(\text{SR})_2$, cryst. flour, m. 103° ; trimethylenethioglycolic, $\text{CH}_2(\text{CH}_2\text{SR})_3$, leaflets, m. 139° ; dimethylmethylenethioglycolic, $\text{Me}_2\text{C}(\text{SR})_2$, needles, m. 168° ; hydroxyethylthioglycolic, $\text{HOCH}_2\text{CH}_2\text{SR}$, leaflets, m. 78° ; carbethoxythioglycolic, EtO_2CSR , needles, m. 90° ; thiodiglycolic amide, $\text{H}_2\text{NCOCH}_2\text{SR}$, needles, m. 148° ; thioglycol- α -lactic acid $(\text{MeCO}_2\text{H})\text{CHSR}$, needles, m. 121° . Similarly, the *p*-phenetidides of carbaminothioglycolic acid, $\text{H}_2\text{NCOSCH}_2\text{CONHC}_6\text{H}_4\text{OEt}$, leaflets, m. 123° , and thioglycolic acid, leaflets, m. 117° , were prepd., the latter yielding the following *p*-phenetidides: dithioglycolic, needles, m. 186° ; methylthioglycolic, needles, m. 63° ; ethylthioglycolic, leaflets, m. 87° ; isopropylthioglycolic, needles, m. $99-100^{\circ}$; isobutylthioglycolic, crystals, m. $106-7^{\circ}$; benzylthioglycolic, needles, m. 111° ; ethylenethioglycolic, needles, m. 197° ; propylenethioglycolic, needles, m. 158° ; trimethylenethioglycolic, needles, m. 147° ; dimethylmethylenethioglycolic, needles, m. 171° ; allylthioglycolic, asbestos-like needles, m. 78° ; hydroxyethylthioglycolic, leaflets, m. 81° ; carbomethoxythioglycolic, needles, m. 119° ; carbethoxythioglycolic, needles, m. 106° ; thiodiglycolic, needles, m. 114° ; barium salt, $(\text{C}_{12}\text{H}_{14}\text{NSO}_4)_2\text{Ba}$, cryst.; thioglycol- α -lactic, needles, m. 113° ; thiodiglycolic amide, needles, m. 155° ; thiodiglycolic ethyl ester, $\text{EtCO}_2\text{CH}_2\text{SCH}_2\text{CONHC}_6\text{H}_4\text{OEt}$, oil, gradually becoming cryst. W. O. R.

The action of chlorine on quinine. A. CHRISTENSEN. *Ber. pharm. Ges.* 25, 256-81 (1915).—Cl in excess easily effects soln. of the alkaloid. If, however, the Cl is applied in limited amt., several distinct products are formed, according as 2, 4 or 6 atoms of Cl are used. Cl_2 per quinine mol.—Quinine dichloride, $\text{C}_{20}\text{H}_{24}\text{Cl}_2\text{N}_2\text{O}_2$, amorphous powder, m. 97° , insol. in H_2O , easily sol. in CHCl_3 and alc., difficultly sol. in Et_2O , gives the thalleioquin reaction; hydrochloride, $\text{C}_{20}\text{H}_{24}\text{Cl}_2\text{N}_2\text{O}_2 \cdot 2\text{HCl} \cdot 2\text{H}_2\text{O}$, cryst., $\alpha_D 169.3^{\circ}$ (0.6905 g. in 25 cc.), yields with alc. KOH dehydroquinine, $\text{C}_{20}\text{H}_{22}\text{N}_2\text{O}_2$, m. 181° (oxalate, m. $133-4^{\circ}$); nitrate, $\text{C}_{20}\text{H}_{24}\text{Cl}_2\text{N}_2\text{O}_2 \cdot 2\text{HNO}_3$, prisms from alc. or H_2O ;

hydrobromoperbromide, $C_{20}H_{24}Cl_6N_2O_7 \cdot 2HBr \cdot Br_2$, orange-red cryst. powder; *herapathite*, $4C_{20}H_{24}Cl_6N_2O_7 \cdot 3H_2SO_4 \cdot 2HI \cdot I_2$, cantharidin-green crystals; *quinine hydroxychloride*, $C_{20}H_{24}Cl(OH)N_2O_7$, α_D 131.35° (4.6435 g. in 25 cc.). Quinine dichloride and Cl_2 yield in mol. proportions a product from which a *nitrate* of the *tetrachloride* was prepd., $C_{19}H_{20}Cl_4N_2O_7 \cdot HNO_3$, colorless crystals. $2Cl_2$ per quinine mol.—*Hydrochlorides* "A" and "B," $C_{19}H_{22}Cl_3N_2O_7 \cdot 2HCl \cdot 2\frac{1}{2}H_2O$ and $C_{19}H_{22}Cl_3N_2O_7 \cdot 2HCl$; *nitrate*, $C_{19}H_{22}Cl_3N_2O_7 \cdot HNO_3 \cdot 3H_2O$, long needles yielding on oxidation β, γ -pyridinedicarboxylic acid; *hydriodide*, $C_{19}H_{22}Cl_3N_2O_7 \cdot HI \cdot 4H_2O$; *5-chloro-6-hydroxycinchonine hydroxychloride*, $C_{19}H_{22}Cl_3N_2O_7 \cdot 4H_2O$, from both "A" and "B," long needles, m. 172–3°. This alkaloid contains 3 OH groups. Corresponding thereto, *5-chloro-6-hydroxycinchonine*, $C_{19}H_{22}Cl_3N_2O_7 \cdot 4H_2O$, was prepd. from hydrochloroquinine, $C_{19}H_{22}ClN_2O_7$ (cf. Comstock and Koenig, *Ber.* 20, 2517) as long prisms, m. 174–5°; *hydrochloride*, $C_{19}H_{22}Cl_3N_2O_7 \cdot 2HCl \cdot 3H_2O$.—Quinine hydrochloride with 3 Cl_2 , or better hydrochloroquinine with 2 Cl_2 per mol., yields *5-dichloro-6-ketocinchonine hydrochloride nitrate*, $C_{19}H_{21}Cl_5N_2O_7 \cdot HNO_3$, small quadratic plates. W. O. E.

Hexabromodiacyetyl. C. LORING JACKSON AND ROGER ADAMS. *J. Am. Chem. Soc.* 37, 2522–36(1915); cf. *C. A.* 8, 2872.— $CBR_2CHBrCOCOCBr_2$ and its principal derivs. must be struck from the list of known compds., for the yellow ketone obtained by the action of Br and H_2O on the 2 acids formed by the treatment of tetrabromo-*o*-quinone with NaOH and to which the above structure was assigned has now been found to be *hexabromodiacyetyl* (a), $(COCBr_2)_2$. It is now prepd. by adding to 200 g. NaOH in 1 l. H_2O at a few degrees above zero 100 g. of tetrabromo-*o*-quinone in small portions with const. shaking, allowing to stand 2–3 hrs. in ice, then 5 hrs. at room temp., pouring into 400 cc. of concd. HCl slowly and with const. stirring, filtering after allowing to settle 5–10 min., adding Br in 2 cc. portions with shaking after each addition until the liquid remains reddish (23–3 cc. in all if the quinone used was pure), filtering the ppt. after 5–10 min., drying on clay, powdering, extg. with successive portions of petr. ether (b. 30–50°) until only a brown tarry impurity is left, concg. and cooling, whereupon the (a) seps. in orange-yellow, arrowhead-shaped plates, m. 100–1° (yield, 21–4 g.), unattacked by strong acids in the cold or on short heating at 100°, sol. without change in appearance but with loss of 1–2% Br in boiling fuming HNO_3 , while several hrs. boiling seems to decomp. it entirely; boiling H_2SO_4 dild. with its vol. of H_2O gives a little $CHBr_3$; H_2O , H_2O_2 or const. boiling HBr do not effect it in the cold but at 100° in sealed tubes CBR_2COCH_2Br and $CHBr_3$ are formed. Attempts to prep. a dicyanohydrin by heating with aq. 40% HCN at 40° gave a yellow oil which on hydrolysis with HCl at 100° again gave only an oil. Alk. reagents (NaOH, KOH, Ba(OH) $_2$, Na_2CO_3) easily decomp. (a) into 2 mols. $CHBr_3$ and 1 mol. of an oxalate; the same is true of hot NaOMe but in the cold a product m. about 80° is formed. Boiling aq. NaOAc gives $CHBr_3$, HBr and $(CO_2H)_2$; $CaCO_3$ in boiling H_2O gives tarry products and evolves a sharp odor like that of a bromoketone; Ag and boiling H_2O produce the same odor but give AgBr and $(CO_2H)_2$; aq. NH_3 and alc. in the cold yield $(CONH_2)_2$ and $PhNH_2$ in C_6H_6 gives $(CONHPh)_2$; *o*- $C_6H_4(NH_2)_2$ gives *o*-phenyleneoxamide; $NH_2OH \cdot HCl$ apparently does not react; $PhNHNH_2$ removes Br; C_6H_5N forms a black tar; $AcCl$, Ac_2O , $BzCl$, aq. H_2SO_4 have no action; Zn and AcOH or Al-Hg give tars; Br does not react in the cold and forms tars on heating in sealed tubes. Allowed to stand 4–5 days in MeOH (not abs.) it gives 0.5 its wt. of *hexabromodiacyetyl monomethyl-hemiacetal* (b), $CBR_2COC(OH)(OMe)CBR_2$, m. 105°; it seps. from petr. ether in 3 kinds of crystals: (1) on cooling or rapid evapn. mostly in long slender prisms, sometimes with a bluntly pointed, sometimes with a square end, turning opaque, without losing wt., in air; (2) on slow evapn. chiefly in short, square-ended prisms usually bevelled on the edges and sometimes on the ends; (3) in octahedra modified by many small planes. (1) and

(2) usually cryst. together and are orthorhombic or perhaps monoclinic, while (3), which were obtained only once under conditions which could not be established, seemed to be tetragonal and have a much more brilliant luster than the others; on recrystn. from MeOH they give (1). The MeOH soln. of (b) turns yellow in a few min. and although colorless crystals sep. from it they melt lower ($100-1^{\circ}$) while in contact with abs. MeOH for some weeks (b) changes to a red oil. That this is due to the formation of a dihemiacetal is rendered improbable by the facts that the C_6H_5 soln. also turns yellow in the air and evapn. of the C_6H_5 leaves a brownish residue, and crystals of (b) have a tendency to turn brown in the air, especially if it is moist. On the other hand, concd. HNO_3 dissolves (b) without change; H_2SO_4 (1:1) does not decomp. it until boiled some time, when it gives an oil smelling of camphor. (b) distils slightly with steam, is unstable towards alkalis, alc. NH_3 giving NH_4Br and $PhNH_2$ an oil; $NH_4OH.HCl$, Ac_2O and $AcCl$ have no action; boiling with Ag in MeOH yields an oil and crystals m. about 70° . *Monoethylhemiacetal* (c), narrow plates from petr. ether, m. $96-7^{\circ}$, easily turns brown in moist air, the Br content decreasing about 2%; heated in sealed tubes with H_2O at 100° for several days it gives CO_2 , $CHBr_3$, HBr and probably HO_2CCO_2Et ; attempts to reconvert it into (a) by evapg. with dil. H_2SO_4 until the b. p. rose from 110° to 135° gave only unchanged (a); after several hrs. at 150° with strong H_2SO_4 , there is decompn. but no formation of (a); 3 hrs. boiling with const. boiling HBr or heating to 100° in sealed tubes produces no change. With other reagents it behaves like (b). In the prepn. of (a), if the filtrate from it is allowed to stand with 5 cc. Br a red oil is formed which becomes semicryst. on standing and gives a mixt. of (a) and $CBBr_3COCH_2Br$ on crystn. from petr. ether. *Pentabromodiacyl monobenzylhemiacetal*, $CHBr_3COC(OH)(OCH_2Ph)CBr_3$, obtained in 2-2.5 g. yield from 5 g. (a) heated 10 hrs. on the H_2O bath with 5-6 g. $PhCH_2OH$, thick rhombic prisms from ligroin, m. $109-10^{\circ}$, more stable towards alkalis than the hemiacetals of (a), as $Ba(OH)_2$ does not attack it after 2 days in the cold and $NaOH$ decomp. it completely only after several days, the resulting yellow oil containing no $CHBr_3$; it crysts. unchanged from Ac_2O . $m-O_2NC_6H_4CH_2OH$ heated on the H_2O bath with (a) gives $(O_2NC_6H_4CH_2)_3O$; $PhOH$ yields a black mass. Allowed to stand 4-5 hrs. at room temp. in acetone and then to evap. spontaneously, (a) gives $(COCHBr_3)_2$; this is also obtained from 1 g. (a) moistened with H_2O and shaken with 2 cc. of const. boiling HI. *Pentabromodiacyl monoethylhemiacetal*, obtained together with (c) from 10 g. (a) allowed to stand 5-8 weeks in 150 cc. alc. and 15 cc. acetone, short, broad prisms from petr. ether, m. 115° , does not give $CHBr_3$ with $NaOH$. The corresponding Me compd. could not be obtained. When 3 g. KI in 25 cc. H_2O are treated with 1 g. (a), a brown color appears, CO_2 is evolved and in 2 days a cryst. ppt. is formed which, after washing with KI and drying on clay, seps. from CCl_4 in slender, lemon-yellow needles, turns brown in the light, m. $122-5^{\circ}$ (decompn.) but the m. p. varies greatly with the conditions of heating; org. solvents decomp. it somewhat with liberation of I; cold fuming and hot concd. HNO_3 and hot HNO_3 dild. with $AcOH$ liberate I; NH_4OH and KOH give CHI_3 , to judge by the smell; H_2O has no action. Its compn. (Br + I, 90.28-90.44, C 7.59-7.67, H 0.61-0.78%) and mol. wt. (475-502) correspond approx. to the formula $C_6H_5OBrI_2$.

CHAS. A. ROUILLER.

Normal nonane. LATHAM CLARKE AND ROGER ADAMS. *J. Am. Chem. Soc.* 37, 2536-8(1915).—3-Nonanol, $b_{718} 192-3^{\circ}$, was obtained in 45 g. yield from 57 g. enanthole (which in turn was prepd. through the $NaHSO_3$ compd. from the fraction of castor oil b. $90-180^{\circ}$) and $EtMgBr$; this with I and red P gave 3-iodononane which, refluxed 1 hr. with excess of concd. alc. KOH , yielded *nonylene*, b. $149.4-9.9^{\circ}$, $d_{15}^{15} 0.7540$; its vapor passed together with H over freshly reduced Ni at 160° yielded nonane, $b_{718} 150.4-0.6^{\circ}$, $d_{15}^{15} 0.7219$, $n_D^{25} 1.4025$.

CHAS. A. ROUILLER.

Constitution of the nitro- α -carbopyrrolic acids. WILLIAM J. HALE AND WILLIAM V. HORT. *J. Am. Chem. Soc.* 37, 2538-52(1915).—From 1.6 g. of $\text{NaON}(:\text{O}):C(\text{CHO})_2$ (a) and 1.4 g. of $\text{HCl}\cdot\text{H}_2\text{NCH}_2\text{CO}_2\text{Et}$ (b) in 6-7 cc. of 70% alc. gently warmed for a few min. on the H_2O bath and, after soln. is complete, allowed to stand at room temp. 15-30 min., there seps. 80% of ethyl β -aldehydo- β -nitroethylideneaminoacetate, $\text{OHCCH}(\text{NO}_2)\text{CH}:\text{NCH}_2\text{CO}_2\text{Et}$, thin pale yellow prisms from alc. or H_2O , m. 104° , does not give primary or secondary amine tests, reduces $\text{NH}_4\text{-AgNO}_3$, gives a cryst. phenylhydrazone, very stable towards acids, crystg. well from concd. HCl , practically unattacked by very dil. alkalies; when, however, 1 g. in 8 cc. of 65% alc. and 40 drops of 20% NaOH is warmed not above 50° , it gives, through the intermediate $\text{O}_2\text{NCH}_2\text{CH}:\text{N}\cdot\text{C}(\text{CO}_2\text{Et})\text{CH}$, 90% of ethyl β' -nitro- α -carbopyrrolate, prisms from alc.,

m. 174° , also obtained directly, in 75% yield, from the mixt. of (a) and (b) in alc. kept 0.5 hr. at 50° with 40 drops of 20% NaOH ; 1 g. in 15 cc. of 20% KOH heated 5-6 hrs. on a H_2O bath, cooled, neutralized with concd. HCl and extd. with Et_2O , yielded 90% of the free acid (c), needles with 1 H_2O , m. 217° (decompn.), identical with Anderlini's acid (*Gazz. chim. ital.* 19, 93 (1889)), thus establishing the structure of the latter. This is further confirmed by the fact that the methyl ester, obtained from (a) and $\text{MeO}_2\text{CCH}_2\text{NH}_2\cdot\text{HCl}$, prisms from alc., m. 198° , is identical with his ester. Potassium salt, from the acid and K_2CO_3 , light yellow needles or prisms. Silver salt, yellow flocculent ppt. Of the isomeric β - and α' - NO_2 acids, the former must give on loss of CO_2 the same nitropyrrole as (c) and in this way it was shown that Ciamician's acid (*Gazz. chim. ital.* 12, 39 (1882)) is β -nitro- α -carbopyrrolic acid (d), needles with 1 H_2O , m. (anhydrous) 146° ; methyl ester, from the Ag salt and MeI heated 1 hr., m. 162° . Consequently the 3rd isomer (Anderlini, *Gazz. chim. ital.* 19, 350(1889)) is α' -nitrocarbopyrrolic acid, seps. with 1 H_2O , m. (anhydrous) 161° . Attempts to decomp. the acids into CO_2 and nitropyrroles led to many failures; heating alone led to explosive decompns.; with pumice, lime, soda-lime, sand, finely divided Cu , Ni and other metals, (c) gave unsatisfactory results; distn. *in vacuo* was more satisfactory but the yield was very small; finally, equal quantities of (c) or (d) and C_{10}H_8 were heated in sealed tubes up to, and not beyond, the charring point, and the product digested with ice H_2O for a few min., the resulting yellow soln. depositing on spontaneous evapn. β -nitropyrrole (e), while the insol. portion, when dissolved in hot H_2O and evapd. spontaneously, deposited a dimolecular form (f) of (e). The α' - NO_2 acid similarly heated with C_{10}H_8 gave a yellow oily NO_2 compd. which could not be purified. (e), small prisms, m. 63.5° , is identical with Angeli and Alessandri's product (*C. A.* 5, 3403). Heated for a short time a little above its m. p. it passes over into (f), pale yellow prisms from H_2O , m. 101° ; its mol. wt. in boiling C_6H_6 is 222 (calcd., 224) but in freezing H_2O it is considerably dissociated (mol. wt. 161.3). CHAS. A. ROUILLER.

Some salts of the haloacetic acids. II. W. G. BATEMAN AND D. B. CONRAD. *J. Am. Chem. Soc.* 37, 2553-60(1915); cf. *C. A.* 9, 454.—Ammonium dichloroacetate, from the acid and NH_3 gas in abs. Et_2O , lustrous, pearly leaflets, non-deliquescent, has a faint halogen odor, is quite stable, forms a neutral aq. soln. which soon becomes acid, volatilizes on cautious heating in white fumes having the odor of NH_3 , decomp. on higher heating into $\text{CHCl}_3\text{CO}_2\text{H}$, NH_3 and CO_2 ; dry HCl passed into its AcOEt soln. ppts. NH_4Cl ; aq. solns. dissolve HgO and after a certain amt. has been dissolved an amorphous ppt. seps. Ammonium bromoacetate, leaflets. Cupric dichloroacetate, $\text{Cu}(\text{O}_2\text{CCHCl}_2)_2\cdot 4\text{H}_2\text{O}$, from CuCO_3 and a concd. aq. soln. of the acid allowed to stand some time, filtered, treated with alc. and allowed to stand, deep blue needles, passing on standing or warming into the anhydrous form, pale blue-green microneedles; another bright green hydrate exists between these 2 forms. The tetrahydrate forms blue solns.

in H_2O , EtOH and AcOEt and green solns. in acetone, AcOH , CHCl_3 , CO_2H and Et_2O , while the anhydrous salt forms blue solns. in H_2O and green solns. in other solvents; it m. above 100° , slowly gives off acid, increases in bulk and changes in appearance. *Cupric trichloroacetate*, medium blue crystals with 3 H_2O , forming blue solns. (blue-green in Et_2O and AcOH); after several hrs. at 103° it yields the *anhydrous salt*, bright blue-green powder, sol. in alc. with green color. With alc. PhNHNH_2 , Cu salts of the haloacetic acids give olive ppts. which quickly decomp. with evolution of N; next long, white needles sep. which in the air or in contact with H_2O turn Cu-red and in NH_4OH form colorless solns. which on shaking with air become green and finally blue, while HCl solns. quickly become brown; if the PhNHNH_2 is used in excess and the mixt. is allowed to become hot, Cu_2O and sometimes apparently free Cu are formed; still other substances are sometimes found (C_6H_4 , Ph_2NH , the Et ester of the acid, CH_3CICHO , PhCl). *Cupric bromoacetate*, dark green crystals with 1 H_2O ; *anhydrous salt*, blue-green, becomes brown in H_2O on the water bath, with formation of CuBr_2 . *Mercuric chloroacetate*, from HgO and excess of the acid in hot H_2O , leaflets from hot soln., gives with H_2S in AcOEt a bright orange ppt. quickly becoming black; with NH_3 in AcOEt it is reduced to metallic Hg; it begins to m. 135° , b. 140° , turning pink, blackens 185° and at 190° mostly free Hg is left; with NH_4OH is pptd. a white powder which becomes yellow on spare washing and drying and contains about 85% Hg and about 0.25% N. *Mercuric trichloroacetate* was apparently obtained as shining needles collecting at the top of the liquid by slowly adding HgO to the acid in H_2O , but they almost immediately fall to the bottom of the vessel as a white powder consisting of almost pure Hg_2Cl_2 . *Mercurous trichloroacetate* from the acid and fresh aq. HgNO_3 , needles from H_2O ; H_2S in C_6H_4 gives a ppt. of HgS and Hg; the salt is at once decompd. by NH_4OH and it volatilizes above 200° with very little decompn. *Mercurous chloroacetate*, needles, decompd. by NH_4OH , darkens when heated in the presence of H_2O vapor and, dry, m. 180° with some decompn. *Mercurous bromoacetate*, amorphous powder, darkens 145° , becomes yellow (liberation of Br) and sublims without melting. No mercurous or mercuric dichloroacetate could be isolated. C. A. ROULLER.

Action of aluminium chloride on the aliphatic ethers. G. B. FRANKFORTER AND E. A. DANIELS. *J. Am. Chem. Soc.* 37, 2560-7 (1915); cf. *Bull.* 2, *Chem. Studies, Univ. Minn.*—The reaction between aliphatic ethers and CCl_3CHO in the presence of AlCl_3 is entirely different from that observed with aromatic ethers. The ether must be perfectly dry, as the presence of H_2O completely changes the course of the reaction. To a mixt. of Et_2O and CCl_3CHO at 0° powdered AlCl_3 was added in 5 g. portions until a small amt. of AlCl_3 remained undissolved; much heat was generated, a little HCl was evolved and the soln. became straw-yellow; after standing 2 hrs. in ice, it was allowed to rise slowly to room temp., when it became reddish brown. After standing overnight at 0° , the resulting light brown jelly was treated with H_2O and the thick brown mass which sep'd. was steam-distd., several substances being obtained but in too small amt. for careful examn. The viscous insol. material remaining in the distg. flask on treatment with Et_2O left a gelatinous substance consisting of a simple Al compd. while the Et_2O ext., distd. *in vacuo*, gave crystals, b_m 52° (evidently $\text{CCl}_3\text{CHO} \cdot \text{H}_2\text{O}$), a small amt. of liquid b_m $62-80^\circ$, and another small amt. of liquid b_m 125° , while the residue was dark brown and apparently charred. When the reaction was carried out at -8° instead of 0° , the vacuum distn. gave a small amt. of liquid at 100° , together with much HCl , and crystals between $110-135^\circ$; these m. $22-4^\circ$ and liquefied in the air. When Et_2O is treated with 1.5 parts AlCl_3 (best in pieces about the size of a pea), first at about 15° and then at $35-50^\circ$ with frequent shaking, and then thoroughly cooled, large plates sep. which, after several recrystns. from Et_2O and drying over H_2SO_4 , contain 14.9% Al and 50.8% Cl (calcd. for $\text{AlCl}_3 \cdot \text{Et}_2\text{O}$, 13.01 and 51.3%,

resp.), fairly stable over H_2SO_4 , although they slowly lose Et_2O and HCl (2.7 and 6.1% in 6 and 38 days, resp.); in H_2O , both Et_2O and HCl are liberated and the residue left by evap., the soln. contains 32% Al and 16% Cl . If the crystals are heated to const. wt. at 106° they lose 55% in wt. and the residue contains practically the same amts. of Al and Cl (32.85 and 17.27%) as the residue from the aq. soln., so that a basic Al salt, probably a mixt. having approx. the compn. $3\text{Al}(\text{OH})_3 \cdot 2\text{Al}(\text{OH})_2\text{Cl}$ is evidently formed. On exposure to the air, the crystals liquefy, then a scum forms on the surface and finally the whole changes to a slightly yellow solid; there is a gradual increase in wt., then a loss and finally a fluctuation with atmospheric conditions (in 1 case a max. increase of 17.9% in 12 days, decreasing to 7.3% in 28 days); over H_2O in a closed vessel there is a very rapid increase in wt. (11.6, 38.1 and 238% after 8 hrs., 29 hrs. and 15 days, resp., with a 5% loss of Cl). Pr_2O instead of Et_2O gives an additive compd. as a red liquid (found, 15.73% Al and 42.61% Cl). While AlCl_3 dissolves clear in absolutely dry Et_2O , a trace of H_2O will form a cloud or ppt., and this reaction may be used as a qual. test for the presence of H_2O ; into 5-10 cc. Et_2O at 10° in a stoppered test tube is dropped a piece of fresh AlCl_3 the size of a wheat kernel; as the Et_2O warms to room temp., reaction takes place and minute bubbles rise to the top, carrying with them, in the presence of H_2O , a delicate white cloud; 7% of alc. will cover the test but not 5%; Et_2O dried over CaCl_2 will give a positive test; 1 drop of H_2O in 500 cc. of Et_2O freshly distd. over Na can be detected in this way. C. A. ROULLER.

Veratrine and some of its derivatives. II. GEO. B. FRANKFORTER AND W. KRITCHEVSKY. *J. Am. Chem. Soc.* 37, 2567-9(1915); cf. *Am. Chem. J.* 20, 358.—The following compds. were prepd. by treating the alkaloid in CS_2 with CCl_3CHO , adding cold Et_2O after the reaction had ceased, filtering, washing several times with Et_2O and drying. Heated several hrs. at $130-40^\circ$, they lose the CCl_3CHO , showing that these compds. are simple additive products. By changing the amt. of CCl_3CHO used, the ratio between the components of the compds. can be varied. *Cevadine-chloral*, $2\text{C}_{27}\text{H}_{49}\text{O}_8\text{N} \cdot \text{CCl}_3\text{CHO}$, amorphous, m. 220° ; $2\text{C}_{27}\text{H}_{49}\text{O}_8\text{N} \cdot 3\text{CCl}_3\text{CHO}$, m. 209° . *Cevine-chloral*, $\text{C}_{27}\text{H}_{49}\text{O}_8\text{N} \cdot \text{CCl}_3\text{CHO}$, m. $206-8^\circ$. *Cevadine-bromal*, $2\text{C}_{27}\text{H}_{49}\text{O}_8\text{N} \cdot \text{CBr}_3\text{CHO}$, bright yellow powder, m. 162° . *Cevine-bromal*, $2\text{C}_{27}\text{H}_{49}\text{O}_8\text{N} \cdot \text{CBr}_3\text{CHO}$, bright yellow powder, m. 106° . Every alkaloid sol. in CS_2 thus far studied similarly gives with CCl_3CHO or CBr_3CHO additive compds. insol. in Et_2O . C. A. ROULLER.

Triphenylmethyl. XXIV. The additive compounds of triphenylmethyl and some saturated hydrocarbons. M. GOMBERG AND C. S. SCHOEFFLE. *J. Am. Chem. Soc.* 37, 2569-74(1915); cf. *C. A.* 8, 1689.—Inasmuch as in the expts. in which the formation of additive compds. between Ph_3C and satd. hydrocarbons was indicated (*Ber.* 38, 1338(1905)) the hydrocarbons used were merely purified samples of petr. ethers and it was not entirely impossible that they still contained small amts. of olefin compds., the expts. have been repeated with carefully purified individual paraffins of natural origin and also some synthetic aliphatic and alicyclic hydrocarbons. The hexane and heptane (from petroleum) were shaken 10 hrs. each with concd. H_2SO_4 and concd. HNO_3 and 6 hrs. with alk. KMnO_4 before drying and fractionating; the synthetic octane and diisooamyl were also shaken with H_2SO_4 ; the cyclohexane and methylcyclohexane were carefully distd. The Ph_3C was prepd. by shaking 10 g. Ph_2CCl , 10 g. Hg and 0.5 g. Pb powder in about 75 cc. C_6H_6 for several hrs., allowing to settle, siphoning off the clear liquid, distg. the C_6H_6 *in vacuo*, crystg. from acetone and drying in CO_2 and finally *in vacuo*. To prep. the additive compds., about 60 cc. of the hydrocarbon and the Ph_3C are heated to the b. p., filtered and cooled; the mother liquors are drawn off from the resulting compds., which usually sep. in colorless crystals; these, after drying in CO_2 and *in vacuo*, are heated at $80-110^\circ$ for 1-1.5 hrs. in a slow stream of CO_2 ; the loss in wt. they thereby undergo corresponds in each case to the amt.

of hydrocarbon combined with the Ph_2C and unchanged Ph_2C remains in the boat. Only when the heating is carried out at 100° or higher and for a considerable length of time does the distillate contain a small amt. (seldom more than 1%) of a substance which reduces KMnO_4 . Examn. of the tabulated results shows that the formation of additive compds. depends on several factors. The foremost is undoubtedly the temp. at which the compd. dissociates, and the 2nd the relative solubility of Ph_2C in the hydrocarbon in question; the higher the temp. of dissociation of the compd. and the greater the solubility of the Ph_2C , the better are the chances that an additive compd. will sep. on cooling. With decane the additive compd. appears to consist of *monomol.* Ph_2C in combination with the solvent. No explanation based upon the valence hypothesis can satisfactorily account for the formation of these compds. with completely satd. hydrocarbons. XXV. Preparation of *p*-hydroxytriphenylcarbinol and attempts to isolate the corresponding triarylmethyl. M. GOMBERG AND R. L. JICKLING. *Ibid* 2575-91; cf. *C. A.* 7, 3507.—By observing the proper conditions, it is possible to obtain from Ph_2CCl_2 and PhOH almost exclusively 1 of the 3 products, $\text{Ph}_2\text{C}(\text{OPh})_2$, $p\text{-HOC}_6\text{H}_4\text{CPh}_2\text{OH}$ or $(p\text{-HOC}_6\text{H}_4)_2\text{CPh}_2$. Ph_2CCl_2 itself is obtained in 90% yield by adding to 135 g. finely-divided AlCl_3 in 300 cc. CS_2 156 g. C_6H_6 and an equal vol. of CCl_4 in the course of 1 hr., keeping the temp. below 30° , decomp. the next day with *ix.* drying the CCl_4 soln. with CaCl_2 , distg. *in vacuo* and redistg. *in vacuo* with the calcd. amt. of PCl_5 to react with the 5-10% of BzPh in the original distillate. When molten PhOH is slowly added to an equal wt. of Ph_2CCl_2 in about 10 vols. of C_6H_6 at 50° , the HCl being removed, as fast as it is formed, by a current of dry air under a slight vacuum, and the soln. is concd. and treated with petr. ether, $\text{Ph}_2\text{C}(\text{OPh})_2$ seps. in 85% yield in needles, m. 132° after crystn. from alc., unchanged by boiling H_2O or *N* alkali, hydrolyzed by dil. acids, even AcOH , into BzPh and PhOH . When to 3-4 mols. molten PhOH chilled in a flask so as to be evenly distributed over the inner surface is added 1 mol. Ph_2CCl_2 (the mouth of the flask being protected with a CaCl_2 tube) and, after 10 hrs. at $20-3^\circ$ with occasional rotations, the mass is steam distd. to remove the excess of PhOH , digested with 5% alkali, freed from BzPh with Et_2O , filtered, freed from Et_2O with air and treated with NH_4Cl or CO_2 , there is obtained a paste, soon becoming granular, of $\text{HOC}_6\text{H}_4\text{CPh}_2\text{OH}$ and a little $\text{Ph}_2\text{C}(\text{C}_6\text{H}_4\text{OH})_2$; the former is dissolved out by treating the mass with alc. (6 cc. per g.; the filtration may be facilitated by adding a few cc. of concd. sugar soln.); addition of H_2O and a few drops of NH_4OH to the filtrate ppts. the carbinol (90-8% yield) in cryst. form. In the prepn. of $\text{Ph}_2\text{C}(\text{C}_6\text{H}_4\text{OH})_2$ by heating PhOH with Ph_2CCl_2 the use of PhONa in PhOH is without advantage nor is the long heating recommended by Zincke (*C. A.* 3, 786) necessary; 90-5% yields are obtained after several hrs. It seps. from AcOH in flakes or needles, m. 286° . G. and J. believe that, whatever the conditions, the 1st stage in the reaction between Ph_2CCl_2 and PhOH consists in the formation of $\text{Ph}_2\text{C}(\text{OPh})_2$ and HCl , and if the HCl is removed the reaction stops at this point. Otherwise, 1 of the OPh groups undergoes a mol. rearrangement, and the resulting $\text{Ph}_2\text{C}(\text{OPh})\text{C}_6\text{H}_4\text{OH}$ with HCl gives to some extent $\text{Ph}_2\text{CClC}_6\text{H}_4\text{OH}$. If the reaction is allowed to proceed still further, the 2nd OPh group rearranges, giving $\text{Ph}_2\text{C}(\text{C}_6\text{H}_4\text{OH})_2$, and the $\text{Ph}_2\text{CClC}_6\text{H}_4\text{OH}$ always formed in variable but small amt. condenses with PhOH , likewise giving $\text{Ph}_2\text{C}(\text{C}_6\text{H}_4\text{OH})_2$. That the intermediate compds. can react as above has been verified experimentally, and all of them, except the $\text{Ph}_2\text{C}(\text{OPh})\text{C}_6\text{H}_4\text{OH}$, have been isolated. Indirect evidence that this is really an intermediate product is afforded by the fact that an approx. quant. yield of $\text{HOC}_6\text{H}_4\text{CPh}_2\text{OH}$ is obtained only when 2 mols. PhOH per mol. Ph_2CCl_2 are used, whereas if the reaction proceeded according to the simple scheme $\text{Ph}_2\text{CCl}_2 + \text{PhOH} \rightarrow \text{Ph}_2\text{CClC}_6\text{H}_4\text{OH} \rightarrow \text{Ph}_2\text{C}(\text{OH})\text{C}_6\text{H}_4\text{OH}$, 1 mol. PhOH should be sufficient. In attempting to prep. the free radical, $p\text{-HOC}_6\text{H}_4\text{CPh}_2$,

the carbinol chloride cannot be used, for with mol. Ag it splits off HCl instead of Cl, probably because the Cl and OH are combined with the same C atom, there being an

equil. between the 2 tautomeric forms: $\text{Ph}_2\text{CClC}_6\text{H}_4\text{OH} \rightleftharpoons \text{Ph}_2\text{C}:\text{C}_6\text{H}_4\text{:}$  To

protect the HO group, therefore, *p*-carboethoxytriphenylcarbinol, $\text{EtO}_2\text{COC}_6\text{H}_4\text{CPh}_2\text{OH}$, was prepd. from 14 g. $\text{HOC}_6\text{H}_4\text{CPh}_2\text{OH}$ in 55 cc. of *N* NaOH and ice treated with 6 g. ClCO_2Et , needles from C_6H_6 , Et_2O , etc. + petr. ether, m. 119° (yield, quant.); with HCl in C_6H_6 in the presence of CaCl_2 it gives the chloride, m. 98° ; a C_6H_6 soln. of this, protected from the air and treated with mol. Ag, becomes dark cherry-red after several hrs. and on exposure to the air the color disappears; concn. of the filtered soln. yields a small amt. of peroxide, m. 171° , obtained in much better yield by boiling the chloride in C_6H_6 with Ag in a stream of air; attempts to obtain the dihydroxy peroxide by hydrolyzing off the EtO_2CO groups resulted in decompn. into either $\text{EtO}_2\text{COC}_6\text{H}_4\text{CPh}_2\text{OH}$ or $\text{HOC}_6\text{H}_4\text{CPh}_2\text{OH}$, the former being obtained in good yield by warming the peroxide with $\text{AcOH-H}_2\text{SO}_4$ (4:1). Boiling *N* alkali does not attack the peroxide, but NaOEt or KOH or Ba(OH)_2 in MeOH decomp. it into $\text{HOC}_6\text{H}_4\text{CPh}_2\text{OH}$. The colored soln. of the free radical, concd. in CO_2 , yields a colorless residue entirely devoid of unsatd. properties and no longer yielding a peroxide on exposure to the air, either as the solid or in soln. This colorless product is obtained to a greater or lesser extent in the prepn. of the peroxide, especially if the soln. of the free radical is kept for some time previous to the oxidation or if it is heated. It is an amorphous powder m. about 280° , mol. wt. (Menzies method) 680, 664, and is probably a metamer resulting from a transformation of the dimol. form of the free radical. All other attempts to prep. the free radical (by changing the solvent, using Hg or Cu instead of Ag, concg. at very low temps. and pressures, etc.) gave the same result. *p*-Bensoxytriphenylcarbinyl chloride, m. 105° . *p*-Bensoxytriphenylmethyl peroxide, m. 167° (decompn.). The free radical could not be isolated, only the colorless metamer being obtained; it m. $266-9^\circ$, mol. wt. 710. *p*- $\text{AcOC}_6\text{H}_4\text{CPh}_2\text{Cl}$ is best prepd. by heating the carbinol in excess of AcCl until it dissolves. *p*-Acetoxytriphenylmethyl peroxide, m. 172° . Polymer of the free radical, m. $255-70^\circ$ (decompn.). *p*-Carboethoxytriphenylmethyl ether, from 10 g. of the chloride, 30 g. HgO and 50 cc. C_6H_6 shaken 1 month at room temp., m. 219° , hydrolyzed to the carbinol by boiling in AcOH or alc. containing a few drops of H_2SO_4 ; thus far, it has not been possible to remove the EtO_2CO groups only. CHAS. A. ROULLER.

Pyrimidines. LXXVII. The alkylation of 2-mercaptopyrimidines. TREAT B. JOHNSON and ROBERT C. MORAN. *J. Am. Chem. Soc.* 37, 2591-7 (1915); cf. C. A. 9, 1066.—The assumption (drawn from the results obtained by the study of 2-allylmercapto-4-methyl-6-oxypyrimidine) that the more negative the group substituted for a H of the Me in a 2-methylmercaptopyrimidine the less tendency will there be for an alkyl halide to form a 1-*N*-alkyl deriv. and the greater will the amt. of *O*-compd. formed be is confirmed by the work reported in this paper. 1,4-Dimethyl-2-benzoylmethylmercapto-6-oxypyrimidine, obtained in 2.8 g. yield from 5 g. 2-benzoylmethylmercapto-4-methyl-6-oxypyrimidine (a), 0.44 g. Na in 50 cc. alc. and 2.73 g. MeI heated on the H_2O bath until neutral, prisms from alc., m. 155° , hydrolyzed by boiling 1 hr. with concd. HCl to 2,5-diphenyl-1,4-dithiene (b) and 1,4-dimethyluracil. When 2.5 g. EtBr is used instead of MeI, the product is 2-benzoylmercapto-4-methyl-6-ethoxyypyrimidine (c), seps. from AcOEt in flat prisms with 1 mol. solvent of crystn., m. 83.5° , hydrolyzed by HCl to (b) and 4-methyluracil. Under the same conditions, (a), Na in alc. and PhCH_2Cl give (c) and none of the expected PhCH_2 deriv., while in MeOH instead of EtOH is obtained 2-benzoylmethylmercapto-4-methyl-6-methoxyypyrimidine (d), slender needles from AcOEt , m. $143-4^\circ$, hydrolyzed by HCl to (b) and 4-methyluracil, cannot

be converted into (c) by warming with EtOH. J. and M. believe that the PhCH_2 deriv. $\text{CH:CMe.N:C(SCH}_2\text{Bz).N:COCH}_2\text{Ph}$ is 1st formed and with the solvent

(ROH) gives an addition compd., $\text{CH:CMe.N:C(SCH}_2\text{Bz).NH.C(OR)OCH}_2\text{Ph}$,

which then loses PhCH_2OH and yields (c) or (d), according as R is Et or Me. (a) could not be alkylated with $\text{ClCH}_2\text{CO}_2\text{Et}$ in alc. CHAS. A. ROUILLER.

Nitrated proteins. IV. Identification of 3-nitrotyrosine among the products of hydrolysis of nitrated fibroin. TREAR B. JOHNSON. *J. Am. Chem. Soc.* 37, 2598-603 (1915).—Repetition of Inouye's work (*C. A.* 7, 802) has shown that, as stated by him, nitrotyrosine is formed by hydrolysis of nitrated fibroin; the compd. is partly pptd. by phosphotungstic acid, the filtrate containing more of the same acid; it is identical with J. and Kohmann's 4,3- $\text{HO(O}_2\text{N)C}_6\text{H}_3\text{CH}_2\text{CH(NH}_2\text{)CO}_2\text{H}$ (*C. A.* 9, 2657), the structure of which was further established by treating it with NH_4SCN in the presence of Ac_2O and hydrolyzing the resulting product with HCl, giving 2-thio-4-[3-nitro-4-hydroxybenzyl]hydantoin. CHAS. A. ROUILLER.

Change of ammonium isethionate by heating. K. MIYAKE. *J. Am. Chem. Soc.* 37, 2604 (1915).—M. has repeatedly attempted, without success, to obtain taurine by heating $\text{HOCH}_2\text{CH}_2\text{SO}_3\text{NH}_4$ at 220° (Strecker, *Ann.* 91, 97 (1854)), and he concludes that the reaction follows the course reported by Carl (formation of $\text{HOCH}_2\text{CH}_2\text{SO}_3\text{CH}_2\text{CH}_2\text{SO}_3\text{NH}_4$; *Ber.* 12, 1604 (1879)), not that given by S. C. A. R.

Phenyl esters of oxalic acid. ROGER ADAMS AND H. GILMAN. *J. Am. Chem. Soc.* 37, 2716-20 (1915).—Any type of substituted Ph ester of $(\text{CO}_2\text{H})_2$ can be obtained in practically quant. yield by slowly adding 5 g. $(\text{COCl})_2$ to 25 cc. of ice-cold $\text{C}_6\text{H}_5\text{N}$, carefully crushing the resulting yellow lumps, gradually adding 2 mols. of the phenol in a little $\text{C}_6\text{H}_5\text{N}$, allowing to stand 2 hrs. or more at 0° , pouring into concd. HCl and ice, filtering, washing with H_2O , and (unless polyphenols or HO acids have been used) removing any unchanged phenol remaining with cold dil. NaOH. In this way were prepd. the di-*p*-cresyl, - α - and - β -naphthyl and -guaiacyl esters (Bischoff, *Ber.* 35, 3443 (1902)) and the following new esters: *Di-o-nitrophenyl*, flat yellow needles from C_6H_6 , m. 185° . *Di-o-aldehydophenyl*, plates from C_6H_6 , m. $153-4^\circ$. *Divanillin*, m. $203-4^\circ$. *Di- β -acetyl- α -naphthyl*, leaves from C_6H_6 , m. 197° . *Di-o-carbomethoxyphenyl*, needles from C_6H_6 , m. 158° . *Di-p-hydroxyphenyl*, white powder, begins to shrink 192° , m. 212° , sol. in dil. NaOH with yellow color. When the reaction between $(\text{COCl})_2$, $\text{C}_6\text{H}_5\text{N}$ and *o*- $\text{HOC}_6\text{H}_4\text{CHO}$ was carried out at the boiling temp. of the $\text{C}_6\text{H}_5\text{N}$, the product was $\text{O(C}_6\text{H}_4\text{CHO})_2$ instead of the above ester. *o*- $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$ gave a white solid containing N, undoubtedly the $\text{C}_6\text{H}_5\text{N}$ salt of the ester which had not been decompd. by the concd. HCl; hot HCl or NaOH set free the $\text{C}_6\text{H}_4\text{N}$ but also hydrolyzed the ester. If the *p*- $\text{C}_6\text{H}_4(\text{OH})_2$ is added to the $(\text{COCl})_2$ and $\text{C}_6\text{H}_5\text{N}$ at room temp. and the mixt. is allowed to warm up from the heat of reaction, several products are formed; one of these, by treatment with glacial AcOH, is obtained in white needles, m. 226° , having a comp. agreeing well with that calcd. for *di-p-hydroxyphenyl ether monoacetate* (found, 68.9% C, 4.7% H). CHAS. A. ROUILLER.

Monoacetyltrichlorotertiarybutyl alcohol (acetylchloreton). T. B. ALDRICH. J. Am. Chem. Soc. 37, 2720-3 (1915).—*Trichlorotertiarybutyl acetate* (a), $\text{CCl}_3\text{CMe}_2\text{OAc}$, obtained from chloreton (b) boiled 2 hrs. with 2 parts Ac_2O and 1 part NaOAc, cooled, neutralized with Na_2CO_3 , distd. with steam, heated 20 min. on the H_2O bath with 10% NaOH to decomp. unchanged (b) and extd. with Et_2O , b_m , $151-2^\circ$; 3 cc. heated 3 hrs. at 160° with 10 cc. H_2O is apparently unchanged; 3 more hrs. heating at 250° produces complete decompn. (partial carbonization, acid reaction, formation of a ppt., sol. in NH_4OH , with AgNO_3 , no evidence of (b)); 8 hrs. heating at 160° of 2 cc. of (a) with

25 cc. H_2O gives 0.5 cc. of a reddish brown oil and a slightly yellow, acid supernatant liquid giving with $AgNO_3$ a voluminous ppt. sol. in NH_4OH ; long boiling of (a) with H_2O (108 hrs.) gives some crystals of (b); considerable of this is obtained after 7 hrs. boiling with H_2O containing H_2SO_4 , and a large amt. after boiling a few min. with concd. HNO_3 . The solubilities of (a) are practically the same as those of (b), it being even less sol. in H_2O ; it is less volatile than (b); it has anesthetic properties similar to those of (b), but, being so slightly sol., its effect does not appear for several hrs. It has a more agreeable odor than (b); its toxicity, when injected subcutaneously into guinea pigs, is slightly less than that of (b).

CHAS. A. ROULLER.

Synthesis of certain substituted syringic acids. MARSTON T. BOGERT AND EDWARD PLAUT. *J. Am. Chem. Soc.* 37, 2723-33(1915); cf. *C. A.* 8, 3789.—(The m. ps. given below are corr.) B. and P. have been able to cryst. Hamburg's oily Me bromotrimethylgallate (*Monatsh.* 19, 596(1898)) from Et_2O in prisms, m. 90° ; the bromination is best effected by gradually treating 10 g. of the $(MeO)_3C_6H_2CO_2Me$ (a) in 60 g. cold Ac_2O with 13 g. Br in 60 cc. Ac_2O and allowing to stand 24 hrs. $O_2N(MeO)_3C_6HCO_2Me$, obtained in 80% yield from 30 g. (a) in 120 cc. cold Ac_2O slowly treated with 20 cc. concd. and 1 cc. fuming HNO_3 , pale yellow prisms from ligroin, m. 67.8° . *Ethyl syringate*, obtained in 85% yield from the acid and alc. HCl, m. 55.8° . *Isoamyl ester*, needles from $EtOH$, m. 101° . *Methyl acetylsyringate*, in 95% yield from 5 g. Me syringate (b) allowed to stand 24 hrs. in 15 g. Ac_2O , m. 129° . Me bromosyringate (Graebe and Martz, *Ber.* 36, 216, 1031(1903)) can be smoothly obtained from 10 g. (b) in 100 cc. Ac_2O at 0° slowly treated with 12 g. Br in 60 cc. Ac_2O and allowed to stand overnight. *3,4-Dinitropyrogallol 2,6-dimethyl ether*, pale yellow, m. 154° , sol. in alkalis, is the main product of the reaction of concd. HNO_3 on syringic acid in cold $AcOH$. *Methyl nitrosyringate*, obtained in 75-80% yield from 18 g. (b) in 100 cc. of Ac_2O slowly treated below 0° with 18 cc. concd. HNO_3 containing a little fuming acid, or in 30% yield from $O_2N(MeO)_3C_6HCO_2Me$ heated with 48% HBr, pale yellow, m. 68.3° . *Ethyl ester*, silky needles from ligroin, m. 74° . *Methyl aminosyringate*, m. 110° , is obtained in 65% yield as its hydrochloride (c), needles, m. 192° , by reducing 10 g. of the NO_2 ester, moistened with alc., with 15 g. Sn and 50 cc. of 33% HCl, first at 0° and finally at 100° and decomp. the resulting double salt with H_2S in HCl. *Diacetyl derivative*, obtained in 4.7 g. yield from 3 g. of the NH_2 ester warmed with 15 cc. of Ac_2O and 0.5 g. NaOAc, allowed to stand overnight and warmed a few min. with 100 cc. H_2O , m. 139.9° . *2,4-Dihydroxy-3,5-dimethoxybenzoic acid*, obtained in 80% yield from 5 g. of (c) in 10 g. concd. H_2SO_4 and 50 cc. H_2O diazotized with 10 g. $NaNO_2$ in 50 cc. H_2O and then heated 2 hrs. at 100° , pale yellow, m. 165° (decompn.), gives a brown color with $FeCl_3$; heated for 40 min., finally to 220° , it evolves gas and becomes purplish; if this is recrystd. from alc., shaken with NaOH and Me_2SO_4 , boiled for a short time, acidified, filtered and the ppt. crystd. from alc., there are obtained needles, m. 89° (cf. Boëris, *Ber.* 29, 1808(1896)). *Diacetyl derivative*, from 10 g. of the di-HO acid boiled a short time with 30 cc. Ac_2O and 0.5 g. NaOAc, decomp. 162° .

CHAS. A. ROULLER.

Preparation of melibiose. C. S. HUDSON AND T. S. HARDING. *J. Am. Chem. Soc.* 37, 2734-6(1915).—Melibiose has uniformly been obtained in 175-200 g. yield from 500 g. pure raffinose (*C. A.* 8, 3777) in about 10% aq. soln. (60° Ventzke in a 2 dcm. tube) treated with 10 g. of baker's yeast, 1-2 drops of $AcOH$ and 1 g. malt sprouts and allowed to stand at room temp. until fermentation is complete (36-48 hrs.) when the rotation is $46.8^\circ V$; the soln. is then cleared with a slight excess of basic Pb acetate, filtered through asbestos, treated with H_2S , then with 30-40 g. of active decolorizing carbon (such as "Eponit" or "Norit"), again filtered, the excess of H_2S removed with air, the soln. distd. *in vacuo* to a syrup with about 20-5% H_2O , 95% alc. added just below the point of pptn. of a syrupy phase and a few crystals of melibiose stirred in;

after 4 days the syrup crystals to a solid mass which is ground at room temp. with 75% alc., filtered, washed with 75 and then 95% alc. and dried in a desiccator. C. A. R.

A second crystalline *d*-fructose pentaacetate (α -*d*-fructose pentaacetate). C. S. HUDSON AND D. H. BRAUNS. *J. Am. Chem. Soc.* 37, 2736-45 (1915); cf. C. A. 9, 1771. —Fructose tetraacetate (a) is easily and cheaply obtained, in 70 g. yield, from 100 g. of very pure, finely powdered *d*-fructose added with stirring to 9 g. ZnCl_2 in 500 cc. Ac_2O at 0° , stirred 0.5 hr. each at 0° , 10° and room temp., dild. with an equal amt. of cold H_2O , the stirring continued 2 hrs. with cooling to convert the Ac_2O into AcOH , the soln. neutralized with NaHCO_3 , filtered, the ppt. and filtrate extd. with CHCl_3 , the exts. dried with CaCl_2 , concd. *in vacuo* to 30-50 cc., then concd. to crystal. in a flat dish in a current of air, with occasional additions of Et_2O and the product recrystd. by spontaneous evapn. of its $\text{EtOH-Et}_2\text{O}$ soln. (a) can also be obtained in 19-20% yield from 30 g. *d*-fructose added to 100 g. cold Ac_2O and 51 g. HBr gas. From 40 g. (a) in 600 cc. Ac_2O treated with 2 g. ZnCl_2 in small pieces and allowed to stand 24 hrs. at room temp. until the rotation changed from the initial value -85.6° to the const. value 95° , then worked up as above, is obtained 36 g. of α -*d*-fructose pentaacetate (b), different from the β -form (c), m. 108° , $[\alpha]_D^{20} -120.9^\circ$, obtained from *d*-fructose, Ac_2O and H_2SO_4 ; $z \approx 70^\circ$, crystals much less readily than (c), mol. wt. 389-410 in freezing C_6H_6 , $[\alpha]_D^{20} 34.3^\circ$ in CHCl_3 . The mother liquors from the 1st recrystns. of (b) yielded crystals m. 55.6° , $[\alpha] -19^\circ$, giving on sapon. values agreeing for a pentaacetate; they were probably a mixt. of (b) and (c). The reaction of the ZnCl_2 and Ac_2O on (a) was stopped at various points before completion to det. whether any intermediate product, possibly the hypothetical α -tetraacetate, is formed, but no evidence of such an intermediate product was obtained. (b) can be obtained directly from fructose, ZnCl_2 and Ac_2O but the yield is not so good as when (a) is the starting point (8 g. crystal. (b) from 50 g. fructose). (b) is also obtained in 1 g. yield from 10 g. fructose added to 67 cc. $\text{C}_6\text{H}_5\text{N}$ and 50 cc. Ac_2O at 0° , stirred 3 hrs. and kept 2 days in the ice chest. That (b) and (c) have the same ring formation is shown by the fact that (c) is obtained in 17 g. yield from 20 g. (a) stirred 45 min. with 120 cc. cold Ac_2O and 5 cc. concd. H_2SO_4 . No equil. can be established between (b) and (c) by the usual method of heating with ZnCl_2 in Ac_2O , nor by heating with $\text{Ac}_2\text{O-H}_2\text{SO}_4$ or boiling with Ac_2O . The same is true of (a); it does not show mutarotation in abs. or 50% alc.; addition of a few drops of AcOH to the alc. soln., raising the temp. from $3-4^\circ$ to 20° or heating with ZnCl_2 in AcOH produces no change in rotation. When 7 g. (c) in 8 cc. AcOH is made up to 25 cc. with AcOH satd. with HBr , the rotation changes from -121.7° to 45.7° , 53.6° , 59.2° , 60.5° , 60.0° , in 20, 30, 45, 65, 85 min., resp.; on shaking the product with ice H_2O and working it up as above, 3.5 g. (a) were obtained; bromotetraacetylfructose is undoubtedly formed in the reaction but cannot be isolated on account of the ease with which it is decompd. by H_2O . When (b) is similarly treated, there is no change in rotation and after 5 min. on the H_2O bath (which changes the rotation from 26.6° to 23.9° and makes the soln. turn dark yellow) treatment with H_2O , etc., yields back about 0.5 of the original (a).

CHAS. A. ROULLER.

Bromoacetylxylose and β -triacetylmethylxyloside. J. K. DALE. *J. Am. Chem. Soc.* 37, 2745-7 (1915).—The following method of prepg. bromoacetylxylose (a) has also given the corresponding lactose, maltose and glucose derivs. in 55-70% yields; mannose and galactose do not give crystal. compds. When 25 g. xylose is treated with 150 cc. of Ac_2O satd. with HBr , violent reaction takes place; the resulting straw-colored syrup, after cooling, is mixed with 300 cc. CHCl_3 , shaken with ice H_2O , NaHCO_3 , and again 3-4 times with H_2O , the CHCl_3 dried with CaCl_2 , evapd. *in vacuo* at 50° to a thick syrup, and the product recrystd. twice from Et_2O ; the (a) so obtained can be kept several hrs. without appreciable decompn.; it m. 102° , $[\alpha]_D^{20} 212.2^\circ$ in CHCl_3 ; treated

in 10 parts MeOH with AgNO₃ in 80% MeOH until the AgBr is completely pptd., filtered, treated with H₂S, shaken with NaCO₃, filtered, evapd. to a thick syrup *in vacuo* on the H₂O bath and crystd. from a little H₂O, it gives β -triacetylmethylxyloside, m. 115°, $[\alpha]_D^{20}$ -60.8° in CHCl₃, converted by shaking 2 hrs. with 0.1 N NaOH into β -methylxyloside (yield, 0.13 g. from 0.4575 g. of the Ac compd.). From 4 g. (a) in 75 cc. AcOH shaken a few min. with 5 g. of AgOAc is obtained β -tetraacetylxylose.

CHAS. A. ROULLER.

The isomeric tetracetates of xylose, and observations regarding the acetates of melibiose, trehalose and sucrose. C. S. HUDSON AND J. M. JOHNSON. *J. Am. Chem. Soc.* 37, 2748-53(1915).—When β -xylose tetracetate (a), m. 128°, $[\alpha]_D^{20}$ -24.7°, -22.3°, -7.3° in CHCl₃, C₆H₆, 99.5% AcOH, resp. (cf. Stone, *Am. Chem. J.* 15, 653 (1893); Bader, *Chem. Ztg.* 19, 55(1895)), is heated in Ac₂O containing a little ZnCl₂, the rotation changes from -23.3° to a const. value 71.8° in 4 min. or less; on pouring into H₂O the insol. syrup soon partially crysts.; the mass is thinned with alc. and the crystals (original (b)) are sepd.; the mother liquor on cooling with ice deposits flaky crystals melting somewhat below room temp. and which are apparently an unstable alcoholate of the α -xylose tetracetate (b); when dissolved in alc. at room temp., the soln. spontaneously deposits the solvent-free (b), the same change being effected when the crystals stand several days in alc. near 0°. (b), which is obtained in 50% yield, m. 59°, mol. wt. in freezing C₆H₆, 303-29, $[\alpha]_D^{20}$ 89.3°, 79.3°, 95.3° in CHCl₃, C₆H₆, 99.5% AcOH, resp. The difference in the mol. rotations of (a) and (b) in CHCl₃ is about the same (36,300) as for the α - and β -glucose pentaacetates (38,100) but in C₆H₆ and AcOH the conclusion does not hold at all well (32,500 and 32,700 for the xyloses, 36,700 and 40,800 for the glucoses; cf. C. A. 9, 1620). From 20 g. α -xylose treated at 0° with occasional stirring for 50 hrs. with 100 cc. each of Ac₂O and com. C₆H₅N bases are obtained (a) and about 9 g. of (b), probably owing to a partial transformation of the α -xylose into the β -form before the acetylation. Acetochloroxylose (cf. Ryan and Ebrill, *Proc. Roy. Dublin Soc.* 11, 249(1905-8)), obtained in 7.8 g. yield from 10 g. xylose boiled until dissolved with AcCl and a trace of ZnCl₂, m. 95-7°, $[\alpha]_D^{20}$ 165° in CHCl₃; 5 g. in 125 cc. AcOH, shaken with AgOAc until the supernatant liquid gave no test for Cl, yielded 3 g. of (a), m. 125°, $[\alpha]$ -25°. Both (a) and (b), treated at room temp. with AcOH satd. with HBr, yield acetobromoxylose (cf. preceding abstr.). β -Melibiose octaacetate, m. 177.5°, $[\alpha]$ 102.5° in CHCl₃, 101.9° in 99.5% AcOH, when heated 35 min. in Ac₂O and a little ZnCl₂ changes in rotation from 107.0° to 147.3°, and on pouring into H₂O and treating the insol. syrup with alc. there is obtained a thick syrup which after some weeks deposits a few crystals; not enough have been secured yet for measurements. Trehalose octaacetate, obtained in 60% yield from the sugar, Ac₂O and NaOAc and in 72% yield with Ac₂O and ZnCl₂, m. 96-8°, $[\alpha]_D^{20}$ 162.3° in CHCl₃; heating repeatedly to 100° in Ac₂O-ZnCl₂ does not change the rotation. The same is true of sucrose octaacetate, m. 69°, $[\alpha]_D^{20}$ 59.6° in CHCl₃.

CHAS. A. ROULLER.

Condensation of aldehyde diacetates and of phenylhydrazones with 2-thiohydantoin. BEN H. NICOLLET. *J. Am. Chem. Soc.* 37, 2753-6(1915).—Since, in the prepn. of substituted phenylalanines, starting from aldehydes and 2-thiohydantoin (a), the required aldehydes can sometimes not easily be bought or obtained pure, it seemed desirable to det. whether derivs. of the aldehydes might not be substituted for the free aldehydes themselves. It seems that the diacetates and phenylhydrazones react equally as well as the free aldehydes. Thus, 2-thio-4-benzalhydantoin is obtained in 61.3% yield from 1.7 g. (a), 3.5 g. PhCH(OAc)₂ and 5 g. NaOAc boiled 2 hrs. in 20 g. AcOH, while with 2.5 g. PhCH:NNHPh instead of PhCH(OAc)₂ the yield is 54%. From (a) boiled 2 hrs. with a slight excess of MeCH:NNHPh in AcOH and NaOAc

is obtained *2-thio-4-ethylidenekydantoin*, yellow-brown cryst. powder, m. around 253° .

CHAS. A. ROUVILLER.

Isopulegolphosphonic acid. FRANCIS D. DODGE. *J. Am. Chem. Soc.* 37, 2756-61 (1915); cf. *Am. Chem. J.* 12, 553 (1890).—The "citronellal phosphoric acid" (a), $C_{10}H_{18}O_4P$, obtained by the action of P_2O_5 on citronellal, is a strong monobasic acid, m. $181-2^{\circ}$, sepg. from alc. in plates of the monosymmetric system, $a:b:c = 1.9828:1:1.9745$, $\beta 57^{\circ}50'$, (001) ∞P , (100) $\infty \bar{P}\infty$, (011) ∞P . *Potassium salt*, plates with 3 H_2O ; no di-K salt could be obtained. *Sodium salt*, plates. The alkali salts are remarkably stable; long boiling in H_2O produces no decompn. *Magnesium and calcium salts*. *Silver salt*, curdy ppt. soon becoming cryst. The Na salt, heated cautiously until white fumes appear, cooled, treated with a little H_2O , distd. to dryness, again heated to fuming, etc., until no more oil is obtained, gives $NaPO_3$ and what is most probably isopulegol (b). (a) is not hydrolyzed by hot alc. KOH or dil. H_2SO_4 and must therefore be regarded as a phosphonic acid, $RPO(OH)_2$, although normal phosphonic acids are dibasic. The ready formation of (b) would indicate the presence of a secondary OH group in (a), but (a) is unchanged by boiling Al_2O_3 , CrO_3 or cold dil. $KMnO_4$, so that the presence of an OH group (except possibly tertiary) is improbable. Neither could any ketone reactions be obtained. Contrary to (b), (a) reacts as a satd. compd.; the Na salt does not decolorize Br H_2O in the cold; on heating there is slow reaction and some unchanged (a) crystals out. The change from an open-chain aldehyde to a cyclic secondary alc., however, seems to be peculiar to citronellal and the fact might probably be taken advantage of to detect citronellal in oils in the presence of other aldehydes. Applying the P_2O_5 reaction to natural lemon oil and the com. concd. oil, no evidence of the formation of (a) was obtained, so that the conclusion seems warranted that the citronellal content of lemon oil is quant. insignificant.

CHAS. A. ROUVILLER.

2-Phenylquinoline-4-carboxylic acid (atophan) and its oxidation products. RUDOLF BOEHM AND KONRAD BOURNOT. Univ. Leipzig. *Ber.* 48, 1570-4 (1915).—The pure atophan (a), needles from MeOH, m. $212-3^{\circ}$, is sol. in 20, 25, 35 and 250 parts of boiling EtOH, MeOH, Me_2CO and C_6H_6 , resp. The alkali salts are colorless and cryst.; the Na salt is little sol. in 15% NaOH, the acid dissolving in NaOH of that concn. but solidifying in a few sec. to a thick magma of fine needles. A mixt. of hot solns. of 10 g. (a), 20 cc. of 15% KOH and 39 g. $KMnO_4$ in 800 parts of H_2O is heated to boiling and steam distd.; when the oxidation is complete (30-40 min.) the soln. is cooled, filtered from the MnO_2 , made faintly acid with dil. H_2SO_4 , evapd. to incipient crystn. of K_2SO_4 , drained, treated with dil. H_2SO_4 as long as a white ppt. (b) is formed, boiled up once with alc., crystd. twice from the least possible amt. of boiling H_2O , decompd. with hot HCl and extd. with Et_2O ; this gives 6.5 g. of α -phenylpyridine- α',β',γ -tricarboxylic acid, sepg. on long standing of a hot supersatd. soln. in air-tight vessels in prisms with 1 H_2O , decomp. $183-5^{\circ}$ (loss of CO_2), m. 239° , sublimes partially undecompd. at higher temps., gives a red color in H_2O with $FeSO_4$. The neutral *potassium* and *sodium*, the *calcium* and *cadmium* salts are sol. in H_2O , the *barium* and *silver* salts almost insol. *Acid potassium salt*, $C_{14}H_7O_4N.C_{14}H_7O_4NK.3.5H_2O$, forms the ppt. (b) above; it can also be obtained by treating 1 g. of the acid in 30 g. H_2O with 0.3285 g. $KHCO_3$ in 10 g. H_2O , sepg. at once in gleaming crystals and, on recrystn. from boiling H_2O , in very slender tables and prisms. α -Phenylpyridine- β',γ -dicarboxylic acid, obtained in 33% yield from the tri- CO_2H acid boiled 5 hrs. with 20 parts AcOH containing 10% of Ac_2O , somewhat yellowish silky needles and whetstone-shaped prisms from boiling H_2O , gives no color with aq. $FeSO_4$, forms easily sol. alkali and alk. earth salts and difficultly sol. cryst. Ca, Cd and *silver* salts. *Acid potassium salt*, $C_{14}H_7O_4N.C_{14}H_7O_4NK$, obtained by shaking the finely powdered acid and the calcd. amt. of $^{100}CO_2$ 1 hr. in 50 parts H_2O , warming gently until soln. is complete and allowing to

stand over H_2SO_4 , needles, decomp. 279° (loss of CO_2). *Dimethyl ester*, from the acid in MeOH treated 6 hrs. with HCl, evapd. *in vacuo*, dissolved in CHCl_3 , shaken with Na_2CO_3 , then with ignited Na_2SO_4 , platelets, m. 74° . The steam distn. during the oxidation of (a) and extrn. of the MnO_2 with Et_2O yields 1 g. of $\text{PhC:N.C}_6\text{H}_4\text{O}$ (Laden-

burg, Ber. 9, 1526(1876)), needles and tables from alc., m. 103° .

C. A. R.

Aromatic-chain-shaped aliphatic indigoid dyes. W. HERZOG AND AD. JOLLES. Vienna. Ber. 48, 1574-8(1915).—*2-Thionaphthene-3-pentanonindigo* (a), $\text{CO.C}_6\text{H}_4\text{S.C:}$ -

C_6Ac , obtained in 1.5 g. yield from 2.39 g. thionaphthenequinonanilide and 1 g. CH_3Ac , heated a short time in about 10 g. Ac_2O under a reflux condenser, reddish yellow, silky, felted needles from ligroin or MeOH, m. $142-3^\circ$, sol. in cold concd. and fuming H_2SO_4 with blue-violet color and repptd. by H_2O in flocks, sol. in hot fuming acid with dirty green color and formation of a sol. SO_3H acid, only slightly sol. in soda and dil. NaOH in the cold, but sol. on addition of hyposulfite and gentle warming with formation of the light yellow leuco compd. *2-Indole-3-pentanonindigo* (b), similarly obtained in 62% yield from α -isatinanilide and CH_3Ac , cinnabar-red needles from AmOH or AmOAc, m. about 200° (decompn.), sublimes with partial decompn. and formation of yellow-red fumes, sol. in concd. and fuming H_2SO_4 with deep wine-red color changing to dirty green on warming, only slightly sol. in cold dil. alkalis and in soda and decompd. by warming with somewhat more concd. alkalis, gives an orange-yellow hyposulfite vat. A very dil. CHCl_3 soln. of (a) shows absorption beginning at $507\mu\mu$, increasing to $485\mu\mu$ and continuing const. towards the violet; in a 0.2% soln. absorption begins at $540\mu\mu$ and from $528\mu\mu$ all light is absorbed. In a very dil. soln. of (b), absorption begins at $541.9\mu\mu$ with a max. at $478\mu\mu$ and weaker absorption up to about $442\mu\mu$; in 0.2% soln., the absorption begins at $583\mu\mu$ and is complete from $571.5\mu\mu$ on. *2-Indolebenzoylpropanindigo*, from α -isatinanilide and AcCH_2Bz , fiery red needles from alc., m. $180-1^\circ$, sol. in concd. and fuming H_2SO_4 with dirty violet color changing, even in the cold, to a blue-green, H_2O pptg. a SO_3H acid as a brown powder; heating changes the H_2SO_4 soln. to violet; the dye forms a yellow brown hyposulfite vat. C. A. R.

m-Aminophenylarsonic acids and their reduction products. HUGO BAUER. Georg-Speyer-Haus, Frankfurt a/M. Ber. 48, 1579-83(1915); cf. C. A. 9, 1778.—Heating free $m\text{-H}_2\text{NC}_6\text{H}_4\text{OH}$ on the H_2O bath with H_2AsO_4 results in oxidation and formation of dark substances from which no arsonic acid could be obtained. With the Ac deriv., the Ac group is at once split off. When, however, 90 g. *carbethoxy-m-aminophenol*, m. 97° , which is obtained in 85 g. yield from 109 g. $\text{H}_2\text{NC}_6\text{H}_4\text{OH}$ in 750 cc. hot AcOEt treated with 60 cc. ClCO_2Et , is heated 1 week on the H_2O bath with 100 g. of H_2AsO_4 (75°Bé.), the resulting solid rubbed with H_2O and washed free from H_2AsO_4 , dissolved in NH_4OH , satd. with NH_3 gas, the NH_4 salt dissolved in H_2O and treated with acid, there is obtained *2-hydroxy-4-[carbethoxyamino]phenylarsonic acid* (a), $\text{HO}(\text{EtO}_2\text{CNH})\text{-C}_6\text{H}_3\text{AsO}_3\text{H}_2$, decomp. 213° ; 15 g. boiled 2 hrs. with 30 cc. of 10 N NaOH and 60 cc. of H_2O and then treated with 150 cc. of 2 N H_2SO_4 gives 9 g. of the *4-amino acid*, m. 173° ; 4.66 g. of this in 20 cc. of HCl (d. 1.19) dropped into 10 g. SnCl_2 , 10 cc. HCl (d. 1.19), 20 cc. AcOH and 1 cc. HI (d. 1.7) at -5° , filtered in CO_2 , and washed with AcOH and Et_2O , yields 3.9 g. of *2,2'-dihydroxy-4,4'-diaminoarsenobenzene hydrochloride* (b), light yellow ppt.; its *dicarboxy derivative*, light yellow ppt., sol. in NaOH with yellow color, is obtained from 3 g. (a) in 15 cc. MeOH stirred 0.5 hr. with 50 cc. H_3PO_4 and 1 g. KI. *2-Hydroxy-4-nitrophenylarsonic acid* is obtained in 72 g. yield from 77 g. $3,6\text{-O}_2\text{N}(\text{H}_2\text{N})\text{-C}_6\text{H}_3\text{OH}$ in 170 cc. HCl (d. 1.12) and 350 cc. H_2O in ice diazotized with 36 g. NaNO_2 , stirred with an aq. soln. of 65 g. Na_3AsO_3 , made alk. with 2 N NaOH, then acid with HCl, filtered, made alk. with NH_3 , heated to boiling with magnesia mixt., the resulting

yellow Mg salt filtered, rubbed up with H_2O , dissolved in HCl and rubbed; it begins to soften 212° , and decomp. about 250° ; when 6.6 g. is boiled 2 hrs. with 40 g. Fe filings, 40 cc. H_2O and 1.6 cc. AcOH, made alk. with NaOH, filtered, the residue extd. several times with boiling alk. H_2O , the filtrates stirred up with 15 cc. $ClCO_2Et$, made acid with HCl, treated with NH_3 and magnesia mixt., heated to boiling, the Mg salt filtered off, dissolved in a little dil. HCl and pptd. by further addition of HCl, (a) is obtained, thus proving that it has the structure given above. (b) has considerably less therapeutic value than its isomer, salvarsan.

CHAS. A. ROUILLER.

3-Methylcoumarin. H. SIMONIS. Berlin. *Ber.* 48, 1583-5 (1915).—Although, in agreement with v. Pechmann (*Ber.* 17, 929 (1884)), no weighable amt. of coumarin was obtained from PhOH, malic acid and *concd.* H_2SO_4 , 1 g. can be obtained from 23 g. PhOH, 37 g. malic acid and 100 g. of 73% H_2SO_4 (cf. *C. A.* 2, 1703); the H_2SO_4 can also be dild. with alc. instead of H_2O . Similarly, when 16 g. α -methylmalic acid in 10-5 g. cold alc. are treated drop by drop with 20-5 g. cold H_2SO_4 , allowed to stand 24 hrs., poured into ice H_2O and extd. with Et_2O , there is obtained 3-methylcoumarin; yield, 1.5 g. from 80 g. of the malic acid.

CHAS. A. ROUILLER.

Chief constituent of Japanese lac. V. Constitution of hydrourushiol. RIKO MAJIMA. *Ber.* 48, 1593-7 (1915); cf. *C. A.* 8, 933.—Brief summary of the exptl. evidence given in the 3 following abstrs., whereby it is shown that hydrourushiol is 1-pentadecyl-2,3-dihydroxybenzene, instead of the 3,4-(HO) $_2$ compd. as previously supposed; the latter is now designated isohydrourushiol by M.

CHAS. A. ROUILLER.

Isohydrourushiol and its lower homolog. RIKO MAJIMA AND IKUYA NAKAMURA. *Ber.* 48, 1597-603 (1915); cf. preceding abstr.—Inasmuch as the 3 compds. 3,4-(MeO) $_2$ - C_6H_3R ($R = C_{14}H_{29}$, $C_{15}H_{31}$ and $C_{16}H_{33}$) previously synthesized proved not to be identical with hydrourushiol di-Me ether, they and the corresponding phenols have again been made by different methods. *Isohydrourushiol* (a), 3,4-(HO) $_2$ - $C_6H_3(CH_2)_{14}Me$, and its lower homolog melt much higher than hydrourushiol (b), and the former give a permanent green color with alc. $FeCl_3$ while (b) becomes only temporarily green, then soon blackens and gradually deposits a black ppt. With alc. alkali, (a) becomes blue, then red, and its di-Me ether on nitration yields only a mono- NO_2 deriv., while (b) with alc. alkali becomes green, then red and finally brownish red, and its ether gives a mono- and a di- NO_2 deriv. (a) is prepd. by heating 8 g. each of *o*- $C_6H_4(OH)_2$ and $Me(CH_2)_{11}CO_2H$ and 20 g. $SnCl_4$ 2 hrs. on the H_2O bath, cooling, treating with HCl, washing the ppt. with H_2O , drying, washing with petr. ether, crystg. the ketone, m. 100° , from xylene (yield, 4.6 g.), and reducing the latter by Clemmensen's method (2.5 g. ketone heated 10 hrs. on the sand bath with 35 g. amalgamated Zn, 1 part *concd.* HCl and 2 parts H_2O ; yield, nearly quant.); it seps. from xylene in leaflets, m. 91° , and gives palmitic acid with $KMnO_4$ in Me_2CO . The di-Me ether (c), long flat leaflets from alc., m. $50-1^\circ$, is obtained by reduction with Zn-Hg of the ketone $(MeO)_2C_6H_3(CH_2)_{14}CO-(CH_2)_{11}Me$, m. $62-2.5^\circ$, which in turn is prepd. by reduction in Et_2O with Pt black and H of the compound $(MeO)_2C_6H_3CH:CHCO(CH_2)_{11}Me$, yellowish flat prisms from alc., m. $67-8^\circ$, obtained in 2.3 g. yield from 2 g. each of methylvanillin and $Me(CH_2)_{11}Ac$ and 2 cc. of 10% NaOH allowed to stand 2 weeks in 100 cc. alc. When (c) is heated 2 hrs. at $180-90^\circ$ with 5 parts of HBr (d. 1.78), extd. with Et_2O , washed with H_2O , the Et_2O evapd., the residue dissolved in alc. and treated with alc. $Pb(OAc)_2$, the well-washed ppt. decompd. with H_2SO_4 and the product distd. under 0.5 mm. and crystd. from xylene, (a) is obtained. (c) in 20 parts AcOH warmed a short time with 6 parts of HNO_3 (d. 1.52) dild. with AcOH gives a *mononitro derivative*, $C_{22}H_{41}O_4N$, yellowish needles, m. $70-1^\circ$, cannot be converted into a di- NO_2 compd. 3,4-Dihydroxy-1-tetradecylbenzene (d), m. 84° , gives $Me(CH_2)_{11}CO_2H$ with $KMnO_4$ in Me_2CO , is obtained by heating *o*- $C_6H_4(OH)_2$ and myristic acid with $SnCl_4$ on the H_2O bath and reducing

with Zn-Hg the resulting ketone, m. 103° . The compound $(\text{MeO})_2\text{C}_6\text{H}_4\text{CH}:\text{CHCO}-(\text{CH}_2)_{10}\text{Me}$, m. $67-7.5^{\circ}$, from methylvanillin, $\text{Me}(\text{CH}_2)_{10}\text{Ac}$ and NaOH in alc., is reduced by Pt and H to the satd. ketone, m. $54-6^{\circ}$, which in turn with Zn-Hg gives the di-Me ether, m. $47-8^{\circ}$, of (d); this ether could not be converted into a labile form, m. $37-8.5^{\circ}$, as claimed by Johnson and Kohmann (*C. A.* 8, 3794); with HBr it regenerates (d) while with HNO_3 is obtained a mononitro derivative, m. $67-7.5^{\circ}$. The Me undecyl and dodecyl ketones used in the above syntheses were obtained by dry distn. of mixts. of $\text{Ba}(\text{OAc})_2$ with Ba laurate and tridecanate, resp.; a part of the latter ketone was also made as follows: Ethyl undecylacetate, b₁ $145-50^{\circ}$, is obtained in 8.7 g. yield from 8.6 g. $\text{AcCH}_2\text{CO}_2\text{Et}$ allowed to stand 1 day with 1.46 g. Na in 24 cc. alc., then heated 10 hrs. at 120° with 18.8 g. $\text{C}_{11}\text{H}_{23}\text{I}$; 7.7 g. of this, heated 10 hrs. on the H_2O bath with 3.2 g. KOH in 35 cc. alc., yields 7.6 g. of the ketone, m. $33-4^{\circ}$. CHAS. A. ROUILLER.

1-Propyl-2,3-dihydroxybenzene. JUNZO KUROSAWA. *Ber.* 48, 1603-6(1915); cf. preceding abstr.—1-Propyl-2,3-dihydroxybenzene (a) was prepd. in order to obtain a simple substance related to hydrourushiol and to compare its properties with the latter. o-Dihydroeugenol, b_m $144-6^{\circ}$, is obtained in 11 g. yield from 15 g. o-eugenol reduced with Pt black and H; 4 g. of this, heated 3 hrs. at 150° with 20 cc. of 48% HBr, gives 3.2 g. of (a), needles from petr. ether, m. $70-2^{\circ}$, gives with aq. FeCl_3 a brown color gradually becoming black and forms a violet-black ppt., but in alc. is produced a transient green color soon turning black; with aq. alkali is gradually obtained a red color while in alc. there first appears a green color, then brown and finally a brownish red; small amounts on the skin slowly produce inflammation and severe itching. Dimethyl ether (b), b_m $134-7^{\circ}$, is obtained in 10.4 g. yield by heating 16.4 g. o-eugenol and an equiv. amt. of NaOEt in alc. with 12.3 g. Me_2SO_4 2 hrs. on the H_2O bath and reducing with Pt and H the resulting o-eugenol Me ether, b_m $139-46^{\circ}$, which is formed in 12.5 g. yield. Mononitro derivative of (b), from 5.5 g. (b) in 56 cc. cold AcOH treated in the course of 1 hr. with 11 cc. HNO_3 (d. 1.4) in 50 cc. AcOH and allowed to stand 1 hr. in ice, b_m $185-6^{\circ}$, partly crysts. after months in needles, m. 32.5° , of the same compn.; probably a mixt. of isomeric mono- NO_2 compds. is formed; heated a short time with HNO_3 (d. 1.4), it is converted into the dinitro derivative, long yellowish monoclinic tables, m. $91-1.5^{\circ}$, also obtained from 1 g. (b) in 5 cc. AcOH warmed a few min. with 3 cc. of HNO_3 (d. 1.52). 1-Propyl-3,4-dihydroxybenzene and its dimethyl ether, similarly obtained from eugenol, behave entirely like isohydrourushiol; the phenol in alc. with FeCl_3 gives a green color and with alkali first a bluish, then a red color, while in H_2O is obtained a green, then a brown color with FeCl_3 and a red color with alkalies; the ether gives a mono- NO_2 deriv. but so far it has not been possible to make a di- NO_2 compd. CHAS. A. ROUILLER.

Chief constituent of Japanese lac. VI. Synthesis of hydrourushiol. RIKO MAJIMA AND JOSHIHIDE TAHARA. *Ber.* 48, 1606-11(1915); cf. preceding abstrs.—The following synthesis proves the correctness of the conclusion drawn from the work reported in the preceding abstrs. that hydrourushiol (a) is $2,4-(\text{HO})_2\text{C}_6\text{H}_3\text{C}_{11}\text{H}_{23}$. 0.38 g. Na is vigorously shaken in a test tube with a little hot PhMe; the lower part of the tube, containing the finely divided Na, is cut off and introduced into a long glass tube containing 2 cc. of Et_2O ; after the Na has become detached from the piece of test tube, the latter is removed, the lower part of the long tube is cooled with ice and salt, 3 g. $\text{CH}:\text{C}(\text{CH}_3)_2\text{Me}$ is added, the tube is evacuated, sealed, heated 1 hr. at 60° , cooled with ice and opened under N; to its contents is added 3.8 g. $2,3-(\text{MeO})_2\text{C}_6\text{H}_3\text{CH}_2\text{CH}_2\text{COCl}$ in a little Et_2O , the tube is resealed and heated with frequent shaking 2 hrs. at 60° ; the contents are now treated with Et_2O and H_2O , the Et_2O soln. washed with dil. alkali and H_2O , dried with Na_2SO_4 concd. and treated with H and Pt, fresh Pt being occasionally added; in the course of 2 days, 390 cc. H are absorbed, and after filtering and concg.

the Et_2O soln. there is obtained 1.1 g. of *2,3-dimethoxyphenylethyl dodecyl ketone*, flat needles from MeOH , m. $47-9^\circ$; this with Zn-Hg gives a compd. in all respects identical with the di-Me ether of natural (a). In the course of various attempts to synthesize (a) the following new compds. were made: *2,3-Dimethoxyphenylethyl hexadecyl ketone*, from hexadecin heated 2 hrs. with Na at 100° and then treated as above, m. 57° . *o*-Acetyl Eugenol, b₁₅ $146-8^\circ$, from *o*-eugenol and cold Ac_2O with a little H_2SO_4 is ozonized in CHCl_3 at 0° , at once distd. with steam, the residue extd. with Et_2O and the ext. shaken with NaHCO_3 . Although the aldehydic substance in the Et_2O weighed about 8 g., it yielded only 1 g. of *2-acetoxy-3-methoxyphenylacetaldehyde semicarbazone*, m. 179.5° . The NaHCO_3 soln. yields the acid, m. 146° . CHAS. A. ROULLER.

Sulfones of the thiophene series. O. HINSBERG. Freiburg i/Br. *Ber.* 48, 1611-4(1915).—*Thionessol sulfone (tetraphenylthiophene dioxide)*, obtained almost quant. from thionessal (a) in hot AcOH warmed several hrs. on the H_2O bath with 2.5-3.0 mols. of 30% H_2O_2 , intensely yellow prisms, m. 265° , insol. in acids and alkalies, unchanged by boiling with Zn dust and AcOH but converted back into (a) when concd. HCl is added to the reducing mixt., sol. in cold H_2SO_4 without color and turning yellow on warming. It is not identical with the substance $\text{C}_4\text{H}_4\text{SO}_2$ obtained by Lanfry from H_2O_2 and (a) (*C. A.* 5, 3226). *3,4-Diphenylthiophene*, obtained by heating the di- CO_2H acid in 1-2 g. portions in a test tube until the evolution of CO_2 ceases, taking up in CHCl_3 , evapg. and crystg. several times from AcOH and finally from dil. alc., striated prisms from AcOH , m. 114° , sol. in hot H_2SO_4 with intense yellow color changing to blue-green on addition of isatin. With H_2O_2 in AcOH on the H_2O bath it gives the sulfone, purified by warming the recrystd. product with a little Zn dust in AcOH and cautiously adding H_2O to the filtrate; it seps. in faintly yellow, hair-like needles and, on recrystn. from alc. or AcOH , in light yellow prisms, m. 182° . 3-Methylpiazthiole is hardly attacked at all by 30% H_2O_2 in AcOH on the H_2O bath. C. A. ROULLER.

The so-called pentazole compounds of J. Lifschitz. TH. CURTIUS, AUGUST DARAPSKY AND ERNST MÜLLER. Heidelberg and Cologne. *Ber.* 48, 1614-34(1915); cf. L., C. A. 9, 1614.—A repetition of L.'s expts. has shown that all his observations and the theoretical conclusions drawn from them are erroneous and that there is no formation of pentazoles from tetrazole nitrile (a) and $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ (b). Not only can many of the observations he describes be at once classed as impossibilities by one familiar with the reactions of the hydrazine compds., but in all but 1 case he detd. only the N of his compds. and even these detns. are mostly incorrect. When 4.75 g. (a) in 50 cc. alc. are treated at 0° with 5 g. (b) in 10 cc. alc. there is at once formed 3.57 g. of a white ppt., m. turbid about 220° ; the filtrate after 15 min. in the cold deposits 0.26 g. more. If the filtrate is now heated 3 hrs. under a reflux condenser in the H_2O bath, NH_3 is evolved and the mass solidifies to a yellow cryst. magma which, when cooled to 0° , yields 3.42 g. of a substance which does not m. 280° ; 2 hrs. more heating of the mother liquors yields 0.49 g. more and a 3rd heating of 3 hrs. gives 0.11 g. more. The white substance partially dissolves when rubbed with 20 cc. ice H_2O and the soln. in *vacuo* over H_2SO_4 deposits 1.5 g. needles, m. 230° after crystn. from dil. alc., consisting of *dihydrazine bistetrazole*, $(\text{N}_2\text{H}_4\cdot\text{R}-)_2$ ($\text{R} = \text{NH}\cdot\text{N}:\text{N}:\text{N}:\text{C}-$), the formation of which is

doubtless due to the presence in the (a) of bistetrazole which, in the prepn. of (a) from $(\text{CN})_2$ and HN_3 , is formed as a by-product by the addition of HN_3 to the (a); shaken in H_2O with BzH , the needles at once give $(\text{PhCH}:\text{N}-)_2$. The residue insol. in ice H_2O is insol. in boiling H_2O but easily sol. in dil. HCl , the soln. giving with BzH a ppt. insol. in Et_2O ; it is not reddened by nitrite and HCl . The yellow $\frac{1}{2}\%$ warmed 0.5 hr. on the H_2O bath with 5 cc. of (b), evolves NH_3 to an orange-yellow magma of *dihydrazine ditetrazyl-dihydrotetrazine*,



crude salt in 50 cc. H_2O supersatd. with 20 cc. of dil. HCl give a thick yellow mush of the free *ditetrasyldihydrotetrasine* (*d*) (L.'s pentazidoacetic hydrazide), seps. with 2 mols. H_2O which it loses, without decompn., *in vacuo* at 130° (yield, 0.82 g.); the filtrate yields 0.98 g. $\text{N}_2\text{H}_4 \cdot 2\text{HCl}$. Warmed with aq. (*b*) it regenerates the bis- N_2H_4 salt. The latter, boiled with 35% KOH , does not evolve NH_3 , as stated by L., but N_2H_4 and gives the light yellow *dipotassium salt*, $\text{C}_4\text{H}_5\text{N}_{11}\text{K}_2$, of (*d*), which with excess of AcOH in hot H_2O gives back (*d*). Finally, the bis- N_2H_4 salt with molten KOH yields a substance giving with HNO_3 and AgNO_3 a white Ag salt which deflagrates on heating (probably Ag tetrazole). Towards cold dil. acids, (*d*) is stable, but when boiled 2 hrs. under a reflux with a mixt. of 2 vols. concd. HCl and 1 vol. H_2O it is quant. decompd. into 2 mols. N_2H_4 and 2 mols. RCO_2H . From 2.2 g. (*d*) suspended in 22 cc. H_2O and dissolved by adding soda until just alk., then treated ice-cold with 2.76 g. NaNO_2 in 5 cc. H_2O , at once acidified with AcOH and allowed to stand in ice is obtained the orange-red *disodium ditetrasyldetrasine*, $\text{C}_4\text{N}_{12}\text{Na}_2 \cdot 2\text{H}_2\text{O}$ (L.'s triazolone), which is not decompd. by AcOH , but with ice-cold

dil. H_2SO_4 it gives the free crimson *ditetrasyldetrasine* (*e*), $\text{RC} \begin{array}{c} \diagup \text{N} \diagdown \\ \diagdown \text{N} \diagup \end{array} \text{N} \text{CR}$ (L.'s iso-

nitrosopentazidoacetic hydrazide), 6-cornered leaflets or large needles from alc.; it is also obtained from (*d*) with CrO_3 in cold dil. H_2SO_4 . When boiled with alc. HCl until the red color changes to red, it loses 0.5 mol. N_2 and gives (*d*) (L. states that isonitrosopentazidoacetic acid is formed, so that this compd. of his and his pentazidoacetic hydrazide are one and the same compd., *vis.* (*d*)). The hydrolysis is explained thus: (*e*) + $2\text{H}_2\text{O} \longrightarrow \text{NH:NH} + \text{RC(OH):NN:C(OH)R} (\longrightarrow \text{RCONHNHCOR})$; (*e*) + $\text{NH:NH} \longrightarrow (\text{d}) + \text{N}_2$. The dihydrazide (RCONH-)₂ which according to this scheme is formed from the 1st mol. of (*e*) has not as yet been isolated. When MeCN is boiled 3.5 days with *anhydrous* $\text{N}_2\text{H}_4 \cdot \text{NH}_3$ is evolved and although on distg. the reaction mixt. under diminished pressure much of the MeCN and N_2H_4 are recovered unchanged, the part which does react gives solely *dimethyldihydrotetrasine* (and not the isomeric *C*-dimethyl-*N*-aminotriazole, as is obtained with $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{O}$; *J. prakt. Chem.* 52, 272(1895)); it seps. from H_2O with 1 mol. of solvent in which it m. 100° ; *anhydrous*, it becomes reddish at 90° , bright red at 110° , colorless at 150° , softens 178° , m. 181° , isomerizing into the triazole; with NaNO_2 and AcOH it gives *dimethyltetrasine*, sublimes without decompn. in needles, m. 74° , sol. in H_2O with yellowish red, in Et_2O with bluish red color, is very volatile even at room temp., and is reduced by H_2S in H_2O to the dihydro compd.

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Arseno-metallic compounds. P. EHRLICH AND P. KARRER. Georg-Speyer-Haus, Frankfurt a/M. *Ber.* 48, 1634-44(1915); cf. *C. A.* 8, 2034, 2222.—What is stated below for $[\text{3,4-H}_2\text{N}(\text{HO})\text{C}_6\text{H}_4\text{As}]_2$ (*a*) holds for all other arseno compds. (*a*) can

add a max. of 2 mols. of a metallic salt to form compds. of the type $\begin{bmatrix} \text{RAs} \dots \text{M} \\ \parallel \\ \text{RAs} \dots \text{M} \end{bmatrix} \text{X}$.

Since, in general, these addition compds. have the same solubilities as the arseno compds. from which they are derived, their comp., except in the case of the CuCl_2 compds., could not be detd. by analysis. Into 100 g. (*a*) $\cdot 2\text{HCl}$ in 1600 cc. MeOH and 16 cc. satd. alc. HCl is introduced with turbinig 35.8 g. $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ in 400 cc. alc., then the liquid is poured into 8 l. Et_2O , the brick-red ppt. sucked off, washed with Et_2O and dried in a high vacuum. The whole operation is best carried out in a N or CO_2 atm.

This *copper salvarsan* (b) is a red to orange-yellow powder, moderately sol. in H_2O , more easily in glycerol and glycol, easily in 2 *N* NaOH without sepn. of $Cu(OH)_2$ until the soln. is heated, when the salt gradually decomp. It has the compn. (a).2HCl.CuCl₂. If twice as much CuCl₂ is used, the resulting compound, which has properties very similar to the above, has the compn. (a).2HCl.2CuCl₂. When 10 g. 3,4- $H_2N(HO)C_6H_4AsO_2H_2$ in 100 cc. H_2O and 43 cc. of 2 *N* NaOH and 3.64 g. $CuCl_2 \cdot 2H_2O$ are turbined 2 hrs. at 50° with 100 g. $Na_2S_2O_4$ and 43 cc. more of NaOH, the tendency of the (a) formed to add the CuCl₂ is so great that the latter is not reduced and there is obtained a substance sepg. in yellow-brown flocks, very easily sol. in dil. HCl and NaOH and containing As and Cu in the atomic ratios 1:1. When 1 g. (a).2HCl in 30 cc. MeOH is treated with 0.716 g. $AgNO_3$ in MeOH and the red-brown liquid is poured into Et_2O there is formed a *silver nitrate salt*, (a).2HCl.2 $AgNO_3$, brown flocculent ppt. easily sol. in H_2O , NaOH, MeOH, etc.; the aq. soln. gives with NaCl a brown-yellow ppt. moderately sol. in H_2O , little sol. in NaCl soln. and which is probably the *silver chloride salt*, (a).2HCl.AgCl. With 0.5 as much $AgNO_3$ is obtained a compound (a).2HCl. $AgNO_2$. If 1 g. (a).2HCl in 20 cc. MeOH is treated with 0.61 g. $HgCl_2$ in MeOH and a few drops of alc. HCl, the light yellow soln. becomes orange and in a few moments the *addition product* begins to sep. as a yellow granular powder, decompd. by H_2O , especially on warming, more quickly by NaOH, with deposition of Hg, insol. in NaCl and KI. *Mercuric iodide compound*, yellow-red, much more stable than the chloride. *Gold chloride compounds*, from 1.5 g. (a).2HCl and 1 and 2 g., resp., of $AuCl_3$ in MeOH, with subsequent addition of Et_2O , brown-yellow powders easily sol. in NaOH. If (a).2HCl in 500 parts H_2O is titrated with 1% $AuCl_3$, the soln. becomes brown-red until 2 mols. $AuCl_3$ have been added; further addition of $AuCl_3$ produces a pptn. of metallic Au until 3 mols. of $AuCl_3$ in all have been added and the (a) is oxidized to the arsonic acid. *Platinic chloride compound*, formed instantly from the components in MeOH, brown powder. From 3 g. $PhAs:AsPh$ in C_6H_5N treated with 1.7 g. $AgNO_3$ in concd. H_2O soln. and then with alc.- Et_2O is obtained a black insol. *addition product*. The *copper compound* is easily obtained as a red-brown, insol., amorphous powder by reducing a mixt. of 4 g. $PhAsO_2H_2$ and 3.4 g. $CuCl_2 \cdot 2H_2O$ with H_3PO_2 . The pharmacological action of these complexes is in many cases markedly more pronounced than that of (a) itself. Thus, in the case of (b), with a toxicity of about 1/600 g. per 20 g. mouse wt. 1/40,000 g. suffices to cure a mouse injected with *Trypanosoma prucei*.

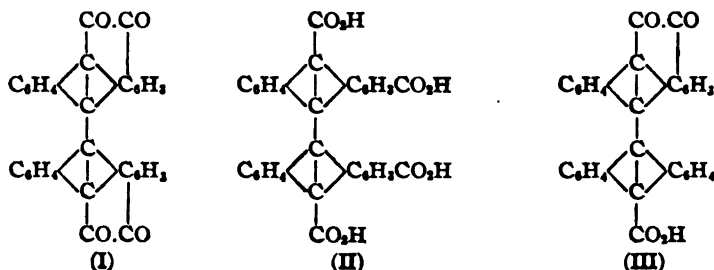
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Polycinnamic esters (continuation). C. LIEBERMANN, G. MÜHLE AND M. KARDOS. Kaiser-Wilhelm-Inst., Berlin-Dahlem. *Ber.* 48, 1645-8(1915); cf. *C. A.* 7, 2554.—The allyl cinnamate polymerized in direct sunlight has been further studied. After being obtained as a pure white flocculent ppt. by pouring into much MeOH, it must be washed by shaking with fresh MeOH several days to remove all of the monomol. ester until the MeOH leaves no residue on evapn. The polymerized ester then forms a white, friable powder, easily sol. in cold $CHCl_3$, gelatinized by cold C_6H_6 but quite sol. on heating; long continued boiling with 20% alc. KOH fails to sapon. it; an attempt to dry it at 110° resulted in making about 25% of it insol. in $CHCl_3$, and at a higher temp. the change in this direction is still greater (the max. being at 138-40°; if exhaustively extd. with $CHCl_3$ and dried at 110° it then gives a C value 2% too low, either because it is so difficultly combustible or for a more deep-seated reason. Contrary to the insol. heat-polymerized form B previously described the new insol. form can no more be sapond. than the sol. form from which it is obtained. In view of the difficulty of completely washing out the monomol. form with MeOH, the light-polymerized Et ester, previously described as dissolving only in traces in org. solvents, has been subjected to renewed purification. After carefully rubbing several times with cold $CHCl_3$,

it was shaken a long time on the machine, then boiled twice for 0.5 hr. periods with CHCl_3 under a reflux; the individual fractions, after filtering and concg. to a small vol., gave with petr. ether white, finely pulverulent ppts. diminishing in amt. and finally disappearing in the last extns.; in all, about 5% of a CHCl_3 -sol. form was thus obtained; the only difference in the 2 forms, however, is in the solubility, for the sol. form can not be sapond. any more than the insol. form. The light-polymerized Me ester, thus far considered as insol., is easily sol. in cold CHCl_3 , petr. ether pptg. from the concd. soln. a fine white powder, m. above 300° , which loses none of its solubility after months in a vacuum desiccator; long heating at 140° converts it into a CHCl_3 -insol. form. The light-polymerized PhCH_3 and octyl esters are not rendered insol. in cold CHCl_3 by long heating at 140° .

CHAS. A. ROULLER.

Action of oxalyl chloride on bianthryl. C. LIEBERMANN, M. KARDOS AND G. MÜHLE. Kaiser-Wilhelm-Inst., Berlin-Dahlem. *Ber.* 48, 1648-53(1915); cf. *C. A.* 7, 3323.—In a flask provided with a stirrer, Hg valve and condenser, 5 g. finely powdered bianthryl, and 20 g. $(\text{COCl})_2$ in 35 cc. cold CS_2 are treated with 4 g. AlCl_3 and, after 2 hrs. stirring, with 3.5 g. more AlCl_3 and 35 cc. CS_2 , stirred a long time, allowed to stand overnight, decompd. with ice, freed of CS_2 by distn., treated with boiling dil. HCl , the brown-red mass boiled out with 400 cc. of 5% soda, then extd. hot twice with 200 cc. concd. NaHSO_3 and 2 l. H_2O , filtered hot, pptd. with H_2SO_4 , dried, exhausted with C_6H_6 and extd. with boiling soda. There is thus obtained 3.1 g. *bisanthrylacediquinone* (10,10'-bisaceanthrenequinone) (I), which, purified through its NaHSO_3 compd.,



seps. from C_6H_6 as a highly red cryst. powder, m. above 350° , but slightly sol. in org. solvents (except CHCl_3), sol. in H_2SO_4 with pure green color; it is not a vat dye; it yields a yellow *oxime* and a dark red *phenylhydrazone*. The soda exts. obtained in its prepn. yield on acidification 1.5 g. of a yellow-brown ppt. which is treated, while still moist, several times with a hot aq. suspension of CaCO_3 ; the resulting sol. Ca salt on acidification yields a ppt. of *bisanthryltetracarboxylic acid* (II), fine orange powder from AcOH , loses 1 mol. H_2O at 160° with formation of a monoanhydride, forms no fluorescein when fused with $m\text{-C}_6\text{H}_4(\text{OH})_2$ (without ZnCl_2); *calcium salt*, light yellow flocks from alc.- H_2O . The treatment with CaCO_3 also yields a mixt. of 2 insol. Ca salts; when the mixt. of the corresponding acids is extd. with boiling AcOH , *bisanthrylacediquinonemonocarboxylic acid* (III) dissolves and on cooling seps. as a brick-red powder. The residue insol. in AcOH is dissolved in $\text{C}_6\text{H}_5\text{N}$; dil. HCl ppts. from this soln. *bisanthrylacediquinonemonocarboxylic acid*, light brown flocks contracting on drying to a chocolate-brown powder.

CHAS. A. ROULLER.

Azafrin. III. C. LIEBERMANN AND G. MÜHLE. Kaiser-Wilhelm-Inst., Berlin-Dahlem. *Ber.* 48, 1653-60(1915); cf. *C. A.* 7, 2946.—The compn. of the colored compds. which azafrin (a) yields with strong acids and one of which (perchlorate) is cryst., together with the analyses of (a) itself and its Me deriv., led to the adoption of the formula $\text{C}_{21}\text{H}_{15}\text{O}_5$ for (a). This is not confirmed definitely by the present work, which was

interrupted by the death of L. In addition to the compds. with acids previously described, 1 g. (a) boiled 5 min. with 30 cc. HCO_2H yields a deep violet soln. which, when filtered and evapd. *in vacuo* over KOH, leaves the *formate*, (a). HCO_2H , as green-black crusts assuming a cantharides luster on rubbing. A soln. of (a) in $\text{AcOH-HCO}_2\text{H}$ retains its deep violet color for months; on filtering and pptg. with satd. NaCl the HCO_2H compd. seps. in flocks with cantharides luster sol. in alc. with pure violet color. Evapn. of the soln. leaves crusts with metallic luster, blue by transmitted light, which contain considerable NaCl (4.8% Na). The acid-free form of (a) corresponding to the colored salts has not been isolated pure. Alkalies under the proper conditions, to be sure, give a Cl-free colorless substance spontaneously forming colored salts with dil. acids, but it could not be obtained in a state fit for analysis. However, the base corresponding to the colored salts is quite different from (a) itself; perhaps it is related to a rearrangement *product*, light yellow amorphous powder of the same comp. as (a), which is obtained by long boiling of (a) with AcOH or still better with PhNMe_2 and is purified by pptg. from dil. KOH with dil. HCl. From 0.4 g. (a) in 125 cc. C_6H_6 and 0.2 g. I in 10 cc. C_6H_6 allowed to stand 24 hrs. is obtained a heavy green-black powder segg. from CHCl_3 in almost black, short, thick columns having a comp. (C 41.61-41.57, H 5.00-4.80, I 46.62-46.42%) intermediate between that calcd. for $\text{C}_{11}\text{H}_{10}\text{O}_4\text{I}_2$ and $\text{C}_8\text{H}_6\text{O}_4\text{I}_2$. Characteristic of this *iodide* is the royal blue color of its CHCl_3 soln., which persists even on long boiling; in alc. it dissolves with violet color completely destroyed by excess of SO_2 but reappearing when the SO_2 is boiled out; alc. SO_2 extraordinarily accelerates its soln. in alc. and C_6H_6 ; it m. 145° (decompn.), gives with alc. KOH a colorless K salt, decompd. by acids with regeneration of the original violet color and production of an intense CHI_3 odor; CHI_3 is also formed by rubbing with aq. KOH; addition of H_2O , filtration and acidification with dil. H_2SO_4 gives a deep violet which, after pptn. from CHCl_3 with ligroin, contains only 7.8% I. The compd. is not identical with the HI salt previously described. All attempts to prep. a similar iodide from bixin failed. From 1.5 g. (a) in 50 cc. AcOH and 0.3 g. Pt sponge added in 2 portions, shaken 10 hrs. with H under 1 m. H_2O pressure until the yellow-red soln. is decolorized, is obtained an *oil*, with 74.11% C, 11.33% H, mol. wt. in Et_2O 465, corresponding approx. to $\text{C}_{21}\text{H}_{14}\text{O}_6$ or $\text{C}_{21}\text{H}_{16}\text{O}_6$, easily sol. in org. solvents (except ligroin) and dil. aq. alkalies; more concd. alkalies produce a voluminous white ppt.; moistening with H_2SO_4 blackens it; on attempting to distil it, it b. $220-400^\circ$, the first fractions being mobile but increasing in viscosity with the temp. and finally carbonizing; the distillate has a very strong peppermint odor. From methylazarin in alc. reduced with aq. PdCl_2 , gum arabic and H is obtained an odorless, colorless, viscous *oil*, $\text{C}_{20}\text{H}_{18}\text{O}_6$ or $\text{C}_{20}\text{H}_{20}\text{O}_6$ (found, C 73.86, H 11.26%, mol. wt. in Et_2O 506), insol. in dil. alkalies. Bixin and methylbixin under the same conditions give colorless, viscous, odorless oils, easily sol. in dil. KOH, turned brown or black by H_2SO_4 . CHAS. A. ROUILLER.

Construction with theoretical atoms of the systems of growth of the organic compounds of carbon and hydrogen (CREHORE) 2. Some new rare earth compounds (GRANT) 6. Some new indicators (LUBS) 11B. Detection of halogen in organic substances (KUNZ-KRAUSE) 7.

II. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

FRANK P. UNDERHILL.

The disturbing influence of some substances of physiological importance on the color reaction between iodine and starch. A. CLEMENTI. Univ. Rome. *Arch.*

farm. sper. 20, 258-68(1915).—Iodized starch paste is decolorized not only by egg albumen, but also by the most widely different types of proteins. Of the amino acids tested, tyrosine was the only one that possessed this property. Furfural decolorizes the starch iodide, while epinephrine instantly changes the color from blue to rose.

A. W. DOX.

Effect of sodium chloride upon the action of invertase. H. A. FALES AND J. M. NELSON. *J. Am. Chem. Soc.* 37, 2769-86(1915).—The relationship between the activity of invertase and the H-ion concn., working at $37 \pm 0.01^\circ$ with 100 cc. of soln. containing 0.500 g. sugar, enough HCl to give the necessary H-ion concn. and 1 cc. of a stock invertase soln. prepd. by N. and Born's method and containing 7 g. invertase per l. (cf. *C. A.* 8, 1435), was found to be as follows: activity, 0, 75, 85, 94, 51, 33, 26; for p_H 1.4, 3.1, 3.3, 4.5, 6.0, 6.3, 6.5, resp., the activity values being $k \times 10^4$, where $k = (1/\theta) \log_{10} a/(a-x)$. The activity was then measured over the same range of H-ion concns. in the presence of 0.1, 0.5 and 2 M NaCl. The effect of NaCl is twofold: it causes an increase in the H-ion concn. when the concn. of the HCl is greater than 0.0001 M, and a decrease in the activity of the invertase for equal H-ion concns., this decrease in activity being least at the optimum H-ion concn. and increasing on both sides of this optimum, so that the use of buffers in large concn. for regulating p_H introduces more or less of an error if it is desired to get the max. activity of invertase corresponding to a given H-ion concn. The H-ion concns. were detd. by the e. m. f. and colorimetric methods, the amt. of sugar inverted by a modified Defren method. C. A. R.

B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

An improved respiration calorimeter for use in experiments with man. C. F. LANGWORTHY AND R. D. MILNER. U. S. Dept. Agr. *J. Agr. Research* 5, 299-348 (1915).—A detailed treatment which does not admit of brief abstracting. A bibliography of 19 titles is appended.

W. H. FRY.

Some new indicators for the colorimetric determination of hydrogen-ion concentration. HERBERT A. LUBS AND WILLIAM M. CLARK. Washington, D. C. *J. Wash. Acad. Sci.* 5, 609-17(1915).—The following new indicators of the methyl red type were prepared: monoethyl red (color changes between the H-ion exponents 4.25 and 6.00), diethyl red (4.50 to 6.50), monopropyl red (4.25 to 6.25), dipropyl red (4.50 to 6.50). The following previously known indicators were studied: monomethyl red (4.25 to 6.00), α -naphthylamine red (not promising), dimethyl- α -naphthylamine red (5.00 to 6.75), diphenylamine red (4.25 to 5.50). The following new indicators of the sulfonephthalein type were prepared by an improved (described) method: thymolsulfonephthalein (useful between 8.00 and 9.50), α -naphtholsulfonephthalein (7.50 to 9.00), bromothymolsulfonephthalein (6.00 to 7.25). The salt and protein errors and biochem. applicability are being investigated.

L. J. GILLESPIE.

Picramic acid as reagent for albuminous substances. I. I. OSTROMUISLENSKII. *J. Russ. Phys. Chem. Soc.* 47, 317-8(1915).—With peptone, albumose, proteins, egg albumen and both the sol. and the insol. globulins of horse serum picramic acid in aq. soln. or aq. emulsion gives an intense dark red color. The liquid to be tested must be free of alkali or salts whose acids are displaced by this reagent. H. M. GORDIN.

Use of trichloroacetic acid as a protein precipitant. I. GREENWALD. *J. Am. Chem. Soc.* 37, 2604-5(1915).—G. makes no claim to have discovered $\text{CCl}_3\text{CO}_2\text{H}$ as a reagent for the removal of blood proteins, and the use of the phrase "G.'s reagent" (Graves and Kober, *C. A.* 9, 2916) is without justification. CHAS. A. ROULLER.

Icterus following ingestion of picric acid. CH. O. GUILLAUMIN. *J. pharm. chim.* 12, 145-52(1915).—The voluntary ingestion of picric acid by men wishing to escape

army service (said to be 0.2 g. a few hrs. before presentation) is difficult to recognize, as the pigments of urine give color tests similar to those of picric acid. The latter is not extd. by Et_2O from an aq. soln. of 0.02 : 1000, unless much HCl (at least 10 g. per l. for complete extn.) is added. 250 cc. of urine + 10% HCl are extd. 2-3 times by 50 cc. Et_2O . Remove the clear liquid from the emulsion, to the latter add 5-10 cc. EtOH , mix, allow to stand. Unite the Et_2O - EtOH liquids, shake these with anhydrous Na_2SO_4 , filter through cotton, evap. to dryness on water bath, take up with 3-4 cc. H_2O , filter if necessary, wash with 3-4 cc. of H_2O . A nearly pure yellow soln. of picric acid results. The mode of extn. from blood is also given. With 6-10 cc. of soln. perform these identity tests: (1) Dip white wool into the warmed liquid for 3 min., then rinse with H_2O . (2) Boil part of this wool with 3 cc. H_2O and 4 drops of 10% KCN . The wool slowly dissolves and the liquid turns brownish rose to dark red (isopurpurate test). The remaining wool, sepd. and washed, is finally pale rose-red. (3) Formation of picramic acid (Isnard, *C. A.* 8, 3191). (4) Formation of Cu picrate, then isopurpurate: Take 4-5 cc. picric soln., add 1 cc. of a mixt. of $\text{CuSO}_4 \cdot 10\text{H}_2\text{O}$ 100, NH_4OH 40. A yellow cryst. ppt. forms, at once in concd. solns., after some min. in 0.10 : 1000, after some hrs. in 0.05 : 1000. To change this ppt. to isopurpurate, add 3 cc. of H_2O , 5-10 drops of KCN and boil. (5) Pptn. by methylene blue: Mix. 1 cc. of soln. with 1 cc. of 1/200 methylene blue; a blackish blue ppt. forms at once. The 5 methods gave + results with 0.01 g. picric acid per l. of urine when using 250 cc. for a test. The wines dated from the 3rd day following the ingestion of the colorant. S. W.

Separation and determination of peptones (VLÄHUTX) 7.

D. BOTANY.

C. L. ALSBERG.

Synthetic processes in the plant organism. II. Occurrence, significance and formation of sucrose in the germination of *Pisum sativum*. P. BOYSEN-JENSEN. Univ. Copenhagen. *Jahrb. wiss. Botan.* 61, 431-46(1915).—In the germination of the pea, two stages can be distinguished. During the first stage the sucrose originally present before germination is partially utilized for growth and for respiration. The isolated cotyledons show a decrease in the sucrose. In the second stage the sucrose present in the cotyledons is to be regarded as a transitional form of starch, for the following reasons: (1) The concn. of sucrose is greater in the cotyledon than in the embryo. (2) In the isolated cotyledon there is an increase in sucrose while in the isolated embryo there is a decrease. (3) Only insignificant amts. of directly reducing sugars are found in the cotyledons. The formation of sucrose from maltose appears improbable, and the only valid assumption remaining is a hydrolysis of starch to monosaccharides and then a synthesis of these to sucrose. A. W. DOX.

Difference in the composition of the oils of different plants of the same family. G. FIGULÉVSKII. *J. Russ. Phys. Chem. Soc.* 47, 393-405(1915).—From an exam. of numerous plants in respect to their oil content and to the amts. of unsatd. acids in the latter as shown by the I number the following conclusions are drawn: The nature of the oil in a plant depends upon climatic conditions and possibly also upon the conditions of its nutrition, a given plant growing in a cold climate producing acids of a lower degree of satn. and therefore of greater chem. activity than the same plant growing in a warm climate. Cultivated plants growing under more favorable conditions lose the ability to produce acids as unsatd. as those produced by plants in the wild state. While there is a difference in the relative amts. of different acids in different oils, there seems to be little difference in the nature of these acids, these usually being oleic, linoleic and hnolenic.

H. M. GORDIN.

E. NUTRITION.

PHILIP B. HAWK.

NORMAL.

The physiology of the newborn infant; character and amount of the katabolism. FRANCIS G. BENEDICT AND F. G. TALBOT. Carnegie Inst. of Washington, *Pub.* 233(1915).—A systematic research into the metabolism of over 100 newborn infants has resulted in an accumulation of sufficient data for definite conclusions. The infants were for the most part obtained from the Boston Lying-In Hospital and a constant routine was rigidly adhered to in all cases, so that the results are comparable. Several hundred experimental periods were obtained. An analysis of the data for the minimum metabolism periods shows that on the first day of life there are important temp. regulation disturbances which result either in a decreased metabolism, or an increased metabolism when there is an effort on the part of the infant to compensate for the loss of heat. After the second day there is a fair uniformity in the heat production per square meter of body-surface and a remarkable uniformity per square meter of body-surface per unit of length. This constancy is such as to permit the establishment of a factor which indicates that when the square meter of body-surface as computed from the body-weight is divided by the length of the body the metabolism per unit is 12.65 cal. From a study of the effect of temp. changes on the basal metabolism and the amt. of available breast secretion in the first week of life, certain procedures for the conservation of energy and supplemental feeding are suggested. F. G. B.

Importance of lime in the nourishment of man, animals and plants. B. HEINZE. *Naturwissensch.* 3, 536-40(1915).—This paper is based largely upon the researches of Emmerich and Loew. Numerous examples are cited to show the great benefits to be derived from the addition of Ca salts to the daily diet. Every person ought to include in his food 1 to 1½ g. of CaCl₂ or Ca lactate per day. C. G. F.

The nitrogen excretion of the cat during a purine-free and a purine-rich diet. FREDERICK S. HAMMETT. Harvard Med. School. *J. Biol. Chem.* 22, 551-8(1915).—"... With the exception of uric acid, the excretion of the cat of nitrogenous urinary constituents is governed by the same laws as the N excretion of man. . . . On a purine-free diet the % of total N excreted as uric acid is so small as to be of no significance when considering the N of the urine. On a purine-rich diet the increase probably denotes an overburdening of the uricolytic enzymes." I. GREENWALD.

Protein metabolism. J. J. R. MACLEOD. Cleveland. *J. Lab. Clin. Med.* 1, 112-9(1915).—A review of the literature with relation to the circulation and utilization of free amino acids. H. G. W.

ABNORMAL.

Studies in carbohydrate metabolism. X. The influence of hydrazine upon the respiratory quotient and heat production. FRANK P. UNDERHILL AND JOHN R. MURLIN. *J. Biol. Chem.* 22, 499-504(1915); cf. *C. A.* 8, 1812.—The respiratory quotient of hydrazinized dogs indicates that the hypoglucemia and loss of glycogen from the tissues is probably due to an increased combustion of carbohydrate. Dextrose administered to such dogs exerts a specific dynamic action and is oxidized more rapidly than in normal fasting dogs. Hydrazine has no sp. effect upon heat production. I. GREENWALD.

F. PHYSIOLOGY.

ANDREW HUNTER.

The formation of carbohydrates from amino acids circulating in the isolated liver. UGO LOMBROSO AND CAMILLO ARTOM. Univ. Rome. *Arch. farm. sper.* 20, 211-24(1915).—The glycogen of the isolated liver diminishes 20-30% after perfusion with blood for an hour. The diminution is somewhat less when Ringer soln. is used in place of blood. Blood containing amino acids produces a slight increase in glycogen when the

liver is already poor in glycogen. Amino acids dissolved in Ringer soln. produce no such increase. A. W. DOX.

Comparison between the sugar content of the blood under oral and rectal intake of dextrose. G. JAHNSON-BLOHM. *Upsala Läkareförenings Förhandlingar* 20, Nos. 6-7(1915); *J. Am. Med. Assoc.* 65, 1686.—The tests were made on 3 healthy men of 24 and 2 diabetic men of 44 and 73 yrs. Ten g. of dextrose were given by mouth, or 30 g. by rectal injection, all in isotonic salt soln. The sugar content of the blood rose at once in each man after ingestion of dextrose by the mouth; but no increase was perceptible in any when administered by the rectum. The fact of absorption by the rectum was established beyond question, but the cause of its different behavior after absorption is unknown. L. W. RIGGS.

Creatine and creatinine excretion during the puerperium and their relation to the involution of the uterus. ARTHUR MORSE. *Yale Univ. J. Am. Med. Assoc.* 65, 1613-5(1915).—M. reports an extended study of 4 cases in which cesarean section was performed, in 2 instances without the removal of the uterus and 2 with hysterectomy. A lower total N output is observed in case hysterectomy is performed; the higher N output observed when the uterus is left *in situ* is explained by the involution process. A lower creatinine output occurs in case of hysterectomy, and at least 2 g. of this substance excreted during the puerperium arise from involution of the uterus. Creatine in large amts. regularly appears in the urine following childbirth. The creatinuria is independent of both the involution of the uterus and the creatinine metabolism. Two charts and 12 references to recent work are given. L. W. RIGGS.

G. PATHOLOGY.

H. GIDEON WELLS.

The question of the specificity of the Abderhalden reaction. E. HERZFELD. *Deut. med. Wochschr.* 41, 1151-2(1915).—The results of expts. as given in the dissertations of E. Rothlin, Zürich, 1915, and of H. Frey, Zürich, 1915, are given. They contradict directly Abderhalden's theory of specific enzymes. S. AMBERG.

The calcium content of bile and its significance for the formation of gall stones. L. LICHTWITZ AND F. BOCK. *Deut. med. Wochschr.* 41, 1215-7(1915).—Mucoid purulent sputum contained 105.2 and 109.5 mg. Ca per 1000 parts, serous mucoid sputum 51.3 mg., while the mucus of this sputum contained 110.2 mg. Ca. It is seen therefore that the inflammatory secretion does not contain any more Ca than blood serum. The results of the exams. are summarized as follows: Normal (?) human bile of the gall bladder contains amts. of Ca varying between 85 and 352 mg. per 1000 g. bile. A definite increase of the Ca in the contents of an inflamed gall bladder cannot be shown. The Ca content of the liver bile obtained from a fresh fistula varies between 65.1 and 83.9 mg. per 1000 cc. bile. In a case of permanent bile fistula with repeated severe attacks of inflammatory bile occlusion the Ca content of the bile, which was very poor in solid residue, varied between 40 and 90.4 mg. per 1000 cc. In 3 days when attacks occurred the Ca content was slightly increased. Although the amt. of Ca of the bile excreted on these 3 days did not exceed that of bile excreted by a fresh fistula, the mucus secreted with the bile was considerably encrusted with "bilirubin-Ca," so that the concn. of the Ca in the mucus was 4-5 times as high as in the bile. S. AMBERG.

The significance of the dialysis method of Abderhalden in psychiatry. V. KAFKA. *Münch. med. Wochschr.* 62, 1316-20(1915).—K. describes an app. to facilitate the washing out of organs for the Abderhalden test. The paper gives a review of the subject based on the data contained in the literature and utilizing the author's own results. S. A.

Examination of tuberculous meningitis puncture fluids with the ninhydrin test. V. KAFKA. *Münch. med. Wochschr.* 62, 1355(1915).—The lumbar puncture fluid from

various diseases was examd. with the ninhydrin reaction according to Nobel. A positive reaction was obtained when the protein content of the fluid was distinctly increased. This means that the direct test cannot serve for the differential diagnosis of tuberculous meningitis. After dialyzing the spinal fluid and testing the dialysate it was found that the reaction was positive in cases of acute forms of meningitis. S. AMBERG.

The cholesterol content of cerebrospinal fluid. P. G. WYSON. State Hosp., Pa. *J. Med. Res.* 33, 119-26(1915).—Cerebrospinal fluids from the cadavers of 85 individuals who had suffered from various types of mental diseases all contained some cholesterol. The fluids were removed from the bodies as soon as possible after death, the time varying from 15 min. to 3 hrs. Neither the quantity of the fluid obtained nor the quantity of the cholesterol was found to bear any relation to the psychosis. The av. amt. of fluid found in cases of paresis and in arteriosclerotic dementia was greater than in the other cases. The av. amt. of cholesterol for cases of epileptic psychoses, dementia precox and organic dementia was greater than for cases of paresis, senile dementia and manic depressive psychoses. GEO. T. CALDWELL.

Relation of certain urinary findings to prognosis of pulmonary tuberculosis. J. C. CUMMINGS. Sacramento. *Calif. State J. Med.* 13, No. 10(1915); *J. Am. Med. Assoc.* 65, 1584.—In 100 cases, of which only 14 were considered clinically "favorable," C. applied the urochromogen and diazo tests. None of the 14 gave a positive urochromogen reaction, while in 39 of the remaining 86 the test was positive. Seven of the 14 and 51 of the 86 gave a positive diazo reaction. L. W. RIGGS.

Critical considerations of the histochemical foundations of cholesterol-steatosis. TH. E. H. THAYSEN. *Centr. Path.* 26, 433-51(1915).—Results by any of the microchem. methods do not correspond to the results of direct analysis, and therefore the latter is the only reliable method for demonstrating the existence of cholesterol-steatosis.

H. G. W.

Specific treatment in typhoid fever. F. P. GAY. Berkeley, Calif. *J. Lab. Clin. Med.* 1, 13-21(1915).—Review of specific treatment with vaccines and antisera.

H. G. W.

The probable toxic effects of prolonged administration of parathyroid gland. R. S. MORRIS. Cincinnati. *J. Lab. Clin. Med.* 1, 26-30(1915).—Case report. Profound mental symptoms and sleeplessness followed prolonged feeding of parathyroid in patient with paralysis agitans.

H. G. W.

Intestinal stasis and intestinal intoxications. A critical review. P. G. WOOLLEY. Cincinnati. *J. Lab. Clin. Med.* 1, 45-53(1915).

H. G. W.

The present status of the Abderhalden reaction and of the theory of the so-called "Abwehrfermente." J. BRONFENBRENNER. Pittsburgh. *J. Lab. Clin. Med.* 1, 79-112(1915).—A review of the literature, with particular reference to the author's own investigations. Emphasis is laid on the uncertainty of the results even when the greatest care is used in technic, rendering the method too unreliable for a clinical method, and only available for scientific purposes under exceptional conditions. Later developments are not in support of the original claim of Abderhalden that specific ferments are produced as a reaction to foreign proteins, but the inhibition of normal antiferments permitting normal blood enzymes to act on the proteins of the serum itself, and not on the substrate, seems to be the fundamental feature of this reaction. H. G. W.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Use of selenium compounds in the therapy of malignant tumors of animals and man. H. COENEN AND W. SCHULEMANN. *Deut. med. Wochschr.* 41, 1213-5(1915).—"Eosin-Se," prepared according to Wassermann, was dissolved in water and acidified with mineral

acid. A ppt. is formed. On extrn. with Et_2O , eosin free from Se is obtained, while the Se remains in the water. On treating the "eosin-Se" with abs. alc. the Se is removed. In a control expt. it was shown that Se cannot be removed by these methods from a truly substituted "eosin-Se." The prep. of Wassermann is regarded as a Na salt of eosin on which there is some dried KCNSe. Various fluorescein derivs. were injected in tumor mice and it was found that the living tumor cells have no special affinity for these dyes. Injections of KCNSe in normal mice produced hemorrhages in various organs, occasionally necroses in the liver. Injection in tumor mice produces hyperemia and hemorrhage in the tumor. It is to be noted that KCNSe produces hemorrhages much more readily in mice than in rats or rabbits. It is shown in mice with tumor transplants that the life, particularly of the cells of the mouse carcinoma, is dependent upon the vessels. The possibility is pointed out that the action of "eosin-Se" of Wassermann is nothing but a KCNSe action on the walls of the newly formed vessels of the mouse tumor affecting the tumor cells but indirectly. S. AMBERG.

The so-called vaccine- or bacterio-therapy: "Ergotrope" therapy of typhoid fever. F. v. GROER. *Münch. med. Wochschr.* 62, 1312-3, 1344(1915).—"Typhin A. No. 2" is a protein-like substance derived from typhoid bacillus by chem. means. Its solns. are water-clear, and can be sterilized. It is antigenic in character, and is hardly less active than the "living sensitized" Bearedka vaccine. Its dosage is detd. gravimetrically, and not by number of bacilli per cc. Simultaneously 1.5 mg. is given intramuscularly and 1.5 mg. intravenously. In this way the danger of collapse possible on intravenous injection of 2 mg. is obviated, while the effect appears a few hours later. In lighter cases of typhoid fever 8-10 mg. are given intramuscularly. The effects of the intravenous injection are about those that follow the injection of Bearedka vaccine. The curative effect must be due to a change of the reactivity of the organism toward the infecting agent. In contrast to the parasitotrope therapy which is directed against the parasites or their products as in chemo- and serotherapy, it is proposed to designate this new kind of therapy as "ergotrope" therapy. S. AMBERG.

The behavior of urinary nitrogen in acute nephritis from corrosive sublimate and the prognostic value of the curve of urea elimination. PIETRO MONTUSCHI. Florence. *Arch. farm. sper.* 20, 194-210(1915).—After a very brief period of scanty elimination of urea coincident with a diminution of diuresis, a high and prolonged excretion of urea may be regarded as an indication of probable recovery from HgCl_2 poisoning. On the contrary, where a continued decrease in urea is noted, the cases generally result fatally. A. W. DOX.

The possibility of producing nephritis by introducing into the circulation substances capable of exerting only a mechanical action. PIETRO MONTUSCHI. Florence. *Arch. farm. sper.* 20, 269-75(1915).—Serious lesions of the kidney are caused by the injection of lampblack, Chinese ink, BiONO_3 , ibit, ivory black and colloidal carbon. A. W. D.

α -Copper gynocardate and its value in tuberculosis and leprosy. I. I. OSTROMUSLENSKII. *J. Russ. Phys. Chem. Soc.* 47, 335-63(1915).—Numerous pharmacological expts. with α -Cu gynocardate (*a*) (*C. A.* 10, 44) gave the following results: The life of guinea pigs infected with tuberculosis is considerably prolonged by subcutaneous injections of *a*, though no complete cure has so far been effected. Healthy animals seem to be protected by it against infection. Theoretically *a* ought to be effective against leprosy, particularly when the latter is accompanied by papules. *a* may be used in 1% soln. in olive oil or in 1-4% soln. in Me gynocardate, but not in free oleic acid, the latter being liable to produce local reactions. The soln. of *a* should be fresh, made transparent by filtration if necessary, sterilized at 130-50°, and should not be supersatd. Successive injections of small amts. are to be preferred to single injections of larger amts. The injection should not be intravenous. H. M. GORDIN.

The action of benzene. I. The significance of myeloid metaplasia of the spleen. H. G. WEISKOTTEN, S. C. SCHWARTZ AND H. S. STRENSLAND. Syracuse Univ. *J. Med. Res.* 33, 127-40(1915).—Following the subcutaneous administration of equal parts of olive oil and benzene, there occurs in rabbits a rapid decrease in the number of leucocytes in the peripheral circulation. Following this primary fall in the leucocyte curve, there occurs a primary rise, which is followed by a secondary fall before a permanent rise to a normal level. The polynuclear leucocytes are especially affected. In rabbits in which the injections are begun 2 days and 6 months, resp., after splenectomy, the leucocyte and erythrocyte curves are essentially the same as in the non-splenectomized rabbits which receive like injections and the duration of the periods of regeneration is essentially the same. The differential counts on the non-splenectomized animals and on those splenectomized 2 days and 6 months previously show no essential differences and the blood pictures are otherwise the same. In the rabbit, the spleen seems to serve no essential function in the destruction of leucocytes and erythrocytes, following subcutaneous injection of the olive oil-benzene mixt. (or in their subsequent regeneration). Any destructive or regenerative function that it has is quickly assumed by some other part of the body when the spleen is removed. GEO. T. CALDWELL.

I. ZOÖLOGY.

R. A. GORTNER.

Amino acids and the production of silk in the larvae of Bombyx mori. Experiments with aminoacetic acid. LUCIANO PIGORINI. Univ. Padua. *Arch. farm. sper.* 20, 225-57(1915).—Since the fibroin of silk is characterized by its high glycine content, the author attempted to increase the yield of silk by feeding glycine to the silkworms. Four lots of 50 worms were fed (a) natural leaves, (b) leaves dipped in water, (c) leaves sprayed with a 2.5% soln. of glycine, and (d) leaves with a 11.4% soln. of sucrose (equimolecular to the glycine). The results are tabulated as follows: Wt. of cocoon $b > c > a > d$; dry wt. of cocoon $d > a > b > c$; N in cocoon $c > a > b > d$; silk in cocoon $b > a = c > d$; N in chrysalis $a > c > b > d$; N in silk $c > d > b > a$; fibroin in silk $c > d > b > a$. A. W. DOX.

Light production by luminous bacteria. E. N. HARVEY. *Am. J. Physiol.* 37, 230-9(1915).—Dried luminous bacteria, even though dead, phosphoresce when moistened with O-containing H_2O but not with O-free H_2O . When finely ground with sand the luminous property is lost; hence it depends on the integrity of some cellular structure. Luminous substances could not be extd. by Et_2O , toluene, or cold absolute EtOH, the bacteria retaining the property of phosphorescence. When cytolyzed by Et_2O or toluene either in the absence or presence of O the luminous substance is rapidly destroyed. Moist bacteria extd. with EtOH lose their luminous power. H. believes that in photogenesis there is involved a substance which in the moist state is irreversibly pptd. (or changed) by EtOH and that it is probably protein in nature. J. F. LYMAN.

12. FOODS.

W. D. BIGELOW, F. F. FITZGERALD.

Food chemistry in 1914. J. RÜHLE. *Z. angew. Chem.* 28, I, 397-401, 405-8, 416-9, 431-2(1915).—A review with numerous references to the literature. E. J. C.

Contributions of the chemist to the packing house products industry. ARTHUR LOWENSTEIN. *J. Ind. Eng. Chem.* 7, 942-4(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc. E. H.

Sugar in fruit sirup of the German Pharmacopeia. ROBERT COHN. *Pharm. Ztg.* 60, 416-7(1915). W. O. E.

Table sirups other than maple. ALP. LÉMOINE. Inland Revenue Dept., Ottawa, Canada, *Bull.* 320, 23 pp.(1915).—Analyses are given of 200 samples collected in Canada. They are classified as follows: Cane sugar sirups 49, essentially glucose sirups 109, mixtures containing a considerable % of cane sugar sirup 27, molasses 15.
E. H.

Lime juice. A. MCGILL. Inland Revenue Dept., Ottawa, Canada, *Bull.* 321, 13 pp.(1915); cf. C. A. 9, 940.—Analyses are given of 83 samples, of which 27 were found to be adulterated.
E. H.

Contribution to the investigation of sugar for feeding. v. WISZELL. Danzig. *Chem. Ztg.* 39, 769-70(1915).—Crude sugar denatured with chopped straw, chaff, bran, sun-flower and hemp-seed meal gave too low results by the polariscope compared with gravimetric results by the inversion method, and investigations showed that the discrepancy was due to inversion in the presence of moisture. The polariscope tests should be checked gravimetrically.
J. H. MOORE.

Chop feed. A. MCGILL. Inland Revenue Dept., Ottawa, Canada, *Bull.* 319, 21 pp.(1915).—Analyses are given of 149 samples collected in Canada. Of these 24 were found to be adulterated.
E. H.

Effect of storage on the moisture content of cloves (OGDEN) 17. **Separation and determination of peptones** (VLÁHUTÁ) 7. **Starch in industry** (MATTHIAS) 28.

Sterilizing foods. F. GARPHEIDE. Brit., 1,018, Jan. 14, 1914. The app. comprises a cylinder in which a piston is advanced by means of a screw cap, and which is filled with a compressing fluid or pickle.

Drying and preserving food products. W. D. EDWARDS and T. E. KOEHLER. Brit., 15,662, June 30, 1914. Food products, such as fruit and vegetables, are cooked, or cut and treated with cold H_2O , or subjected to both these treatments, and then subjected to the drying action of air having a determinate degree of humidity short of satn.; afterwards they may be steamed or stood in heaps and "sweated" by the heat spontaneously generated. The app. is specified in detail.

Food from wood. J. KÖNIG. Brit., 8,006, Mar. 30, 1914. Wood is treated under pressure in a digester with dil. mineral acids or with dil. alkalis. The liquid which is sepd. is rich in sugar and may be evapd. to dryness, used as subsequently described, or treated to recover alc., adhesives, resin, tannic acid, etc. The wood residue is digested to remove sugar and acid, and the resulting liquid may be used for treating a fresh charge of wood. $Ca(HSO_3)_2$ is added to the wood residue in the digester and heated. The sulfite liquor contains substantially only lignine and is heated to expel free SO_2 , aerated by falling down a tower containing limestone, etc., and passed into a pit where the gypsum is allowed to settle. The clear liquid, alone or mixed with the liquid rich in sugar previously obtained, or with liquors remaining after alc. fermentation of this liquor, is evapd. to dryness and employed alone or mixed with spent malt, etc., as fodder. Resin can be recovered, in treating coniferous wood, from the sugar liquid by neutralizing with NH_4OH , etc., or by neutralizing the ext. obtained when dil. H_2SO_4 is used, with $CaCO_3$, and allowing the resin to sep. The remaining liquid is an almost pure sugar soln., which can be fermented or worked into sirup. To recover tannic acid, the sugar liquid, after removal of the resin, is concd. By eliminating the lignine contained in the residue left after the preliminary treatment by treatment with bleaching powder, etc., a purer cellulose is obtained than by the well-known sulfite process. The cellulose so obtained is suitable for the prepn. of artificial silk and nitro-cellulose.

Kola preparations. G. C. ZIMMERMANN. Brit., 15,725, July 1, 1914. Kola nuts are disintegrated, allowed to ferment, and roasted. An ext. obtained by boiling the product with H_2O may be used directly as a beverage or concd. with sugar.

Fodder and cellulose. J. KÖNIG. Ger., 284,715, Feb. 3, 1914. Materials containing cellulose, especially wood of all kinds, are subjected first to a pretreatment with dil. mineral acids (H_2SO_4 or HCl) and dil. alkalies (preferably NH_4OH), or with one of these solns. alone, with heating under varying pressure. The materials are then treated further according to the usual sulfite process, and the resulting sulfite liquors, after complete neutralization and sufficient aeration, are evapd., alone or preferably together with the first disintegrating liquid rich in sugar or gum, and worked up further, in the usual manner (cf. 265,483, C. A. 8, 386), to a fodder. In case the first disintegrating liquid, rich in sugar or gum, has served for the manuf. of alc. or for the production of any by-products, the residual liquid from such treatment is evapd. with the sulfite liquor, and worked up further into fodder. In experience, an average of 4.0-5.5 kg. alc. can be obtained from 100 kg. wood, and the fermentation residues can be worked up into a fodder. The subsequent evapn. with $CaSO_4$ yields, according to the kind of wood, 8-15% of organic substances. In spite of the low sugar content the mass, mixed with dry brewer's husks, is taken by animals with relish.

Caffeine-free coffee beans. L. KLEIN. Ger., 284,374, Feb. 19, 1910. Addition to 276,014 (C. A. 9, 493). In the parent process the extn. of the caffeine may be effected, generally, with mixts. of alk. caffeine solns. As a rule the mixts. appear to exert a better action than the alkalies or alkali solvent employed heretofore. Further advantage is secured in that, according to the nature of the mixt. employed, the extn. of the caffeine can be carried to any desired extent. E. g., by the employment of a mixt. of lime-water and any one or several alkalies, 100 kg. of beans are treated, according to the parent process, with 400-500 kg. of a liquid containing $Ca(OH)_2$ to which 2-2.5 kg. of the other alk. agent is added (K_2CO_3 , KOH , $NaOH$, and the like) for a period of 3-5 hrs., whereby the caffeine content of the beans is reduced from about 1.2% to 0.17-0.15%.

Coffee, tea, and like effusion beverages. A. KLIMA. Ger., 284,266, Sept. 24, 1913. The coffee powder or the like is softened first by steam, then extd. by a mixt. of hot H_2C and steam, and the residual extractive matter removed by steam.

14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

Misbranding of "White Stone Lithia Water." U. S. Dept. of Agr., *Service and Regulatory Announcements*, 10, 569.—Condemned because it was not a lithia water and did not contain ingredients capable of producing the therapeutic effects claimed
E. BARTOW.

Pressure scraping fifteen miles of water mains. JAMES MACFADZEAN. *Surveyor* 47, 772-4 (1915).—Scraping a main of 8 miles 16-inch and 6.5 miles 14-inch pipe increased the delivering capacity 618,000 gals. per day, 36.5% of the capacity before cleaning. Nodules up to $\frac{1}{8}$ inch thickness and $2\frac{1}{2}$ inch diam. made up the greater part of the material removed. Analysis showed Fe_2O_3 7, FeO 2.57, Al_2O_3 0.49, CO 1.12, P_2O_5 0.43, SO_3 0.56, SiO_2 0.36, H_2O and org. matter 24.42%. In 2 years after cleaning the carrying capacity had decreased 276,000 gals. per day. "Before deciding to scrape a main the engineer should seriously consider whether the advantages to be gained will balance the deterioration due to more rapid corrosion, in addition to the cost of periodic scraping."
W. D. COLLINS.

The water supply of Bamberg (Germany). HOCHBERG. *J. Gasbel.* 58, 532-6 (1915).—The city is supplied with ground water. The av. Fe content is 0.02 g. per 100 l.

ARTHUR LEDERER.

The water works of Senftenberg (Germany). K. WAGENFÜHRER. *J. Gasbel.* 58, 376-82, 405-7 (1915).—Three districts are provided with water. District 1 is supplied by ground water. The water is collected in a reservoir and then freed from the Fe, Mn, CO₂, and H₂S which it contains. The water is first aerated to remove as much as possible of the Fe and then passed through a layer of broken marble to take care of the CO₂. Permanganate is added to destroy as much of the org. matter as possible. This water passes a layer of sand and permutite to eliminate the Mn. A vacuum plant removes the excess air and the H₂S in the water. The final effluent is clear, odorless, and free from colon bacilli. District 2 is likewise supplied by ground water. The Fe is removed in an open plant and the aerated water is filtered. Purple windows are installed at the Fe removal plant to prevent the growth of detrimental algae. District 3 is supplied by a small ground water plant.

ARTHUR LEDERER.

Influence of potash waste liquors upon crops. E. HASLHOFF. *Gesundh. Ing.* 38, 429-32 (1915).—H. discusses the work done on this question, particularly that of Stutzer and Haupt. He states that Stutzer and Haupt do not answer the question whether potash liquors influence crops adversely. Their expts. should have covered a longer period. The question is still an open one.

ARTHUR LEDERER.

The clarification plant of the slaughtering house at Lille (France). P. KEM. *Gesundh. Ing.* 38, 349-50 (1915).—The plant consists of a Kremer tank, septic tank, and intermittent sprinkling filters. The sludge is removed 4 to 5 times daily in small quantities and mixed with other fertilizer material. The period of flow in the septic tank varies greatly. The filter effluent is clear and contains but little suspended matter; it has a slight humus odor.

ARTHUR LEDERER.

The disposal of liquid wastes from manufacturing processes. H. MACLEAN WILSON AND H. T. CALVERT. West Riding of Yorkshire Rivers Board. *Surveyor* 48, 228-31 (1915).—Report to Rivers Board commenting on the recommendations in the 9th report of the Royal Commission on Sewage Disposal. The opinion that trade refuse should generally be treated by sanitary authorities along with domestic sewage is sound. Advances in methods of treatment are most likely to come from the work of manufacturers or chemists and engineers employed by them, as nearly all the processes now in use have been so developed. It is claimed that the classification of certain wastes and the proposed standards for some effluents are not in accordance with the latest practice, nor wholly justified by evidence given in the report. In regard to suggested changes in the laws, "it is difficult to see that this (the proposed) mode of legal action is any better than that under the existing law."

W. D. C.

Milwaukee's activated sludge plant, the pioneer large-scale installation. T. C. HATTON. *Eng. Record* 72, 481-4 (1915); *Eng. News* 74, 667-8 (1915); *Surveyor* 48, 258-61 (1915); cf. *C. A.* 9, 2412.—The plant consists of 11 circular reinforced-concrete tanks 30 ft. inside diam. by 13 ft. max. depth. Tanks 1 to 6, inclusive, are the aerating tanks in which the sewage mixed with activated sludge is aerated. Tank 9 is used as the sedimentation tank and tanks 10 and 11 are the activated sludge tanks. Drawings are given showing the curved baffles and the manner of sloping the bottom of the running-through channels of the aerating tanks. The sewage enters tank 1 and is aerated with the sludge, then passes to tank 2 and is again aerated and so passes through the other tanks to tank 9 where it is settled. The sludge from this tank is discharged by gravity into tanks 10 and 11 where it is aerated to maintain the N cycle. From these tanks the sludge is pumped to the inlet chamber of tank 1. Activated sludge which is

in excess of that needed is dried and used for fertilizer. The plant is designed to treat 1.6 million gals. sewage per day with a 4-hr. period of aeration and with 25% activated sludge. It is estimated that the cost will be \$5.30 per million gals. exclusive of engine room and plant labor and the disposal of sludge. Cf. following abstract.

FRANK BACHMANN.

The world's first full scale plant for the treatment of sewage by the activated sludge process. T. C. HATTON. *Am. Soc. Municipal Improvements* 1915; *Eng. Contr.* 44, 322-7(1915); *Can. Engr.* 29, 517-9, 549-50(1915); cf. preceding abstr.—This describes tests on the activated sludge plant at Milwaukee showing bacterial removal of 99% and cost data indicating a partial cost of \$4.43 per mil. gal. of sewage when 1.7 cu. ft. of air are used per gal. of sewage. A stable effluent is produced with city sewage containing 250 p. p. m. of suspended matter. The sludge contains 5.45% NH_3 .

LANGDON PEARSE.

Test plant operated to deodorize oil refinery wastes. F. R. HESSER. *Eng. Record* 72, 541-2(1915).—The methods tried in an experimental plant to deodorize the wastes from the Standard Oil Co. refinery at Neodesha, Kan., were aeration, coagulation, sedimentation and storage. It is believed the odors from the waste are due to naphthalenic and sulfonic acids, partially in soln., and partially suspended as an emulsion. Results were recorded by the diln. giving the equivalent odor. Raw waste was usually detected in 1 to 1000 or 1 to 4000 dilns. Aeration at rate of 28 million gals. per acre per day or less on a coke filter gave an effluent equiv. to a 1 to 256 diln. Coagulation with lime and iron and subsequent aeration gave better results and plain storage for periods of 24 hrs. or more effected a reduction of 25% in some cases. Diln. of 1 to 256 represented a reduction of odor of 75% or more.

FRANK BACHMANN.

Method and cost of refuse collection and disposal in Los Angeles, Calif. A. C. HANSEN. *League Calif. Municipalities* 1915; *Eng. Contr.* 44, 255-6(1915).—In Los Angeles, garbage, non-combustible and combustible rubbish and market refuse are separated. The regulations, details and costs are given. A reduction plant is now operating.

LANGDON PEARSE.

Incineration of Atlanta garbage. E. R. CONANT. *Eng. Record* 72, 532(1915).—About 27,000 tons were incinerated at a cost of 91 cents per ton. The refuse consists of 40-45% of garbage, 50% rubbish and 5-10% of ashes. The clinker from the plant varied from 20 to 30% and was sold for use in hardening streets.

F. BACHMANN.

Detection and estimation of traces of phosphoric acid (MEDINGER) 7. The alkalies of Montreal (CUMMING) 8. Mineral springs of southeast Mährens (SCHUBERT) 8.

Removing temporary hardness from water. K. SCHREMPF. *Brit.*, 2,971, Feb. 5, 1914. The water is heated and then the pressure is suddenly reduced. H_2O heated below the b. p. may be passed into a vessel in which there is a partial vacuum. If heated above the b. p. under pressure may be passed into an open vessel. Pressure may be exerted on the H_2O by a pump, steam injector, or other mechanical means before, during, or after the heating.

Sterile drinking water. J. W. MACKENZIE. *Brit.*, 15,366, June 26, 1914. Equal amounts of $\text{K}_2\text{Mn}_2\text{O}_8$ and $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, which are subsequently pptd. by H_2O_2 , are added to the H_2O . The reagents may be added in the form of tablets.

Sterilizing and removing iron from water. B. KOHNSTEIN and J. M. MUCHA. *Brit.*, 2,020, Jan. 26, 1914. The H_2O is filtered through or otherwise treated with absorbent such as charcoal or kaolin which has been satd. with tannin, gallic acid

phenols, and their derivs., phenolsulfonic acids, alone or in admixt., or their condensation products with HCHO .

Sulfur furnaces for fumigating. C. D'OGNY. Brit., 16,523, July 10, 1914. App. for producing a mixt. of SO_2 and air for fumigating, disinfecting, extinguishing fires, destroying rats, etc., comprizes a S furnace, a filter, 1 or more suction devices for admitting an adjustable amt. of air, which may be drawn from the room, etc., to be fumigated, 1 or more pulsating gas propellers, which act also as coolers, a d. gage for indicating the proportion of SO_2 , and a distributing box. In the furnace the S, pyrites, or S and coal, is burnt in troughs, and air entering through an aperture is directed on to the S, etc., by inverted troughs.

15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

The properties of soil particles and the plasticity of soils. A. ATTERBERG. *Koll. Clem. Beihefte* 6, 55-89 (1914); cf. C. A. 6, 1060, 1331; 8, 221, 2020, 2588.—To obtain particles of different sizes (from 5 mm. to 0.001 mm.) gravel, coarse, medium and clay sand of glacial origin from the Kalmar region, and silt from north Sweden were used. The raw material was freed from Al_2O_3 and humus substances by treatment with acid and alkali. The coarser particles were sepd. by means of sieves. The finer sands were sepd. into the desired sizes by means of the sedimentation app. of Kopecky (*Die Bodenuntersuchung*, Prag, 1901). The finest particles were obtained by sedimentation in wide low glass cylinders by controlling time of this process. By these means the soil was sepd. into particles of sizes: 5-2 mm., 2-1 mm., 1-0.5 mm., 0.5-0.2 mm., 0.2-0.09 mm., 0.09-0.04 mm., 0.04-0.02 mm., 0.02-0.009 mm., 0.009-0.004 mm., 0.004-0.002 mm., and 0.002-0.001 mm. The particles larger than 0.02 mm. were true sands; the smaller particles were silt. Analysis showed the soils to consist mainly of K feldspar, Na feldspar and quartz and only in the very finest particles could mica be detected with the microscope. On drying, the particles larger than 0.02 mm. were of a loose, sandy consistency, while those smaller than 0.02 mm. formed cakes, the cohesion of the particles being in proportion to their sizes. By allowing 10 g. of the soils to stand over H_2O for 2 days at 16° and weighing, it was found that particles larger than 0.02 mm. were not hygroscopic. The space vol. between the particles was detd. by weighing the amt. of H_2O the particles would take up; it was found to be between 40 and 42%. The capillarity detns. showed that most of the water rose in the tubes of the sands the first 24 hrs. and that the rise during the next 24 hrs. was small. The capillarity increased from the larger particles to those of size 0.04-0.02 mm., where the max. was reached. In the smaller particles the capillarity decreased greatly. In detg. the amt. of H_2O the soils would hold upon pouring the H_2O on them it was found that particles from 5 to 0.2 mm. held from 4 to 8 vol. % H_2O according to size, and the particles from 0.2 to 0.009 mm. held 25 vol. % H_2O . The point of sepn. of soils which hold H_2O and which do not hold H_2O is therefore 0.2 mm. The size of soil particles has a great influence on vegetation as is shown by the fact that root hairs of papilionaceous plants could not penetrate soils with particles smaller than 0.03 mm. and the hairs of the roots of gramineous plants could not penetrate soils with particles smaller than 0.02 mm. In expts. to det. the coagulation of soil suspensions by means of acids, alkalies and salts it was found that particles of 0.04-0.02 mm. size show evidence of coagulation but the decided coagulation is only evident in particles smaller than 0.02 mm. Except in the case where lime water was used as a coagulant the sediments were fluid in properties and would not become hard. This explains the property of microscopic sands to remain fluid. Brownian movement was found in soil particles smaller than 0.002-0.001

mm. The committee of agrogeologists which was appointed at Stockholm in 1910 to standardize methods of mechanical soil analysis later adopted the division of soil particles as suggested by A. into the following sizes: larger than 20 mm. as stones, from 20 to 2 mm. as gravel, from 2 to 0.2 mm. as coarse sand, from 0.2 to 0.02 mm. as fine sand, from 0.02 to 0.002 mm. as silt and smaller than 0.002 mm. as colloidal particles. The sedimentation app. as described by A. was also adopted by this committee as a standard. The different methods for detg. the plasticity of clays are discussed, and former work reviewed (cf. C. A. 6, 1060). In the division of clays into 2 classes, sticky and non-sticky, it was found that in the mechanical analysis of the 1st class the proportion of colloidal particles lies above 50% and of the 2nd class the proportion of fine sand or silt lies above 50%. It is easier and quicker to det. the plasticity and the limits of stickiness of clays than to carry out a mechanical analysis of the soils. W. F. Z.

The application of potassium permanganate for the determination of humus of soils. N. P. GRIGORIEV. *Russ. J. Exp. Landw.* 16, 217-22(1915).—The nature of the oxidation of humus by KMnO_4 is considered. It is shown that the figures obtained are not in concordance when the oxidation method and the method of Goustavsohn are compared, the results in the former case being too high. From this it is concluded that the oxidation method cannot have preference over the combustion method.

W. H. FRY.

Soil acidity and methods for its detection. E. TRUOG. *Science* 42, 505-7(1915).—T. holds that soil acidity is due to true acids and not to colloids. Small amts. of very finely powdered soil were thoroughly shaken with comparatively large amts. of the respective salt solns. for a short period and then quickly filtered and the acidity of the filtrate detd. When this was done the soil took up very nearly equiv. amts. of different bases from salts having a common acid ion. To quantitatively det. soil acidity T. treats 25 g. of soil in a casserole with 35 cc. of water, and then adds an excess of $\text{Ba}(\text{OH})_2$ soln. This is allowed to act for 1 min. with const. stirring and then CO_2 is immediately passed in, changing the excess of hydroxide to the carbonate. The material is evapd. to complete dryness on a steam bath, and then the excess of hydroxide is measured by detg. the carbonate present. A special form of app. has been devised for this detn. When the detn. is made by this method it makes little difference whether Ca, Ba or Na hydroxide is used to neutralize the acidity. If soil acidity is due to colloids, then according to the properties of colloids it should take different chem. equivalent amts. of Na, Ba and Ca hydroxides. This again indicates very strongly that soil acidity is due to true acids and not to colloids.

R. C. ROARK.

A new test for soil acidity. E. TRUOG. Wisconsin Agr. Expt. Sta., *Bull.* 249, 3-16(1915).—In a small Erlenmeyer flask place 9 cc. of the soil to be tested, 95 cc. of water and 5 cc. of a soln. containing CaCl_2 and ZnS (5 g. ZnS and 50 g. $\text{CaCl}_2 \cdot 2\text{H}_2\text{O}$ added to 250 cc. water), and boil for 1 min. Then place a moistened piece of lead acetate paper over the mouth of the flask and boil the mixt. just 2 min. more. Dry the test paper and compare with a standard color chart (given in this bull.). A portable app. with an alc. lamp for use in the field is pictured and described. According to T. this test is better than others in that it is more positive, it indicates the degree of acidity, is not affected by CO_2 , and can be quickly made by anyone capable of following simple directions.

R. C. ROARK.

A new method for mechanical soil analysis. SVEN ODÉN. Uppsala. *Internat. Mitt. Bodenkunde* 5, 257-311(1915).—A method founded upon rate of sedimentation is discussed mathematically. The app. to be used is described.

W. H. FRY.

The characterization of soils on the basis of hydrochloric acid soil extracts and the power of exchanging bases. A. J. VON SIGMOND. Budapest. *Internat. Mitt. Bodenkunde* 5, 165-224(1915).—Detailed chem. analyses of HCl exts. gave characteristic

comparative values as to the soil-forming factors which could not be obtained by lump analyses.

W. H. FRY.

Losses of moisture and plant food by percolation. G. S. FRAPS. Texas Agr. Expt. Sta., *Bull.* 171, 5-51(1914).—As a result of 3 years' expts. with Texas soils in 12-inch pots it is concluded that uncultivated clays and loams allowed more water to percolate than uncultivated sands and sandy loams. Cultivation increased percolation through the sands and sandy loams, but had but little effect upon the percolation through the loams and clays. K_2SO_4 increased percolation through the sandy soils but decreased it through clay soils. Application of manure increased percolation from the sandy soils especially, application in the fall being more effective than in the spring. The nitrates in the water percolating from the uncultivated soils is related to a certain extent to the total N of soil and subsoil. Only small quantities of K appeared in the percolates from most of the soils even after heavy applications. In 3 years the max. loss was 12% with the Norfolk sand and from 0 to 4.5% with the other soils. Losses of P in the percolate were very small. Losses of CaO from the uncropped uncultivated soils vary from 70 to 582 lbs. per acre and are in a general way related to the amt. of CaO sol. in strong HCl.

R. C. ROARK.

The movement of soluble salts with the soil moisture. F. S. HARRIS. Utah Agr. Expt. Sta., *Bull.* 139, 119-24(1915).—The results of expts. on the horizontal and vertical movement of salts in soils are recorded. They show that salts are transferred through the soil very readily by moving water. H. concludes that it is probable that low lands will continue to be ruined by the accumulation of alkali salts as long as the uplands are over-irrigated.

R. C. ROARK.

Nitrification. I. Preliminary observations. E. R. ALLEN AND A. BONAZZI. Ohio Agr. Expt. Sta., *Tech. Bull.* 7, 5-42(1915).—A critical review of present methods of studying nitrification with suggested means of improvement. A bibliography of 42 titles is given.

R. C. ROARK.

A new nitrite-forming organism. N. V. JOSHI. *Mem. Dept. Agr. India (Bact. Ser.)* 1, 85-96(1915).—By inoculating a soln. of $(NH_4)_2SO_4$, K_2HPO_4 , $MgSO_4$, NaCl, $FeSO_4$, and $CaCO_3$ with a Pusa soil a new NO_2 -forming organism corresponding to the description of *B. oligo-carbophilous*, but having distinctly different morphological characters, was detected. In the culture media it had the appearance of a mass of ramifying threads which occurred in thin pellicles dotted with white, chalky prominences. The optimum temp. for its activity is between 25° and 35° and its thermal death point is between 70° and 80° . $MgCO_3$ is much less effective than $CaCO_3$ as a base for NO_2 -formation by this organism. An addition of glucose to the culture soln. retards NO_2 -formation, while 50 to 100 p. p. m. of CO_2 stimulate and larger amts. retard its activity. 0.1 g. asparagine and 0.2 g. urea in 50 cc. of soln. increase NO_2 formation. In P-containing solns. NH_4Cl , $(NH_4)_2SO_4$, $(NH_4)_2CO_3$, asparagine and urea serve as sources of N for NO_2 formation. In solns. containing no P, $(NH_4)_2CO_3$ is the only substance which is easily changed into NO_2 by the organism. In solns. of $(NH_4)_2CO_3$ and urea, $CaCO_3$ exerts an inhibitory influence on the activity of the new organism.

J. J. S.

Soil protozoa. GEO. P. KOCH. N. Jersey Expt. Sta. *J. Agr. Research* 4, 511-59 (1915).—The loop method for counting bacteria was improved by using a wire bent into a permanent loop with an angle of $30-35^\circ$ and the quantity of soln. that could be transferred to a ruled slide carefully detd. The av. error is about 7%. Numerous expts. under different soil conditions showed that the max. development of ciliates and flagellates varies with the culture soln. and the condition and amts. of soil used in the expts. For the development of all forms soil ext. seemed a little more favorable than dried-blood ext. The development of protozoa was studied in different culture solns. with varying amts. of soil inoculations, and a comparison made of the numbers and types

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ed from compost and field soils. Every variation in the amts. of culture soln. used caused the development of different numbers and A temp. of 15-16° is most favorable for small ciliates and at this is most favorable. Large ciliates will develop at all temps. noted, favorable otherwise. Many flagellates developed at all temps. but it was at 6-7° in dried blood and at 15-16° in hay infusion.

R. O. E. DAVIS.

and nitrogen fixation in Indian soils. J. H. WALTON. *Mem. Dept. Agr. Ser.* 1, 97-112 (1915).—Working with soil from 6 provinces of India at this organism is more active in the Pusa soils than in other sections. *Azotobacter* isolated from the different soils vary in N-fixing power, morphological and cultural characters. These morphological and cultural characters are different in any particular variety. There is a well-marked, seasonal variation in cultures inoculated with soil. The addition of urea, $(\text{NH}_4)_2\text{SO}_4$, asparagine and casein to the culture media had only a small influence on the fixation of N by *Azotobacter*. Basic slag considerably affected N-fixation. The physiological activities of this organism are increased in the soil by presence of Ca and of available carbohydrate food. J. J. S.

of temperature on movement of water vapor and capillary moisture in soils. Mich. Agr. Expt. Sta. *J. Agr. Research* 5, 141-72 (1915).—When a column of soil of uniform moisture content is maintained at 20° and 40° for 8 hrs. the % water moved from the warm to the cold soil is half at 0° for 8 hrs. the % water moved from the warm to the cold soil in all the different types of soil with a rise in moisture content until a certain content was reached, and then it began to decrease again with further increase in moisture content. The results plot into a parabola. Moisture % at which maximum translocation occurred is designated as the "thermal critical moisture content." Results lead to the conclusion that the capillary movement of water in moist soil is not controlled entirely by the curvature of the capillary films, but also by the attractive forces of the soil for water. When a moist column of soil was placed between a dry column of soil at 20° and 40° and a dry column of soil at 0° for 8 hrs., the 2 columns being separated by a thin space, the % moisture distd. over from the moist and warm column to the dry column was very insignificant for both amplitudes of temp. and was the same for all moisture contents. This leads to the conclusions that the amt. of water lost from the soil by water vapor is very small, that there is no rise of vapor from the soil at night from the warmer soil below to the cold soil above, and that the water loss is not derived from the soil vapor. When a moist column of soil was in contact with a dry column of soil and the former was kept at 20° and 40° and the latter at 0° for 8 hrs., the amt. of moisture moved from the moist and warm soil to the dry and cold soil was maintained with temp. and with moisture content. But when the moist column of soil was maintained at 0° and the dry column of soil at 20° and 40° for the same number of hrs. there was very little, if any, movement of water from the former to the latter. This has a very marked influence on the conservation of moisture by mulches.

W. H. FRY.

effect of heat upon soil fertility. Wm L. OWEN. *Sugar* 17, No. 10, 31-2 (1915).—The theory of Russell and Hutchinson (cf. C. A. 4, 290) is presented together with a description of the work of a number of investigators whose expts. indicate that the beneficial effect is due to conditions other than the destruction by heat of certain bacteria in the soil which are predacious toward the beneficial bacteria.

A. GROSS.

soil, and fertility studies with roses. MAURICE A. BLAKE. N. Jersey Agr. Sta. *Bull.* 277, 5-55 (1915).—The sources of N best suited to the needs of

the florist, and amts. to use per 100 sq. ft., are: dried blood, 5 to 8 lbs.; dried fish, 7.5 lbs.; cottonseed meal, 10 lbs.; and NaNO_3 , 4 to 5 lbs. As a source of P, the author prefers acid phosphate, to be applied at the rate of 4 lbs., and as a source of K, K_2SO_4 , to be applied at the rate of about 12 oz. per 100 sq. ft. of bench surface. Ground limestone is the best way in which to apply Ca, 15 to 25 lbs. per 100 sq. ft. being most desirable for New Jersey soils.

R. C. ROARK.

Ammonification studies with soil fungi. HARRY C. McLEAN AND GUY W. WILSON. N. Jersey Agr. Expt. Sta., *Bull.* 270, 3-39(1915).—Of the fungi studied, including members of the Aspergillaceae, Mucoraceae, Dematiaceae and Moniliaceae, all were found to have the power of ammonifying both cottonseed meal and dried blood. With but a single exception increased growth of mycelium in the soil is accompanied by increased NH_3 accumulation; all of the cultures were pure according to inoculation. Fungi belonging to the Moniliaceae were the most active ammonifiers. In the soils containing 155 mg. of N in dried blood and inoculated with *Trichoderma Koenigii* Strain v. 3, 49.29% of the organic N was accumulated as NH_3 in 7 days. With acid phosphate added, the accumulation was increased to 59.01%; with cottonseed meal as a source of organic N the ammonia N accumulation was 27.48% and the addition of acid phosphate depressed it. The Aspergillaceae showed the least ammonifying power. When dried blood was used as a source of N, acid phosphate increased NH_3 accumulation in the soils with 18 out of the 26 pure cultures of fungi studied. On the other hand, with cottonseed meal as a source of N, NH_3 accumulation was increased only in the case of 8 out of the 25 cultures studied. All of the fungi with the exception of four, viz.: *Zygorrhynchus ouilleminii*, *Rhizopus nigricans*, *Monilia silophila*, and *Mucor hiemalis* were able to ammonify dried blood more readily than cottonseed meal. The results of these expts. show that ammonification of the soil organic matter by fungi depends not only upon the chem. and physical compn. of the soil, but also upon the quality of the organic matter present as well as on the presence of sol. phosphates.

R. C. ROARK.

Relation of sulfur compounds to plant nutrition. E. B. HART AND W. E. TOTTINGHAM. Univ. Wisc. *J. Agr. Research* 5, 233-50(1915).—Greenhouse studies with one type of soil indicate that certain plants are measurably increased in their growth by the addition of sulfates, but sulfates have very little effect as compared with sol. phosphates. Plants most affected were Leguminosae and Cruciferae. There was noticeable stimulation to seed production in both barley and oats, although there was little or no effect on the development of the quantities of straw. With clover, the increase of air-dried matter due to CaSO_4 alone was about 23%. With rape, CaSO_4 superimposed upon a complete fertilizer gave an increase of 17% over the complete fertilizer. A similar order of increase was observed with radish, 9% above complete fertilizer. CaSO_4 was more effective than Na_2SO_4 . Sulfates were particularly effective on the root development of red clover and rape. Elemental S was generally harmful, even in the presence of a generous supply of CaCO_3 .

W. H. FRY.

Effect of alkali salts in soils on crops. FRANK S. HARRIS. *J. Agr. Research* 5, 1-53(1915).—Many expts. carried out to det. the effect of varying amts. of alkali on plant growth, and results of over 18,000 tests are given. Only about half as much alkali is required to prohibit the growth of plants in sand as in loam. In seedling stage, barley is most resistant, followed in order by oats, wheat, alfalfa, sugar beets, corn and ~~Cornfield~~ peas. Results on toxicity in soln. do not hold when the solns. are ~~soil~~ ^{soil}. The anion or acid radical detd. the toxicity of the alkali. Toxicity of salts is in the following order: NaCl , CaCl_2 , KCl , NaNO_3 , MgCl_2 , KNO_3 , $\text{Mg}(\text{NO}_3)_2$, Na_2SO_4 , K_2SO_4 , and MgSO_4 . Percentage of H_2O influences the toxicity. Without ~~re~~ ^{ammon} ~~ation~~, soils with more than the following amts. are not suited

to cultivation: in loam, chlorides 0.3%, nitrates 0.4%, carbonates 0.5%, sulfates above 1.0%; in coarse sand, chlorides 0.2%, nitrates 0.3%, carbonates 0.3%, and sulfates 0.6%.

R. O. E. DAVIS.

The influence of certain organic materials upon the transformation of soil nitrogen. R. C. WRIGHT. *J. Am. Soc. Agron.* 7, 193-208(1915).—With a sandy loam and a clay loam to which $(\text{NH}_4)_2\text{SO}_4$ was added rotted manure stimulated nitrification from the first. Fresh manure and straw at first inhibited nitrification until decompn. was well advanced. In a greenhouse bench soil to which KNO_3 was added reduction took place with fresh manure, straw and starch until a certain stage of decompn.; then nitrification commenced, but was checked by a second application of the organic materials. In a soil from the District of Columbia and one from Nevada to which peptone was added the original NO_3 content was reduced by cellulose, glucose and starch, and no nitrification took place until the glucose and starch had disappeared. With a productive Calif. soil to which KNO_3 was added, straw caused a reduction of NO_3 of 0.152 mg. per g., fresh manure 0.07 mg., cellulose 0.320 mg. and dextrose 0.699 mg. after 2 weeks. The loss of NO_3 was accompanied by a gain in organic N and there was some gain in total N. The only serious loss occurred with dextrose. With the productive Calif. soil and a District of Columbia soil to which no N was added green rye and vetch caused rapid nitrification accompanied by rapid decrease in organic N and a small loss in total N in both soils. Mature wheat straw caused a loss in total N. In an expt. with these 2 soils to which KNO_3 was added nitrification that was not so rapid took place in the controls and in the cases in which green manure was used. It is pointed out that in agricultural practise the plowing under of straw material in a decayed state or of green manures that have been allowed to mature serves to reduce the quantity of available N in the soil. When such practise is followed only during fall plowing, a sufficiently advanced stage of decompn. would be reached by spring so that interference with normal nitrification would not occur. Plowing under of green manures presents a different problem; these are readily attacked by saprophytic microorganism and rapid decay accompanied by vigorous nitrification takes place, thus maintaining a supply of available N.

J. J. SKINNER.

Austria-Hungary and the artificial fertilizer industry. H. G. *Chem. Ind.* 38, 239-41(1915).—A review.

F. W. SMITH.

Evaluation of methods for the determination of phosphoric acid which is soluble in citric acid and which is found in dephosphorization slags (Thomas slag). O. SICHMANN. *Russ. J. Exp. Landw.* 16, 160-212 1915.—A comparison of the molybdc method, the methods of Lorentz, Popp, Darmstadt, and Naumann, and the HCl method, shows very little difference among them. The method of Lorentz gave the lowest results. Tests with Na_2PO_4 show that ppts. obtained by the Lorentz method are pure. For speed and convenience, the methods of Popp and Lorentz are more advantageous, the latter method being the simpler.

W. H. FRY.

Tobacco: Influence of fertilizers on composition and quality. J. W. AMES AND G. E. BOLTZ. *Ohio Agr. Expt. Sta. Bul.* 385, 1-5-200 1915.— NaNO_3 causes a decrease, in most instances, in total ash, P, S and Cl. Of the essential elements present, Ca is found in largest amt. followed by N, K, Mg, S and P. The addition of CaO to the soil decreased the Ca and increased the Mg in the tobacco. A complementary relation exists between Ca and Mg when one is high the other is low. Tobacco from limed plots, as a rule contains less P, K and S than that from unfired plots. Relatively small amts. of P are removed by the crop as compared with other constituents which are regarded as less essential for plant growth. The highest percentage of N is found in tobacco from unfertilized soil. Organic N supplies more N to tobacco leaves than inorganic N. Tobacco from CaCl_2 or KNO_3 plots contains

larger amts. of K than from KCl plots fertilized with like quantities and carriers of P and N. NaNO_3 tends to increase the K content. KCl impairs the smoking test of cigars. Tobaccos with high Cl content had a black charred ash and held fire only $\frac{1}{2}$, as long as tobacco from plots treated with K_2SO_4 or KNO_3 . R. C. ROARK.

Experiments with fertilizers and manure on tobacco grown continuously and in rotation with wheat and clover. C. E. THORNE. Ohio Agr. Expt. Sta., *Bull.* 285, 210-21 (1915).—Detailed results are given in tables of the effect of different fertilizer treatments. R. C. ROARK.

The fertilization of peach orchards. W. H. ALDERMAN. West Virginia Agr. Expt. Sta., *Bull.* 150, 3-39 (1915).—Of the several single elements of plant food used, N gave the best results. K diminished development and in some cases killed the trees, while P in no way influenced either vigor or productiveness. The influence of CaO could not be definitely detd. R. C. ROARK.

The use of sprays rich in copper. E. RABATH. *Rev. vit.* 42, 377-81 (1915).—Gayon and Millardet have shown that 20-30 mg. CuSO_4 per 100 liters of water prevent growth of zoospores of mildew (of vines). R. recommends the following Denigé test for small amts. of Cu in soln. To 1 cc. powdered KBr add 1 cc. H_2O and shake till in soln. Then add to the cold soln. 2-3 cc. pure K_2SO_4 . To test for small amts. Cu, evap. 2-3 cc. of suspected soln. in an evapg. dish. To the residue add a drop of the above reagent. Cu is indicated by rose or carmine color. The reaction is specific. Com. sprays should be so tested because they are often colored with methylene blue and contain no Cu in soln. Molasses or glycerol added to neutral Bordeaux spray gives a larger amt. of Cu in soln. Casein or milk gives increased adhesion to leaves. R. recommends the following formula: 250 g. CuSO_4 added just before use, 250 g. NH_4OH , 60-80 g. casein dissolved in H_2O with sufficient CaO, 1 kg. molasses, all made up to one hecto. W. V. CRUICK.

The Martini copper-lime spraying solution. M. RIPPER. *Wiener Landw. Ztg.* 65, 331 (1915).—A great saving of CuSO_4 can be realized if Cu-CaO spraying solns. are made according to the Martini method in which one-half of the CuSO_4 is replaced by alum. The soln. which contains 0.4 CuSO_4 , 0.4 kg. alum, 0.5 kg. CaO and 100 l. H_2O , is prepared by first dissolving the alum and CuSO_4 in water and then adding CaO emulsion until an alk. reaction is obtained (either litmus paper or phenolphthalein as indicator). This soln. is stated to be just as effective as a 1% Cu-CaO soln. and has been used with excellent results both in Italy and Austria. The alum causes the soln. to cling to the leaves better. C. F. MILLER.

The amount of arsenic in solution when lead arsenate is added to different spray solutions. W. B. ELLETT AND J. T. GRISSOM. Virginia Agr. Expt. Sta., *Tech. Bull.* 8, 160-4 (1915).—Na and K sulfides dissolve more As when mixed with Pb arsenate than the commercial "Ca and Ba sulfur" spray solns. When Pb arsenate is added to either the summer strength of "Na sulfur" or of "K sulfur" a large % of As goes into soln. BaCl_2 retards the solubility of the As when added to Na and K sulfides. When Pb arsenate is added to the different sulfur spray solns. the amt. of As in soln. is increased. This accounts for the burning effect when used together as a spray. The As in soln. is in the form of sulfides, polysulfides, thioarsenate and arsenates of the diff. alkali metals present and when oxidized forms arsenates and arsenites. With Ca and Ba the As is less sol. than with Na and K. If mixts. with As are desired for spraying, Pb arsenate is less harmful than Paris green. Ba arsenate, when used with the diff. sulfur sprays, indicates that slight burning would take place with "Ca and Ba sulfur" and that the amt. of As in soln. is less than when used with water. With Na and K sulfides this substance would be harmful. R. C. ROARK.

Control of the cochylis and eudemis (insect pests of the vine). J. FREYLAND. *Rev. vit.* 42, 421-4(1915).—A Pb arsenite spray is prepd. by adding slowly a soln. of 900 g. $\text{Pb}(\text{OAc})_2$ in 75 l. water to 300 g. $\text{Pb}_2(\text{AsO}_4)_2$ in 25 l. water. A nicotine spray consists of 300 cc. of a 10% soln. of nicotine in 100 l. Bordeaux spray. W. V. CRUESS.

Rapid method of preparing sprays containing casein. V. VERMOREL AND E. DANTONY. *Rev. vit.* 42, 448(1915).—To 1000 cc. H_2O add 100 g. casein; mix with 1000 cc. $\text{Ca}(\text{OH})_2$ containing 50-200 g. CaO per l. The casein dissolves in a few minutes. Use 1000 cc. of this casein soln. per hectoliter of alk. spray to give increased spreading and adhesive power. W. V. CRUESS.

Influence of potash waste liquors on crops (HASELHOFF) 14.

Fertilizers. W. F. DOWNS. *Brit.*, 16,335, July 8, 1914. The phosphate content of natural phosphate rock is rendered available as a plant food by heating a mixt. of the finely divided rock and SiO_2 to a temp. below that at which P_2O_5 is evolved or sintering can occur, the amt. of SiO_2 being sufficient to unite fully with all the bases present in the rock. Generally, a temp. from 720 to 750° and not in excess of 1100° is desirable. The product is insol. in H_2O but is sol. in HCl and gives up a substantial proportion of the contained phosphate to a neutral soln. of NH_4 citrate.

Insecticides. WILKIE & SOAMES. *Brit.*, 15,765, July 1, 1914. A compn. for destroying insects, larvae, etc., consists of a mixt. of dried and powdered soap and S. Naphthalene and cresylic or carbolic acid may also be added. The mixts. may be employed in powder form or dissolved in H_2O .

Disintegrating superphosphate. H. HALL. *Ger.*, 284,580, Oct. 6, 1914. Constructional details of a chamber for this purpose.

16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Clarification of wines with milk. B. FALLOT. *Rev. vit.* 42, 407-8(1915).—One-half to 2 liters milk per hecto. of wine is very useful in bleaching rose colored wines or yellow wines. An objection to milk fining is that considerable lactose is left in the wine and may serve as food for bacterial diseases of wine. W. V. CRUESS.

"Sulfuring" crushed grapes. L. SEMICHON. *Rev. vit.* 43, 200-2(1915).—One kg. of S may be burned per hectoliter of space in the wine tank. Grapes may be crushed into this. The must will absorb about 75 mg. SO_2 per liter in this way, if the work is done carefully. The SO_2 checks wild yeasts and gives a cleaner fermentation than is possible without its use. W. V. CRUESS.

The production of wine from mildewed grapes. J. LARMEILLIERE. *Rev. vit.* 43, 193-6, 213-6(1915).—By judicious use of SO_2 and pure selected yeast, sound wines can be made from grapes attacked by mildew. Vineyards and grapes in France have become badly attacked by mildew this season. W. V. CRUESS.

Detection and estimation of phosphoric acid (MÄDINGER) 7. Utilization of sulfite waste liquors (KIBV) 23.

Rectifying spirit. C. SCHILLING. *Brit.*, 16,474, July 10, 1914. In rectifying spirit in periodically working app., the whole of the foreshots and faints obtained in 1 operation are distd. with the crude spirit in the next operation, so that in each operation the end products, namely ethers and fusel oil, are obtained. No faints of the 2nd

grade are obtained, the fractions collected being ethers, foreshots of the 3rd and 2nd grade, rectified spirit, faints of the 3rd grade, and fusel oil. (1) In treating crude spirit having a low content of aldehydes, the crude spirit is first put into the still and dild. The charge is heated, and, after the formation of vapors, the trays of the column are filled with foreshots of the 2nd grade. The foreshots of the 3rd grade are then admitted to the top of the column. The admission of H_2O to the condenser is then reduced, so that vapors flow to the cooler, ethers being thus obtained. The remainder of the foreshots of the 2nd grade is then run into the middle of the column, and ethers, foreshots of the 3rd and 2nd grade, and refined spirit are successively collected. A few hrs. before the end of the distn., the faints are run into the still or the bottom of the column, and the remainder of the refined spirit and the faints is successively obtained. The fusel oil may be afterwards distd. over. (2) In the case of crude spirit containing a large amt. of aldehydes, the process is modified by charging the still with H_2O which is heated till it boils, running preheated crude spirit rapidly into the top of the column, then running foreshots of 3rd grade into the top of the column, and the whole of the foreshots of the 2nd grade into the middle of the column. The crude spirit may, before distn., be treated with $K_2Mn_2O_7$ to destroy malodorous impurities and with alkali to neutralize acid and to decompose the ethers.

Purifying carbon dioxide. G. M. CLARK. *Brit.*, 12,165, May 16, 1914. CO_2 obtained in the brewing of beer is purified before returning to the cycle of operations, by washing the gas first with H_2O and then with permanganate soln., then drying the gas, and afterwards washing with concd. H_2SO_4 , and finally freeing the gas from acid particles by passage over an alk. substance. The vessels used in the successive washings are each provided with a bell into which the gas is passed and which dips into the washing liquid, the bell being provided with means for breaking up the bubbles of gas. Thus the washing liquor is contained in a closed vessel, and gas is introduced through a bell resting on the bottom of the vessel and provided at its lower edge with notches and on its exterior with superposed and inclined perforated flanges for breaking up the bubbles of gas. Gas passes from the closed vessel containing the washing liquor through the upturned end of a pipe leading into the upper portion of one of the washing vessels.

17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

Pharmacopeia Fennica v. F. DIETZE. *Apoth. Ztg.* 30, 305-7, 312-4, 322-3 (1915).—A discussion of some of the more important changes contained in the new edition. W. O. E.

Testing ext. condurango fl. and cortex condurango. ERNST RICHTER. *Apoth. Ztg.* 30, 330(1915).—Reference is made to Ger. Pharm. prepn. W. O. E.

The pneumatic filling of ampoules. ERNST RICHTER. *Apoth. Ztg.* 30, 338-9 (1915). W. O. E.

Evaluation of insect powder. G. FROMME. *Apoth. Ztg.* 30, 405-6(1915); cf. Kurt Trottner, *C. A.* 8, 1325.—As the result of recent expts., it would appear that no marked relationship exists between the number of pollen grains present in the sample and its toxicity. W. O. E.

The conversion of hydroacridine into acridine. J. BOGS. *Apoth. Ztg.* 30, 406-7 (1915).—Oxidation with H_2SO_4 was employed, the best results being obtained by heating at 100° with 78% H_2SO_4 . W. O. E.

Studies on mace. A. TSCHIRCH AND H. SCHKLOWSKY. *Univ. Bern. Arch. Pharm.* 253, 102-9(1915).—The finely powdered material was exhausted in rotation

with petr. ether, alc., CHCl_3 and H_2O . The first named solvent yielded a brownish oil which on cooling and freezing gave the monobasic *macilenic acid*, $\text{C}_{14}\text{H}_{20}\text{O}_2$, needles, m. 70° , difficultly sol. in cold, easily sol. in hot alc., in CHCl_3 , benzene and Et_2O , difficultly sol. in cold, more readily in hot chloral hydrate soln. It forms the *silver salt*, $\text{C}_{14}\text{H}_{18}\text{O}_2\text{Ag}$, likewise a *barium salt* difficultly sol. in H_2O and alc. The acid possesses a double bond and is monocarboxylic; it belongs to the oleic acid series. This is the first time an acid of this type has been isolated from plant sources. On treating the oil, from which the above acid was separated, with steam for a week in the presence of KOH , 2 layers gradually formed in the flask, the upper being the alkali-insol., the lower the alkali-sol. portion. Only from the former could a cryst. substance be sepd., namely an acid m. 65° and having the formula of myristinic acid, $\text{C}_{14}\text{H}_{28}\text{O}_2$. Attempts to detect glycerol in the oils extd. by petr. ether were negative, hence the conclusion that mace contains no true fat or glycerol ester. On distg. *in vacuo* the oil freed from macilenic acid, *macilolic acid*, a hydroxycarboxylic acid, $\text{C}_{20}\text{H}_{30}\text{O}_3$, was isolated from the highest boiling portion in the form of scales m. 68° . The *silver salt*, $\text{C}_{20}\text{H}_{28}\text{O}_3\text{Ag}$, and *potassium salt*, $\text{C}_{20}\text{H}_{28}\text{O}_3\text{K}$, were both prepd. The acid is sol. in cold chloral hydrate soln. Boiling alc. exts. considerable yellow coloring matter together with a colorless substance m. $76-7^\circ$, likewise a wax-like substance, which on hydrolysis with alc. KOH yielded a colorless cryst. compd. carbonizing at 300° . The CHCl_3 ext. gave crystals m. 131° and showing all the reactions of the phytosterols. In addition, a reddish yellow coloring matter was isolated in pure form, the spectrum of which was similar to that of xanthophyll. Both cold and hot H_2O yielded yellowish solns. containing amylopectin starch precipitable by alc. and having the compn. $6(\text{C}_6\text{H}_{10}\text{O}_5) \cdot 2\text{H}_2\text{O}$.

W. O. E.

The chemical importance of cacao bean rootlets (radiculae). E. P. HAEUSSLER. *Arch. Pharm.* 253, 109-10(1915).—Reference is made to an earlier paper by H. (cf. C. A. 8, 3704), certain data contained therein being compared with that obtained by Hoy (cf. C. A. 8, 2006).

W. O. E.

Hematoxylin as indicator in volumetric alkaloidal determinations. Evaluation of cinchona bark. G. FRERICHS AND E. MANNHEIM. *Arch. Pharm.* 253, 117-35(1915).—The conclusions arrived at are summarized as follows: (1) The indirect titration of cinchona alkaloids with freshly prepd. hematoxylin soln. as indicator according to the Ger. Pharm. is impossible. (2) Indirect titration of cinchona alkaloids with hematoxylin soln. containing hematein is unreliable. (3) Direct titration of cinchona alkaloids with 0.1% HCl and freshly prepd. or old hematoxylin soln. as indicator is simpler and more certain than the indirect titration. (4) The addition of Et_2O in the direct titration according to Fromme is superfluous and impracticable. (5) A 1:100 soln. of hematoxylin in alc. is recommended. (6) The evaluation of cinchona bark according to the Ger. Pharm. yields much too low results on account of incomplete extn. of the alkaloids. (7) Fromme's procedure (preliminary treatment of the bark with aq. HCl) is simple and dependable. (8) Gaze's modification of the Pharm. procedure (decrease in the quantity of bark and addition of alc.) may yield lower values in barks of high alkaloid content than would result with Fromme's procedure. (9) The tedious Pharm. method for purifying the alkaloids is superfluous. The crude alkaloid isolated according to Fromme can be titrated directly without previous purification.

W. O. E.

Evaluation of cinchona bark. J. ZIEGLER. *Apoth. Ztg.* 30, 366-7, 374(1915); cf. preceding abstr.

W. O. E.

Evaluation of Cortex Chinae. G. FROMME. *Apoth. Ztg.* 30, 352-3(1915); cf. preceding abstrs.

W. O. E.

Commerce in drugs during the war period 1914. H. THOMS. Univ. Berlin. *Ber. pharm. Ges.* 25, 185-221(1915).—An address.

W. O. E.

Two sweet tasting drugs. R. KOBERT. Univ. Rostock. *Ber. pharm. Ges.* 25, 162-85(1915).—An address dealing with *Eupatorium rebaudianum* Bertoni and *Glycerhiza glabra* var. *glandulifera*, and the relationship of certain of their constituents to the saponins. W. O. E.

Determination of the solidification point of fatty acids and its importance in judging cacao butter. P. BOHRISCH AND F. KUERSCHNER. *Pharm. Ztg.* 60, 361-2(1915). W. O. E.

The botanical source, physical characters, and chemical constituents of chaulmoogra oil. FREDERICK B. POWER. *Am. J. Pharm.* 87, 493-500(1915).—A severe criticism of the paper by Chattopadhyaya (*C. A.* 9, 3117). P. emphasizes the statement that chaulmoogra (*Taraktogenos*) oil and gynocardia oil are totally unlike both in their physical characters and chem. compn. Along with data establishing the authenticity of his oils, P. gives the following: *Physical characters*: (1) chaulmoogra oil: soft solid at ordinary temp., m. $22-3^{\circ}$, d_{25} 0.951 and d_{45} 0.940, $[\alpha]_D^{15} + 52.0^{\circ}$, acid value 23.9, sapon. value 213.0, I value 103.2. (2) Gynocardia oil: pale yellow liquid at ordinary temps., odor resembling that of linseed oil, d_{25} 0.925, acid value 4.90, sapon. value 197.0, I value 152.8. *Chemical composition*: (1) chaulmoogra oil: (from the seeds of *Taraktogenos Kursii*, King), optically active, consists, to a large extent, of the glyceryl esters of optically active acids of an entirely new type, represented by the general formula $C_nH_{2n}-O_2$, having a cyclic structure. The acid present in the largest proportion possesses the formula $C_{11}H_{20}O_2$, m. 68° , $[\alpha]_D + 56^{\circ}$, and has been designated *chaulmoogric acid*, while a lower homolog, $C_{10}H_{18}O_2$, m. 60° , $[\alpha]_D + 68^{\circ}$, has been termed *hydnocarpic acid*, on account of having first been isolated from a hydnocarpus oil (*J. Chem. Soc.* 87, 888(1905)). Both of these acids are beautifully cryst. substances, from which a number of derivs. have been prepd., and their constitution has also been definitely established (*C. A.* 1, 1561, 2114). Inasmuch as acids of the above described type had hitherto not been known to occur in a fatty oil, they have been classified by Lewkowitsch ("Chemical Technology and Analysis of Oils, Fats and Waxes") under the heading of "the chaulmoogric acid series." Chaulmoogra oil contains, furthermore, a relatively small proportion of palmitic acid and a phytosterol. (2) Gynocardia oil (from the seeds of *Gynocardia odorata*, R. Br.) is completely devoid of optical activity, contains none of the members of the chaulmoogric acid series, and has been shown to consist of the glyceryl esters of the following acids: (cf. *J. Chem. Soc.* 87, 896-900(1905)); (1) linolic acid, or isomerides of the same series, constituting the largest proportion of the oil, (2) palmitic acid, in considerable amt., (3) linolenic and isolinolenic acids, the latter preponderating, and (4) oleic acid, in relatively small amount. A phytosterol, m. 133° , was also isolated. Both the physical properties and chem. compn. of the above mentioned oil render it evident that the chaulmoogra oil of European commerce could never have been obtained from *Gynocardia* seeds. On the other hand, representative samples of commercial chaulmoogra oil have been found to agree closely in character with the oil expressed from genuine *Taraktogenos* seed, thus completely confirming, from the chem. side, the botanical observations of Prain (*Pharm. J.* 64, 522(1900); 66, 596(1901)) with respect to the source of chaulmoogra oil. *Gynocardia* seeds contain, besides the fatty oil, the cryst. cyanogenetic glucoside, gynocardin, $C_{12}H_{19}O_5N$, which has likewise been made the subject of a complete chem. investigation (*J. Chem. Soc.* 87, 349-57(1905); 97, 1285-9(1910)). P. also notes that the total compn. of chaulmoogra oil, as given by Chattopadhyaya, is equal to 110%, which is obviously an error. W. G. GAESSLER.

A comparison of the guinea-pig and cat methods for the physiological standardization of aconite preparations. J. C. FORD, C. P. S. FORD AND J. E. WINE. *Am. J. Pharm.* 87, 489-92(1915).—A discussion of the methods of assay used with the following

conclusions: (1) The chem. method of assay for aconite is unreliable. (2) The taste and frog methods for the physiol. testing of aconite have little to recommend them. (3) The guinea-pig method and the cat method give results that are fairly concordant.

W. G. GAESSLER.

So-called concentrated solution of silver iodide. JOHN K. THUM. *Am. J. Pharm.* 87, 500-1(1915).—T. recommends the following formula: AgNO_3 , 3.7 g., KI 17.0 g., distd. water ad 25.0 mils. This vol. of 25 mils soln., when added to 75 mils distd. H_2O , makes a 5% suspension of AgI .

W. G. GAESSLER

Stearic acid as a coating for enteric pills. WILLIAM G. TOPLIS. *Am. J. Pharm.* 87, 518-20(1915).—T. recommends stearic acid as a coating to render enteric pills insol. in the stomach and describes method of coating.

W. G. GAESSLER.

Effect of storage on the moisture content of cloves. A. W. OGDEN. *Am. J. Pharm.* 87, 526-7(1915).—Samples of whole cloves were taken from original unbroken bales after arrival in this country and stored in ordinary wooden spice boxes in a dry storeroom in New York City. Gross weighings were made at intervals and as these showed a gradual loss, the expt. was continued and careful net weighings were made after periods of 6 months and 54 months. A table is given showing analyses and the av. losses for the periods specified. The av. loss on all samples for the 6 months' period was 2.42% and for the 54 months' period 4.70%; the max. loss for this latter period was 7.83%.

W. G. GAESSLER.

Tincture of opium (laudanum). A. MCGILL. Inland Revenue Dept., Ottawa, Can., *Bull.* 315, 15 pp.(1915).—Analyses are given of 127 samples collected in Canada. Of these 96 met the demands of the Brit. Pharm.

E. H

Contributions of the chemist to the perfumery and essential oil industry. EDWARD T. BRISER. *J. Ind. Eng. Chem.* 7, 936-7(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc.

E. H.

Contributions of the chemist to the manufacture of pharmaceutical products. FRANK R. ELDRÉD. *J. Ind. Eng. Chem.* 7, 939-40(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc.

E. H.

Notes on the eucalyptus oil industry of California. P. W. TOMPKINS. *J. Ind. Eng. Chem.* 7, 995-7(1915).—T. compares the production of eucalyptus oil in Cal. to that in Australia and suggests improvements in the Cal. production.

E. H.

Glycobromine. ANON. *Boll. chim. farm.* 54, 263(1915).—This compd. is the glyceride of the dibromide of cinnamic acid and contains 50% of Br ; it is a white, amorphous, tasteless powder, m. $66-8^\circ$, and is insol. in H_2O , slightly sol. in alc. and more sol. in Et_2O and CHCl_3 . It may be used as a substitute for the common bromides.

H. S. PAINE.

Method of determination of proteolytic enzymes. BICE NEPPI. Milan. *Boll. chim. farm.* 54, 289-97(1915).—After considering the various methods which have been proposed N. concludes that the Fuld method (detn. of the minimal amt. of enzyme prepn. which is capable of effecting the proteolysis of 2 cc. of a 1% edestin soln. in $N/300$ HCl so that, after 15 min., no turbidity is produced by the addition of a 30% NaCl soln.) is the most suitable method for controlling the strength of pepsin preps. and should replace the method of the Italian Pharmacopeia. The Gross method of detg. the minimal amt. of enzyme prepn. which is capable of effecting the proteolysis of 10 cc. of a 1% casein soln. in 1% Na_2CO_3 so that, after 30-40 min., no turbidity is produced by a 5% hydro-alc. soln. of AcOH , with slight modification, is recommended for displacing the present method of the Italian Pharmacopeia for the detn. of the strength of pancreatin preps.

H. S. PAINE.

Iodated cotton containing approximately four per cent of free iodine. E. BOURQUEROT. *Boll. chim. farm.* 54, 390(1915).—Twenty-five g. of cotton dried at 30° are uniformly sprinkled with 2 g. finely powdered I and placed in a glass vessel provided with a ground glass stopper; this vessel, after being securely closed, is immersed to the neck in boiling H₂O for 2 hrs. The cotton is then preserved in closed containers; no decrease in content of free I was observed after 3 mos.

H. S. PAINÉ.

Medicinal plants of North America. THRO. HOLM. *Carica papaya* L. *Merck's Rep.* 24, 136(1915). *Ananassa sativa* L. *Ibid* 192. *Vanilla planifolia*, Andrews. *Ibid* 212. *Maranta arundinacea* L. *Ibid* 238.—Descriptive articles with drawings showing plant and minute structure of vegetable organs.

C. M. PENCE.

Cod liver oil industry. ANON. *Pharm. Era* 48, 255.—Modern methods of manuf. are described.

C. M. PENCE.

Arsenic iodide. LANGUOPIN. *L'union pharm.* 1915, 201; *Pharm. Era* 48, 345 (1915).—Heat 20 g. metallic As with 400–500 cc. H₂O and 10 g. I on H₂O bath until combination takes place. Boil for a few min., filter and evap. to dryness.

C. M. PENCE.

Progress and novelties of the pharmaceutical chemical industries in 1914. J. BOES AND H. WEYLAND. *Chem. Ind.* 38, 107–21, 146–65(1915).—A review.

F. W. SMITHER.

The caffeine content of various beverages. JOHN L. HENDERSON. *Carolina J. Pharm.; Midland Druggist* 49, 348–9(1915).—The following amts. of alkaloid were found: Coffee No. 1, in 160 cc. 0.0287 g. No. 2, in 165 cc. 0.0174 g., No. 3, in 190 cc. 0.0372 g. caffeine. Tea, in 180 cc. 0.0176 g. theine, "Coca-cola," in 190 cc. 0.0371 g., "Pepsi-cola," in 193 cc. 0.0278 g. caffeine or allied substance. Chocolate, in 158 cc. 0.0195 g. theobromine. The results are also shown graphically and indicate that each cup or glass of these beverages contains alkaloid equiv. to $\frac{1}{5}$ – $\frac{1}{4}$ of the therapeutic dose. In excessive use, the alkaloids cause nervousness, and tannin and caffeine cause gastric disturbances.

S. WALDBOTT.

Preparing argyrol solutions. ROBERT W. TERRY. *Midland Druggist* 49, 347 (1915).—To avoid formation of a large lump, rapidly powder weighed argyrol in a dry mortar and add a small amt. of H₂O at once with rapid trituration. Pour off soln. and add to the residual small lump more H₂O in small amt. Solns. up to 50% may thus be prepared.

S. WALDBOTT.

Stability of lime water. ROBERT W. TERRY. *Midland Druggist* 49, 406–7(1915).—Filtered lime water left in a corked bottle, changed only from 0.1649 g. to 0.1614 g. Ca(OH)₂ in 10 days. Lime water containing undissolved Ca(OH)₂, a caustic irritant, should never be dispensed.

S. WALDBOTT.

The accuracy of fermentation saccharometers. ROBERT W. TERRY. *Midland Druggist* 49, 407–8(1915).—Four series of detns. of glucose (1%, 0.75, 0.5 and 0.25%) were made with 5 Hg-seal fermentation instruments. The fermentation temp. of 90° F. was maintained by means of a const. temp. water bath heated by elec. light globes. The percentages indicated were practically fully recovered. The method is preferable to that with Fehling soln.

S. WALDBOTT.

Unguentum iodoformi. Brit. Pharm. 1914. D. F. RITCHIE. *Pharm. J.* 95, 539(1915).—Prepared lard directed by the new pharmacopeia in the prepn. of this ointment develops after a week free fatty acids, causing decompn. of CHI₃ and browning of the ointment due to free I. The paraffin base of the former pharm. gives a pharmaceutically sound prepn.

S. WALDBOTT.

Influence of fertilizers on tobacco (AMES) 15.

Therapeutic compounds. R. WOLFFENSTEIN. Brit., 16,585, July 11, 1914. Hydroxyquinoline salicylic esters or derivs. thereof are obtained by the reaction of a chloride of salicylic acid or a homolog or deriv. thereof upon hydroxyquinolines. The production of the salicylic and acetoxybenzoic esters of 8-hydroxyquinoline is described in examples. The products have therapeutic properties, as they affect the metabolism of purines.

Enzymes; toxins. A. BORDIN and J. EYFRONT. Brit., 16,198, July 7, 1914. Enzymes and toxins are prepd. by cultivating aerobic bacteria in contact with air in thin layers of a mash rich in nitrogenous constituents and poor in carbohydrates, formed of vegetable or animal albuminoid materials, such as casein, fibrin of maize, soy-cake, from which the fat has been extd., or bran or other vegetable waste product which has been freed from carbohydrates by saccharification, fermentation, and distn. The mash prepd. in a boiler is forced by air pressure into a sterilized culture chamber formed of materials such as Al, enamelled metal, porcelain, or glass, which do not affect bacteria. The mash is distributed in thin layers on trays mounted on a central shaft, which is rotated either with a to-and-fro motion to agitate the mash or rapidly to discharge the trays by centrifugal action. Either a sep. culture is added to the mash, or portions of a previous culture are left on the trays. The culture chamber is retained at 30-40°, and air sterilized by passage through a filter is passed through the chamber. The culture may also be made in a chamber with fixed plates, or filled with pumice-stone, coke, shavings, etc. Starch-liquefying enzymes are obtained from bacteria of the species *tyrothrix* or *subtilis*, and toxins from the bacilli of diphtheria, tetanus, or tuberculosis. The cultures may be preserved by the addition of sea-salt, $MgSO_4$ (dihydrogeraniol), or $(NH_4)_2SO_4$ or $HCHO$. The soln. may be concd. *in vacuo*. The enzyme or toxin may be pptd. by addition of a large quantity of $(NH_4)_2SO_4$.

Catalytic hydrogenation. C. PAAL. Brit., 16,180, July 7, 1914. Alcs., aldehydes, and acids of the olefinic terpene series are hydrogenized by treatment with H in the presence of a metal or protohydroxide of the Pt group, preferably deposited upon a finely divided support. In this manner, citral, geraniol, and linalool are converted into dihydro and also into tetrahydro derivs. The process may be carried out at ordinary or increased pressure. The phenylurethan of dihydrolinalool melts at 60° and the semicarbazone of dihydrogeraniol at 112-113°.

Methyl chloride. B. S. LACY. Brit., 16,194, July 7, 1914. $MeCl$ is prepd. by mixing Cl with a large excess of CH_4 and exposing the mixt. to an elevated temp. in a suitable reaction vessel: a temp. of about 400° is suitable. The reaction vessel is preferably a tube of glass, quartz, porcelain, earthenware, etc. Bone-black or other forms of C, or other material, may be used as a catalyst in the reaction. The resulting mixt. of gases is passed through an absorbent, preferably H_2O , to remove HCl , then dried, then subjected to cold and pressure to liquefy the $MeCl$ and other chlorides of CH_4 , formed while unused CH_4 is recovered for re-use.

***o*-Acetoxybenzoates.** O. GERNGROSS and H. KAST. Brit., 25,080, Nov. 3, 1913. An aq. soln. or suspension of *o*-acetoxybenzoic acid is treated with a suitable metallic compd., filtered, the resulting soln. concd., preferably under reduced pressure, and the sepn. of the salt completed by addition of an org. precipitant, such as acetone, alc. mixed with ether or acetone or both, or alc. mixed with a hydrocarbon such as ligroin or benzene; the sepd. salt is finally washed with ether, etc. Preferably, such metallic compds. are used as have an acid component which does not decompose the acetoxybenzoates and also prevents or limits injurious action of the base upon the free acid; such compds. are, e. g., water-glass or other metal silicate produced by interaction of water-glass and a metallic salt such as $CaCl_2$. According to examples: an aq. suspension of acetoxybenzoic acid is treated with $NaHCO_3$, the filtered liquid

is evapd. under reduced pressure, and the sepn. of the Na salt is completed by addition of acetone; an aq. suspension of the acid is treated with water-glass soln., pptd. silicic acid is filtered off, and the soln. further treated as above; or the silicic acid may be removed by addition of alc. and filtering. Zn or Hg salts can also be obtained by the process. Cf. *C. A.* 9, 1225.

Esters of tertiary alcohols. NEUMANN & CO. CHEM. FABRIK GES. and J. ZELTNER. Brit., 25,262, Nov. 5, 1913. For the process see *C. A.* 9, 1370. The production of the valerate, cinnamate, benzoate, *p*-nitrobenzoate, and acetate of tertiary amyl alc. is described in examples; the cinnamate yields a dibromo addition product; the *p*-nitrobenzoate on reduction gives the *p*-aminobenzoate.

Pyrrolidine derivatives. CHEM. FABRIK AUF ACTIEN V. E. SCHERING. Brit., 25,805, Nov. 11, 1913. An acylpyrrolacemic acid ester is condensed (1) with benzaldehyde and a nuclear substituted aniline, or (2) with a substituted benzaldehyde and aniline or a nuclear substituted aniline, or (3) with benzaldehyde and a pyrazolone or quinoline deriv. containing a primary amino group, or (4) with a heterocyclic aldehyde and aniline or a nuclear substituted aniline, or with a pyrazolone or quinoline deriv. containing a primary amino group. As substituted benzaldehydes, piperonal and *p*-dimethylaminobenzaldehyde are suitable, and as derivs. of aniline are indicated toluidines and anisidines.

Chlorohydrocarbons. CASSELLA & Co. Brit., 16,317, July 8, 1914. Tetrachlorotoluene is obtained by chlorinating toluene in the presence of anhydrous FeCl₃ or Fe. Tetrachlorobenzal chloride is obtained by chlorinating tetrachlorotoluene at temps. considerably below b. p., preferably at 100–130°, in the presence of light or ultraviolet rays.

Ethers; hydrocarbons. G. BOITREAU. Brit., 15,806, July 2, 1914. Ethylidene-glycol ethers are obtained by the reaction of C₂H₂ on OH compds., particularly alcs., in the presence of catalysts such as Hg salts. *E. g.*, MeOH is treated. Unsatd. hydrocarbons are obtained by dehydrating the ethers specified above. The dehydration may be effected by passage through a heated tube containing oxides, such as SiO₂, Al₂O₃, Ca or Mg silicates, argillaceous earths, or kaolin, phosphates, *e. g.*, of Al, Ca, or Mg or sulfates, such as those of Al, Ba, or Ca. Examples are given of the production of butadiene.

Aldehydes; carboxylic anhydrides; hydrides; esters; ethers. G. BOITREAU. Brit., 15,919, July 3, 1914. In carrying out the reaction of C₂H₂ upon H₂O, alcs., carboxylic acids, or hydroxy or carboxylic compds. generally, in the presence of a catalyst, the catalyst is formed in the substance treated. This may be effected by dissolving in the substance treated a slightly acid Hg salt, such as the acetate, or HgO, and then adding H₂SO₄ to form the sulfate. According to an example, HgO is dissolved in HOAc, H₂SO₄ is added, and then C₂H₂ is introduced; or a mixt. of H₂SO₄ and HOAc may be added to the soln. of HgO in HOAc. The production of Ac₂O and ethylidene diacetate is referred to.

Organometallic compounds. FARBW. v. M. L. & B. Brit., 15,950, July 3, 1914. Organoarsenic compds. are obtained by combining diazo compds. with derivs. of 3,5-diaminoarylarsinic acids substituted in the 4-position, or reduction products thereof. Products are specified from the following pairs of components: *p*-nitroaniline and 3,4,5-triaminophenylarsinic acid; aniline and 3,5,3',5'-tetraamino-4,4'-dihydroxyarsenobenzene; sulfanilic acid and 3,4,5',3',4',5'-hexaaminoarsenobenzene. The products have therapeutic properties. 3,4,5-Triaminophenylarsinic acid is obtained by reducing 3,5-dinitroarsenilic acid with FeSO₄ soln. in the presence of NaOH lye.

Acid chlorides. A. HOCHSTETTER. Ger., 283,896, Aug. 17, 1913. COCl₂, to-

gether with vapors of organic acids (chloroacetic acid), are conducted through a heated reaction chamber charged with porous bodies as contact substance. The yield is quant., and technical difficulties are eliminated.

Acid chlorides. A. HOCHSTETTER. Ger., 284,617, Aug. 17, 1913. One mol. of the alkali salt is heated in a closed vessel with at least 1 mol. of COCl_2 (for each carboxylic group present). E. g., 8.2 kg. anhydrous NaOAc are heated with 10 kg. COCl_2 in the autoclave at 120° , with continuous removal of the resulting CO_2 . After cooling and removing the residual CO_2 , almost pure AcCl , in a nearly quant. yield, is obtained upon condensing the vapor passing off with the CO_2 by strong cooling.

Salicyl chloride. R. WOLFFENSTEIN. Ger., 284,161, Dec. 20, 1911. Addition to 277, 659 (C. A. 9, 514). Salicylic acid is allowed to react, in the heat, preferably at the b. p. of the reaction mixt., upon SOCl_2 dissolved preferably in benzene or other indifferent organic solvent. The action is allowed to proceed until no more HCl and SO_2 are evolved.

Condensation products containing nitrogen. FARBW. v. M. L. & B. Ger., 284,291, Oct. 16, 1913. To obtain these products diarylamines or the corresponding carbazole derivs. are heated with epichlorohydrin to high temps. They serve for the manuf. of new dyes and also for pharmaceutical purposes.

Dihydric phenols and substitution products. C. F. BOEHRINGER & SÖHNE. Ger., 284,533, Mar. 15, 1912. Addition to 269,544 (C. A. 8, 2221). Dihydric phenols and their substitution products, such as the sulfonic and carboxylic acids, may be obtained from the corresponding dihalogen substitution products of aromatic hydrocarbons or their sulfonic and carboxylic acids, by heating these compds. under pressure with aq. alkali hydroxides or alkali carbonates in the presence of Cu or Cu salts as catalyzers. The process marks a material technical advance, and gives high yields.

Hydroxyanthrapyridones. FARBW. v. M. L. & B. Ger., 284,209, Oct. 18, 1913. Arylsulfonacetyl compds. of α -aminoanthraquinone are heated with alkali. The reaction proceeds smoothly.

Dry cultures of bacteria. R. MARCUS. Ger., 283,882, Mar. 8, 1913. The bacterial dry cultures obtained heretofore with the employment of starch or milk sugar have the disadvantage that the absorptive material (starch, milk sugar) cannot be rendered sufficiently sterile, so that the products are never pure cultures. Perfectly pure dry cultures may be obtained by this process with the aid of amorphous silicic acid which is easily sterilized and chemically unalterable. Undild. bacteria cultures can be preserved by the amorphous silicic acid, without weakening their activity. The silicic acid can be sterilized thoroughly by heat, and rendered anhydrous, since it is stable even at temps. of 600° . Furthermore, its insoly. in H_2O is an advantage, as is also its low sp. gr. In preparing the culture, the organisms or bacteria cultures, grown on suitable media or in liquid media, are ground up in a sterile mortar with purest amorphous sterilized silicic acid. Silicic acid obtained in the elec. osmotic way is preferred. Silicic acid is added equal to about 50% of the wt. of the pure cultures.

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

The barium industry in the United States since the European war. MAXIMILIAN TOCH. *J. Ind. Eng. Chem.* 7, 993-5(1915).—An address. E. H.

A new filling material for reaction towers, gas washers and fractionating columns. FRIEDRICH LUDWIG. *Chem. App.* 2, 247-8(1915).—Small cylinders of sheet or cast

Fe, Pb, Cu or stoneware about 1 in. in diam. and length, or larger if desired, the essential feature being that the length and diam. must be equal. The cylinders are loosely piled into the app. and give high efficiency with a minimum wt. of material. Cf. *C. A.* 3, 2211; 4, 2192; 5, 3614; 6, 2827; 7, 3051, 3863; 8, 214, 2924, 3101, 3352; 9, 258. J. H. MOORE.

Colloid industries. WOLFGANG OSTWALD. *Kunststoffe* 5, 217-9(1915).—A brief discussion of the role of colloid chemistry in the industries. F. W. SMITHER.

Chemical patents. III. Contractual rights relating to letters patent. S. C. MASTICK. *J. Ind. Eng. Chem.* 7, 984-5(1915). IV. Actions for infringement. *Ibid* 985-91, 1071-81; cf. *C. A.* 9, 2794, 3332. E. H.

Applied chemistry. L. H. BAKKELAND. *J. Ind. Eng. Chem.* 7, 978-81(1915); *Science* 42, 547-55(1915); cf. *C. A.* 9, 2970.—An address presented at the Seattle meeting of the Am. Chem. Soc. E. H.

Some American contributions to industrial chemistry. SAMUEL P. SADTLER. *Chem. Eng.* 22, 177-80(1915); cf. *C. A.* 9, 3118.—An address delivered at the National Exposition of Chem. Industries, Sept. 24, 1915. E. H.

The industrial resources and opportunities of the Northwest. H. K. BENSON. *J. Ind. Eng. Chem.* 7, 981-4(1915).—An address presented at the Seattle meeting of the Am. Chem. Soc. E. H.

The status of the chemical industries in the United States at the end of 1915. I. F. STONE. *J. Ind. Eng. Chem.* 7, 991-3(1915).—An address. E. H.

Comments on war and industry. WILH. VON SIEMENS. Berlin. *Technik. u. Wirtschaft* 8, 257-75(1915).—The chem. industry has been the most active and efficient of all industries in Germany in coping with the many national problems, such as, new explosives, new foods, substitutes for copper, etc. Comments are made on the effect of the war on the industries of Germany, England, France and United States. C. G. F.

The English chemical industry and the war. III. H. GROSZMANN. *Chem. Ztg.* 39, 761-4(1915). J. H. MOORE.

The status of chemical publications in Germany, France, and England during the war. H. G. *Chem. Ind.* 38, 241-2(1915). F. W. SMITHER.

Adhesive. J. MENSIK. Aust., 9,409, Nov. 5, 1913. Pulverized resin is treated with salicylic acid or its salts.

Sulfuric acid. M. SRECK. Brit., 16,187, July 7, 1914. The walls of H_2SO_4 chambers, etc., are supported by horizontal strips, tubes, etc., freely suspended by hooks. Flaps hooked on to or passed round the strips serve to secure these to the walls, and the strips are employed in short lengths to give freedom of movement to the walls of the chamber.

Sulfuric acid. F. CURTIUS & Co. Brit., 28,550 Dec. 10, 1913. The SO_2 gases are introduced into the first tower of the system when cold or at a temp. considerably lower than 250-300°, which is that usually employed. The method is particularly advantageous when using roaster gases, as it is not necessary to reheat them after they have been cooled by the necessary purification. The lower temp. allows the first tower to be packed with coke, and it is advisable to make this tower larger than usual and to supply it with acid containing only a small amt. of HNO_3 or nitrosulfonic acid. For this purpose, the first tower may be fed exclusively with the acid from the producing towers, and not with acid from Gay-Lussac towers.

Sulfur dioxide. A. BAMBACH. Brit., 3,174, Feb. 6, 1914. Sulfates such as those of Ba, Ca, or Sr are raised to a red heat by burning among the broken material a

mixt. of gas and air. A hood is applied to the kiln as soon as SO_2 is evolved. The reaction is completed either by continuing the supply of gas and air, an excess of air being finally admitted to produce an oxidizing flame for destroying the sulfide which has formed, or by supplying only gas, *e. g.*, water-gas, until the reaction is completed, after which only air is introduced. Sulfides may also be treated in a similar manner, only gas with excess of air, or air alone, being supplied to the red-hot material. When a volatile oxide is obtained, such as ZnO from blende, a settling chamber is necessary; when BaO is formed, arrangements are provided for drawing it off in the fused condition.

Synthesis of ammonia. M. PIER. Brit., 213, Jan. 3, 1914. Catalytic agents are employed consisting of Ir or Rh or their compds., either singly or together, and a contact carrier of an alk. or basic nature, the amt. of carrier being a multiple of that of the catalytic metal, etc. *E. g.*, Rh or Ir chloride is pptd. with alkali, the ppt. mixed with an oxide or carbonate of an alkali or alk. earth metal, such as K_2CO_3 or MgO , and the product dried; or the soln. of the chloride may be applied directly to the contact-carrier; or Cr_2O_3 , obtained by heating H_2CrO_4 , is satd. with Rh chloride, and the product dried.

Synthesis of ammonia. M. PIER. Brit., 214, Jan. 3, 1914. A catalytic agent is spread on or distributed through a support or contact carrier of MgO or MgCO_3 . The MgO or MgCO_3 may be used together with other supports; but in all cases the amt. of MgO or MgCO_3 is a multiple of that of the catalytic agent. The catalytic agents used may be the metals of the Pt group, or Fe, Ni, Co, Mo, W, or U, or compds. of these metals, *e. g.*, $\text{Fe}_3(\text{OH})_8$, K ruthenate, Ru oxide or hydroxide or chloride, or mixts. of the last mentioned substance with Ir or Rh chlorides.

Ammonia. F. W. DAFERT and R. MIKLAUZ. Brit., 16,597, July 11, 1914. NH_3 is obtained by treating Ba_3N_2 with H, forming an intermediate compd. $\text{Ba}_3\text{N}_2\text{H}_4$, which on further treatment with H gives NH_3 and BaH_2 . The BaH_2 is converted into nitride by means of N at a higher temp. By periodically varying the temp., the reaction can be conducted with a mixt. of H and N.

Titanium oxide. P. FARUP. Brit., 15,680, June 30, 1914.

Alumina; alkali aluminates. M. BUCHNER. Brit., 15,854, July 2, 1914. Clay or like material containing Al or AlN is treated with strong or dil. acid such as H_2SO_4 , and the salt soln. obtained is pptd. by NH_3 soln. or by gaseous NH_3 , which may be obtained by treating AlN with H_2O ; or gases such as coke-oven gas or Mond gas containing NH_3 , or by a basic NH_3 deriv. The mixt. of Al_2O_3 and $\text{Fe}_3(\text{OH})_8$ is treated with an alkali such as soda lye, and the Al_2O_3 is then recovered from the aluminate soln. by auto-pptn. To make the original filtration easy, the Al salt soln. should be strong, and the NH_3 should be in excess. Alternatively, when a trace of Fe may be left in the product, the original soln. may be treated with $(\text{NH}_4)_4\text{Fe}(\text{CN})_6$ or other ferrocyanide, and the $\text{Fe}_4[\text{Fe}(\text{CN})_6]_3$ filtered off and treated with NH_3 for the production of $(\text{NH}_4)_4\text{Fe}(\text{CN})_6$ for re-use, the purified Al salt soln. being then pptd. with NH_4OH , etc., as before, the alkali treatment being omitted. The aluminous material used may be first converted into AlN .

Chromium and iron chlorides. BADISCHE. Brit., 29,325, Dec. 19, 1913. Cr ores, such as Cr ironstone, are heated with gaseous HCl or Cl and with a reducing agent such as coal, coke, or CO , the products being sepd. by volatilization. When HCl is used, the FeCl_3 volatilizes and the Cr_2Cl_6 is dissolved out of the mass with H_2O ; when Cl is used, both chlorides usually volatilize, the Cr_2Cl_6 depositing on the cooler parts of the app. In examples, Cr ironstone and coke are heated in a current of HCl ; and Cr ironstone is heated in a current of CO and Cl until Fe_2Cl_6 is no longer evolved,

whereupon sol. impurities are extd. with H_2O and the Cr_2Cl_4 is extd. in any suitable way.

Ammonium sulfate. BADISCHE. Brit., 27,962, Dec. 4, 1913. Ammonium sulfate is prepd. by the reaction of $(NH_4)_2CO_3$ or NH_4HCO_3 with $CaSO_4$ in the presence of H_2O , and is filtered from the pptd. $CaCO_3$ by immersing in the suspension a filter consisting of a hollow frame or box with 1 or more permeable sides and provided with means for placing the interior of the filter under reduced pressure; the $(NH_4)_2SO_4$ soln. is thus drawn off, while the $CaCO_3$ sets in a layer on the outside of the filter and is subsequently washed thereon with H_2O while the reduction of pressure in the interior of the filter is maintained. In carrying out the reaction, the $(NH_4)_2CO_3$ or NH_4HCO_3 may be employed as such, or gaseous NH_3 and CO_2 may be passed into a tower, down which an aq. suspension of $CaSO_4$ is allowed to trickle. Cf. C. A. 9, 1834.

Hydrogen. BADISCHE. Brit., 27,963, Dec. 4, 1913. A mixt. of CO and steam is passed over a mixt. containing a catalytic agent and a body which promotes the activity of the catalytic agent. Suitable catalytic mixts. consist of Fe, Ni, or Co, or oxides thereof, mixed with O compds. of Cr, Th, U, Be, or Sb; Fe mixed with less than its wt. of Ni; Fe_2O_3 of low activity coated with finely divided Fe_2O_3 prepd. at a low temp.; or Zn, Pb, Cu, V, Mn, or Ti, together with a promoter. The efficiency of a given substance as a promoter may be detd. by carrying out parallel tests with the catalyst with and without the substance in question. The contact masses may be in powder, porous lumps, etc., and binders, carriers, etc., may be added. The production of H is preferably effected at temps. not exceeding 600° . Any suitable gas mixts. may be used, and the bulk of the CO may be first removed therefrom catalytically, or otherwise, if desired; H_2S , etc., may be previously removed by means of Cu, etc. The presence of Cl, P, B, or Si in the catalytic mixt. should be avoided, if necessary. The following examples of the prepn. of the catalytic mixts. are given: a mixed soln. of ferric and Cr nitrates, with or without Al nitrate, is pptd. by NH_4OH , and the hydroxides are filtered off and pressed into suitable shapes; a mixt. of ferric nitrate, NH_4 chromate, and Th nitrate, is heated to give the oxides; a mixed soln. of ferric nitrate, Ni nitrate, and Cr nitrate is pptd. by K_2CO_3 , and the ppt. is filtered, washed, shaped, and dried; Fe_2O_3 produced at a high temp. is mixed with moist $Fe_2(OH)_6$, made into lumps, and dried; fine-meshed Fe wire netting is treated with ferric nitrate soln., and heated to decompose the nitrate; Cr, Ni, or Al nitrate may also be added; ZnO is mixed with Cr nitrate and heated to decompose the nitrate; Cr nitrate or acetate is pptd. by NH_4OH , the hydroxide is mixed with pptd. ZnO, shaped and dried; BeO may also be used; a mixt. of $Pb(NO_3)_2$ or $Pb(OAc)_2$ and $UO_2(NO_3)_2$ soln. is pptd. with NH_4OH , the ppt. is filtered, made into lumps, and heated; Cu and Zr nitrate soln. is pptd. by Na_2CO_3 or K_2CO_3 , filtered, the alkali salt washed out partly or completely, and the product molded and dried; mixts. of oxides of Mn and Cr, Ti and Sb, V and Cr, or Cr and Th, are also suitable; Al_2O_3 , alkali carbonates, etc., may be added as binding-agents or promoters; a soln. containing Ce and Cr nitrates is pptd. with NH_4OH , the ppt. filtered off, partly dried, made into a paste, shaped, and dried; other rare-earth salts may replace the Ce nitrate.

Hydrogen. J. PINTSCH, AKT.-GES. Brit., 28,904, Dec. 15, 1913. In mfg. H from ferruginous material by alternate oxidation with steam and reduction, briquets are employed for lining and building the reaction chambers, which are composed of oxides or carbonates of Fe, together with oxides or carbonates of such metals as do not form hydroxides in contact with H_2O , particularly Mg, Ba, Sr, Al, or a mixt. of the oxides or carbonates of Ca and Mg in which the Mg compd. must exceed 75% of the mixt. The briquets are produced by mixing ground natural or artificial Fe_2O_3 , as pure as possible, with ground natural or artificial carbonates or oxides of Mg, Sr, Ba,

etc., including $\text{Al}(\text{OH})_3$, stirring the mixt. with H_2O to form a paste, pressing in molds, drying, and firing before use. Cf. C. A. 9, 1376.

Hydrogen. BADISCHER. Brit., 16,494, July 10, 1914. In the production of H by the process described in 27,955, 1912 (C. A. 8, 1853), there is employed, as catalyst, spathic Fe ore, or a hydroxide Fe ore, which has not at any stage of the process been subjected to a temp. appreciably higher than 650° ; the catalyst may be employed in the form of grains, or may be made into shaped pieces with the aid of binding agents, such as hydroxides or salts of Fe, Al, etc.; the presence of P, S, or Si is preferably avoided.

Hydrogen. K. SCHAEFER. Brit., 16,140, July 6, 1914. In the production of H by the alternate oxidation of Fe by means of steam and reduction of the oxide by reducing gases, the central zone of the vertical reaction chambers is filled with coarser particles of Fe than the outer portions to ensure ready passage of gas through the central zone. Vertical Fe bars or tubes may be disposed in the central zone with the charge loosely packed around them. A loose layer of broken pieces of stone or the like may be disposed in proximity to the charge at either end and serve as a heat accumulator or to superheat the steam or for burning the waste gases with air.

Fire-proofing. T. J. I. CRAIG and WHIPP BROS. & TOD. Brit., 16,153, July 7, 1914. Fabrics or fibers are fire-proofed by treatment with a soln. of alkali aluminate and then with a soln. of alkali hydrogen carbonate. After the treatment with alkali aluminate, the fabric may be dried and subjected to the action of CO_2 gas at a temp. above 100° before the treatment with the alkali hydrogen carbonate soln. The acid alkali carbonate soln., or the CO_2 gas, or both, may be applied under pressure. The result of the process is to ppt. an insol. double carbonate of alkali and Al.

Artificial mother-of-pearl. E. DOUZAL, L. DAVIAN and E. DELOUME. Brit., 16,070, July 6, 1914. Pellicles or layers of muscovite and gelatin or the like are superposed alternately and compressed while heated, and the block thus formed is immersed for a short time in a bath of HCHO . The muscovite may be previously immersed in a soln. of TiCl_4 and then strongly heated. The layers of gelatin or the like may be coated with fish scales or scales of pholerite or nacrite. The muscovite layers may be coated with the gelatin by immersing them in a soln. of that substance with or without fish scales or pholerite in suspension.

Treating waste liquids. G. EBRILL. Brit., 15,799, July 1, 1914. Nitrogenous substances are recovered from waste liquids by adding a precipitant, *e. g.*, passing the mixt. through a centrifugal filter, and then into a settling-tank in which the scum rises to the surface and is removed. The recovery of casein from creamery waste is specified.

Printing surfaces. S. A. C. KRISTENSEN. Brit., 15,935, July 3, 1914. Printing plates of light wt. suitable for ready transportation are made from a compd. sheet material as follows: The fibrous sheet of unsized paper, linen, etc., coated with metal compn., preferably Al powder and water-glass, as described in the parent specification, is backed with a carrier comprizing a thin sheet of substance capable of retaining impressions. A thin sheet of celluloid is suitable. This compd. sheet is molded on a matrix of the original plate. The matrix may be a cast in type metal from a flong made preferably by pressing a sheet of the compd. material described above into a matrix composed of Pb faced with a very fusible metal taken from the original. Cf. C. A. 9, 1672.

Electric insulating composition. F. D. BULL, W. HERMANN and RADONIT SYNDICATE. Brit., 26,716, Nov. 20, 1913. A fire and oil resisting and electrical insulating compn. is made from dried and ground skins, sinews, hoofs, etc. The animal matter is dried at about 80° and ground, and to it is added about 10% of fine wood pulp, and 10% of asbestos. To this is added 1% of asphalt, pitch, etc., and 20% of a liquid

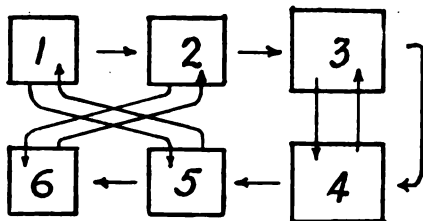
made up of equal parts of H_2O , animal or vegetable oil or fat, and fresh blood, and the whole is thoroughly mixed. If a hard compn. is required, the quantity of oil is reduced. The compn. is pressed in molds at a pressure of about 100 atms. and a temp. of 75° . The compn. after drying may be cut to shape; or the molds may be suitably shaped.

Horn or ebonite substitute. E. KRAUSE and H. BLÜCHER. Brit., 76, Jan. 1, 1914. Yeast residues, such as those obtained in the manuf. of yeast exts., are hardened with $HCHO$ and the product is molded and pressed with heating. Albuminous substances and suitable filling materials and suitable oils such as castor, linseed, or paraffin oil may be added to the compn. In an example, 100 parts of a paste of the yeast residue are mixed with 15 parts of 40% $HCHO$. H_2O is removed as far as possible by pressing and evapg., and the mixt. is molded and pressed at 100° at a pressure of several hundred atms. In another example, 30 parts of dry powdered albumin are added to 100 parts of yeast residue and 20 parts of $HCHO$.

Metal adsorptions. ELEKTRO-OSMOSE AKT.-GES. (GRAF SCHWERIN GES.). Brit., 15,267, June 25, 1914. Metals are reduced to dust in the presence of suspension colloids; scattering the metal, *e. g.*, Ni, by means of an elec. arc in the presence of a colloidal suspension of say silicic acid, is the preferred method. Suitable colloids are carborundum, clay, finely divided C, kaolin, or amorphous silicic acid. The metal adsorptions, particularly Ni adsorbed by silicic acid, are suitable as catalysts, *e. g.*, in hardening fats.

Separating air into oxygen and nitrogen. H. RUNGE. Brit., 3,420, Feb. 10, 1914. The sepn. is effected by means of liquefaction and rectification. The air is subjected preliminarily to a process of dialysis to increase the % of O therein. This is preferably effected by providing a taffeta sack in the suction inlet of the compressor.

Sulfuric acid. E. HARTMANN (v. E. HARTMANN & F. BENKER). Ger., 284,636, Dec. 13, 1912. A tower system comprizes 6 or more towers. The first tower forms with the next to the last tower in the series, and the second tower forms with the last tower in the series, each a completely closed acid spraying system. The method of spraying towers 3 and 4 remains unchanged. In the usual method of operation, the acid is carried through the series of towers by the gases in the form of a mist, entering tower 5, which performs, in the main, the function of the Gas-Lussac tower, the performance of which is influenced so that an increased consumption of HNO_3 results. To overcome this difficulty the towers 1 and 5, and 2 and 6 are paired, so that the acid from tower 5, which has the highest HNO_3 content, is conducted to tower 1, so that the formation of H_2SO_4 is effected in the first of the series of towers. As a result of this method of spraying, HNO_3 content of the acid flowing from tower 1 is dependent upon the temp. of the entering gases. If this is not sufficient, the acid can be drawn from tower 2. This is possible inasmuch as tower 2 obtains the acid from tower 6 which contains less nitrous gases than does tower 5.



Sulfuric acid. METALLBANK UND METALLURGISCHE GES. AKT.-GES. and H. KLENCKE. Ger., 284,995, Nov. 25, 1913. Increasing the capacity of a tower system without chambers for the manuf. of H_2SO_4 , by directing the gases, from above downwards, in part or all of the acid-forming towers. This practice has been followed already in the operation of denitrification towers (Glover towers). However, the operation of such a tower is fundamentally different from that of an exclusively acid-forming

tower. When the gases are downwardly directed in acid-forming towers they come in contact with the strongest nitrous gases present in the particular tower at a point where the gases have a greater content of SO_2 . As a result, nitrous and roast gases pass in intimate contact the entire height of the tower filling, so that a very vigorous reaction can take place. At the same time the resulting acid vapors may condense more readily without opposing an increased resistance to the gases, whereby the capacity of the tower is increased. The gases pass from one tower to the next in a condition much better suited for further reaction.

Nitrogen oxides. BADISCHE. Ger., 284,815, Mar. 13, 1914. See Brit., 13,687 (C. A. 9, 3337).

Alumina. F. HIRSCH and F. RUSS. Ger., 284,601, Apr. 10, 1912. Obtaining alumina from aluminate lyes by the Bayer process, according to which the aluminate lyes, obtained from bauxite, are stirred up with $\text{Al}(\text{OH})_3$. Expts. have shown that by the passage of ozonized air or ozonized O through such aluminate lyes, before or during the stirring process, the lyes which are otherwise yellow, yellowish red, to deep brown, are completely decolorized, so that the process may be carried out more quickly, the decompn. resulting from the agitation is more complete, and the resulting $\text{Al}(\text{OH})_3$ and the compds. obtained therefrom (e. g., $\text{Al}_2(\text{SO}_4)_3$) show a pure white color. The yield is greater, power is saved, and the app. for a certain amt. of product can be much smaller. While a lye treated according to the usual process gave a yield of only 31.4% pptd. $\text{Al}(\text{OH})_3$, the ozonized lye gave a yield of 60.4% $\text{Al}(\text{OH})_3$.

Pure colorless ammonium salts. GEBR. HINSELMANN. Ger., 284,641, Sept. 23, 1913. Salts which do not discolor upon storing are obtained from slightly colored crude salts, by heating the crude salts without volatilization in order to convert the troublesome H_2O -sol. impurities into insol. substances, and to free the salts therefrom by crystn. The impurities are converted, by a definite heat treatment of the salt, into H_2O -insol. compds., with marked intensification of color, so that they may be readily sepd. by filtration, and so that with a single crystallization of the filtered soln. a salt seps. which is pure white and not subject further to discoloration. E. g., NH_4SCN , which is present in NH_4NO_3 , not discernible in the fresh salt but imparting to the salt upon long standing a yellow or red color, cannot be removed from the salt even by repeated filtration and recrystallization. If, however, the solid crude NH_4NO_3 be heated to 135–140°, the NH_4NO_3 reacts with the NH_4SCN in such manner that the latter is converted into an insol. compd., apparently perthiocyanogen, which, upon subsequent soln. of the crude salt and filtration, can be obtained in the state of a fine slime from the liquor. The filtrate then yields a white or slightly yellow odorless NH_4NO_3 , which does not change even upon long keeping. In like manner, from the condensate may be obtained a stable white NH_4Cl , as practiced in the direct recovery of NH_3 from distillation gases. E. g., in the direct recovery of NH_3 salt from distillation gases, the gases are cooled to about 90°, and a condensate seps. which contains, principally, NH_4Cl , is exceptionally colorless, but contaminated with thiocyanate and S compds., as well as H_2O -sol., tarry substances. If the salt obtained from this condensate be heated to 200–250°, the salt blackens as a result of sepn. of C and the conversion of the impurities into H_2O -compds. After soln. of the salt and pptn. of the H_2SO_4 by means of BaCl_2 , filtration, and crystallization, a white odorless pure salt is obtained, and a black powder is left which can be used as a pigment.

Compounds of the rare earth metals. GEBR. SIEMENS & Co. Ger., 284,889, Apr. 2, 1913. Fluorides and phosphates of the rare earth metals are obtained by adding the corresponding compds. of the alk. earths or of Mg or Al to a soln. of the rare earths. An aq. chloride soln. or other aq. salt soln. can be employed for the soln. of the rare earth. The fluorides or phosphates of the alk. earths are suitable as pre-

precipitants. The compds. of the rare earths are obtained directly in the form of a rapidly settling uniform ppt. suitable for further working. E. g., the waste liquors of the Th manuf. can be pptd. by means of finely ground natural fluor spar, which produces a ppt. of the fluorides of the rare earths. Also, native ground apatite or other natural Ca phosphate may be employed, giving then the phosphates of the rare earths. When fluor spar is employed, some HCl or other mineral acid should be used to hasten the reaction, and the mass should be heated and stirred. E. g., rare earths 15.7 kg. (consisting of Ce chloride $\frac{1}{3}$ and La and Di chlorides $\frac{1}{2}$) are dissolved in H₂O 84.3 liters and heated to boiling, whereupon HF 7.5 kg. and HCl 1-2 kg. are added to the soln. with stirring. The soln. is maintained at the b. p. until the earths have been completely pptd., a period of 1-2 hrs. being sufficient. An addition of NaCl hastens the sepn. The ppt. is washed with H₂O, filtered, and dried. The yield of dry powder is 12.1 kg. fluoride, i. e., 96% of the theoretical.

Thionylchloride and sulfur tetrachloride. CHEM. FABRIK BUCKAU. Ger., 284,935, Apr. 15, 1914. COCl₂ and SO₂ are allowed to interact at temps. of 200° and above. These are preferably conducted, in gaseous state, over heated catalyzers. CO may be mixed with these gases, or a mixt. of CO and Cl may be used instead of COCl₂. The mixt. of SO₂ and Cl may be replaced by SO₂Cl₂ which is heated, in vapor form, with CO. E. g., liquid SO₂ 10 kg. is mixed with COCl₂ 10 kg., and the mixt. is heated in a high pressure autoclave for several hrs. at 250°. The CO₂ forming as a result of the reaction may be allowed to escape, from time to time, to relieve the pressure. After the reaction has proceeded to completion, the residual CO₂ and the excess SO₂ are allowed to escape, and the reaction product is subjected to distn. after the addition of some free S to convert the higher S chlorides into S₂Cl₂ which, by reason of its high b. p., can be sepd. readily from SOCl₂. If a mixt. of 2 vols. SO₂, 1 vol. COCl₂, and 3 vols. CO is conducted through a porcelain tube filled with charcoal heated to 400°, the escaping gas condenses, in part, in suitable condensers, while CO escapes. The condensate consists essentially of S₂Cl₂, mixed with small amts. of SOCl₂ which can be removed by distn. The manuf. of SOCl₂ is materially cheapened by this process.

Hydrogen. CHEM. FABRIK GRIESHEIM-ELEKTRON. Ger., 284,816, Mar. 14, 1914. The H is manufd. from C, gases containing CO, steam and alkali or alk.-earth hydrides. When gases containing CO and steam are conducted over Ca(OH)₂ or NaOH at temps. of 450-550°, H is obtained. This reaction is favored materially by employing increased pressure and correspondingly increased temps. In the same period of time 4 times as much H can be secured as when operating at atm. pressure. Either steam or a mixt. of steam and gases containing CO is conducted over a mixt. of alkali or alk.-earth and C, or a mixt. of steam and CO is conducted, at an increased pressure, over alkalies or alk.-earths. Pressures of 10-100 atm. and over are employed. If gases containing CO are to be acted upon alone, good yields are secured at 5 atm. pressure. With the use of lime, a temp. of 600-800° is suitable, and with the use of Ba(OH)₂ and alkali, a materially lower temp. may be employed. Especial advantages are secured by conducting steam, under a pressure of 10 atm. and more, over a mixt. of lime and coal, almost pure H being obtained. The reactions proceed in the sense of the equations: $C + 2H_2O = CO_2 + 2H_2$; $CO_2 + CaO = CaCO_3$; $CO + H_2O = CO_2 + H_2$. Since the thermal effect is strongly positive, generally the application of heat is not required in sufficiently large app. If the process is carried out without the use of water-gas, the generator is filled with a mixt. of coal and lime, and the combustion of the lime and the production of H₂O can be effected in a tower. The coal present in the tower with the lime serves both as a source of heat and for the decomposition of the steam. When the charge has been brought to the desired temp., the supply of air is discontinued, and H₂O or steam is conducted, from above, over the

mixt., at 20 atm. pressure. The burned lime is discharged from below, mixed with fresh coal, and returned to the process. Brown coal or charcoal is preferred since they react more quickly and at lower temps. than hard coal and coke.

Solid plastic masses. C. HAGENBORG. Ger., 284,214, Feb. 19, 1914. Addition to 274,179 (C. A. 8, 3129). Instead of the more or less turbid product obtained by the principal process, a clear opalescent or transparent mass is obtained if the albumin soln. or the blood serum is brought almost or quite to dryness by heating with HCHO soln. and alkali peroxide or with a neutral peroxide, such as H_2O_2 , in the presence of a caustic alkali. E. g., 10 parts of a 40% HCHO soln. and 0.25 part Na_2O_2 are added, with stirring, to 100 parts of ox blood serum, and the mixt. is evapd. to about $\frac{1}{4}$ its vol. The residue mixes with the phenol and HCHO mixt. clear or almost clear, and does not become turbid upon subsequent heating. Even better is the evapn. of the serum mixt. to a gelatinous consistence or wholly to dryness. The residue is then heated with a mixt. of 100 parts phenol and 100 parts HCHO soln. (40%) or 40 parts trioxymethylene, and 20 parts Na_2SO_3 , for 8-10 hrs., at 80-90°.

Mixture of asbestos fiber and hydraulic binder. J. FÜRST ZU COLLOREDO-MANNSELD. Ger., 284,595, Apr. 2, 1913. Construction and operation of an app. for mfg. the mixed product.

Mixing drum for preparing a mixture of asbestos fiber and hydraulic binder. J. FÜRST ZU COLLOREDO-MANNSELD. Ger., 284,599, Apr. 2, 1913.

Reflectors. M. WISKOTT. Ger., 284,611, Dec. 10, 1913. Plastic masses, such as cement, gypsum, casein, hard gum, papier maché, clay, and the like, are shaped over forms with parabolic, hyperbolic, and the like surfaces. The shaped products are not treated further by polishing.

Separating substances of different specific gravities. A. GRÜNDLER. Ger., 284,666, Oct. 30, 1912. The process is applicable especially to firing residues. A sepg. liquid of intermediate d. is employed. Cf. Fr., 460,225 (C. A. 8, 2798).

19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLININGER.

The influence of alumina on the fusibility of glasses. FELIX SINGER. *Keram. Rundschau* 23, 65-6, 78-9, 95-6, 103-4(1915).—Modifications of the ordinary window glass are made by additions of Al_2O_3 , by use of pegmatite. Variations are also made in Na_2O , CaO and SiO_2 . The results show that small amts. of Al_2O_3 increase fusibility. The improvement by use of Al_2O_3 is especially noted with 0.6 CaO , 0.4 Na_2O and 2.5-3.0 SiO_2 .
R. K. HURSH.

Studies of glass fusions with antimony compounds. L. SPRINGER. *Sprechsaal* 48, 211-12, 221-22(1915); cf. C. A. 9, 2135.—In both leadless and lead glasses Sb_2O_3 and $Pb_2(SbO_4)_2$ had no coloring effect; metallic Sb was incompletely dissolved; Sb_2S_3 gave yellow but caused turbidity in Pb glass.
R. K. HURSH.

Turquoise-blue copper glazes. H. HECHT. *Sprechsaal* 48, 201(1915).—Silicates of K and Na with $3SiO_2$ dissolve CuO with deep blue color. Introduction of CaO , MgO , BaO , B_2O_3 , or Al_2O_3 gives green. With $3SiO_2$ equimol. parts of K_2O and PbO give blue; increase of PbO gives green; B_2O_3 and Al_2O_3 give intense green. Cf Hecht, *Tonind. Ztg.* 1895, 453, and Granger, C. A. 8, 1000.
R. K. HURSH.

Thermal conductivity of refractory materials. ANON. *Brit. Clayworker* 24, 128(1915).—Review with comments.
C. H. KERR.

Deterioration of fire clay. T. HOLGATE. *Brit. Clayworker* 24, 122(1915); see *C. A.* 9, 2384. C. H. KERR.

The replacement of English kaolin (China clay) by domestic materials. R. RIECK. *Specksaal* 48, 183-5, 191-3, 199-201(1915).—Tests show German kaolins generally finer grained than china clays. Hygroscopicity was detd. by desiccation over 10% H_2SO_4 and by drying at 120°. R. concludes that the Atterberg plasticity factor is less a measure of plasticity than hygroscopicity. The best white is obtained with lowest $TiO_2 + Fe_2O_3$. To replace English clay use one of moderate plasticity, low Fe_2O_3 and very low TiO_2 . R. K. HURSH.

Gas versus electrically heated ovens. G. H. TROUT. *Iron Trade Rev.* 57, 526 (1915).—A discussion of the advantages of clean producer gas over elec. heat for firing enamelling ovens. The cost with producer gas is claimed to be less than one-third of the cost of elec. heating. F. A. S.

French cones and Seger cones. A. GRANGER. *Céramique* 18, 22-3(1915).—The compn. of the French and of Seger cones is described. J. C. EVANS.

Properties of soil particles and the plasticity of soils (ATTERBERG) 15. Electrical porcelain (AUSTIN, *et al.*) 4.

Silica glass. P. L. PFANNENSCHMIDT. *Brit.*, 420, Jan. 7, 1914. The glass is manufd. in an elec. furnace fitted with several resistances which are specially adapted to be rapidly withdrawn. The interior of the furnace is filled with sand, and the current is passed through a number of resistances arranged in parallel and series, in graphite blocks. When the sand is fused, the resistances are drawn out on a trolley running on rails. One of the hinged lids is then opened, and the mass of fused SiO_2 is rapidly withdrawn. The distance apart of the walls of the furnace, and hence the thickness of the slab of SiO_2 produced, can be adjusted by screws. The furnace is mounted on trunnions so that it can be charged in the horizontal position and turned into the vertical position for heating operation.

Treating ceramic argillaceous materials. E. TUSCHHOFF. *Brit.*, 29,421, Dec. 20, 1913. These materials are prepared for molding by grinding the material sufficiently fine to pass through a bolting screen of 5,000 meshes per sq. cm., then submitting the ground material, mixed with a small amt. of H_2O , oil, or other liquid assisting compressibility, to a kneading treatment in a pug-mill or like machine by which the material is pressed into cakes or lumps, which, when crumbled up and if necessary screened, yield a grain suitable for the molding process.

Glass-blowing machine. FAIRMOUNT GLASS WORKS. *Ger.*, 284,546, Apr. 30, 1913. Machine for blowing hollow glassware. Cf. *C. A.* 9, 137.

Glass-blowing machine. H. KÖHLER. *Ger.*, 284,547, May 28, 1913.

Glass-blowing machine. GLASMASCHINENFABRIK SYSTEM J. WOLF. *Ger.*, 284,649, May 9, 1914.

Automatic cutting-off device for automatic glass-blowing and -pressing machines. J. MAINZER. *Ger.*, 284,516, Mar. 24, 1914.

Basic lining for revolvable tube furnaces. W. HAPPE. *Ger.*, 284,809, Jan. 4, 1914. Addition to 281,207 (*C. A.* 9, 2301). For the burning of the lining, the sheet Fe shell is replaced by a structure of refractory material which may be finally removed by breaking up into small pieces, while the furnace is hot. If stones or plates of MgO , chromite, clay, or C are used, they may be left in the furnace, and serve, for the first run, as the lining. The sheet Fe segments are only necessary when stamping in the plastic mass. The warm mass is stamped behind the sheet Fe shell, and allowed to

cool. The cooled mass has sufficient strength to allow removal of the sheet Fe shell from the cold furnace. In place of the shell, a ring of arch brick is built in the lining mass. When the refractory masonry work is finished, the fire is kindled to coke the gas and solidify the basic lining, or hot gas is conducted through the interior. After cooling is complete, the refractory work is removed, which may be accomplished readily without injury to the lining. The removed material can be used again.

Refractory coarsely porous masses. L. KERN. Ger., 284,435, Dec. 4, 1913. Construction and operation of a furnace for their manuf. A mixt. of silicates, alumina, and the like, mixed with combustible matter, is burned, with the employment of a strong draught.

Tunnel furnace. P. J. LENGERSDORFF. Ger., 284,810, Feb. 15, 1914. The furnace is built up of portable chambers.

Tunnel furnace for burning bricks and pottery. W. DRAYTON. Ger., 284,338, Sept. 30, 1913. The cars in this furnace are adapted to run lengthwise.

Charging and mixing apparatus for clays. N. ORT. Ger., 284,753, Sept. 18, 1912.

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

The German cement industry and the war. ANON. *Chem. Ztg.* 39, 769(1915).

Standard specification for cement. ANON. *Yearbook Am. Soc. Testing Materials*

1914, 290-317.—*Natural cements:* Residue on no. 100 sieve shall not be more than 10%, on no. 200 not more than 30%. It shall not develop initial set in less than 10 min., and hard set in less than 30 min. or in more than 3 hrs. The minimum tensile strength for briquets 1 sq. in. in cross-section shall be as follows, and the cement shall show no retrogression in strength within the periods specified: neat cement, 24 hrs. in moist air, 75 lbs.; 7 days (1 in moist air, 6 in H₂O), 150 lbs.; 28 days (1 in moist air, 27 in H₂O), 250 lbs.; 1:3 Ottawa sand mortar: 7 days (1 in moist air, 6 in H₂O), 50 lbs.; 28 days (1 in moist air, 27 in H₂O), 250 lbs. Pats kept in moist air for 24 hrs., then in air at normal temp., and pats kept in moist air for 24 hrs. and then in H₂O as near 70° F. as practicable shall remain firm and hard and show no disintegration, distortion, checking or cracking for at least 28 days. *Portland cement:* Sp. gr. shall not be less than 3.10. When sp. gr. is low cement sample may be ignited at low red heat and sp. gr. redetd. Loss in wt. shall not exceed 4%. Residue on no. 100 sieve shall be not more than 8% and on no. 200 sieve not more than 25%. It shall not develop initial set in less than 30 min. and must develop hard set in not less than 1 hr., nor more than 10 hrs. Minimum tensile strength requirements on briquets with 1 sq. in. cross-section (neat cement): 24 hrs. in moist air, 175 lbs.; 7 days (1 in moist air, 6 in H₂O), 500 lbs.; 28 days (1 in moist air, 27 in H₂O), 600 lbs.; 1:3 Ottawa sand mortar: 7 days (1 in moist air, 6 in H₂O), 200 lbs.; 28 days (1 in moist air, 27 in H₂O), 275 lbs. Cement shall show no retrogression in strength within the period specified. Pats for constancy of vol. shall be kept in moist air for 24 hrs. (a) A pat is then kept in air at normal temp. for at least 28 days. (b) Another pat is immersed in H₂O as near 70° F. as practicable for at least 28 days. (c) A third pat is exposed in any convenient way in an atm. of steam above boiling H₂O for 5 hrs. The pats shall remain firm and hard and show no signs of distortion, checking, cracking or disintegrating. Cement shall not contain more than 1.75% SO₃, and not more than 4% MgO.

A. A. KLEIN.

New Argentine specifications for portland cement. *Mill. Z. Deut. Port. Cement* 3, 333-6, 347-50(1914).—The hydraulic modulus must be at least 1.7; ignition

at a red heat for 30 min. must give a sp. gr. of at least 3.05 in the LeChatelier-Candlot volumometer. Not over 5% residue may remain on the 900-mesh nor over 30% on the 4900-mesh sieve. Normal consistence is detd. with the Tetmeyer piston and setting time with the Vicat needle. Initial set is 35 min. to 3 hrs. and final set not over 10 hrs. Tension tests with the shot running at the rate of 100 g. per sec. must show at least 30 kg. sq. cm. at 7 days and 35 kg. sq. cm. at 28 days. The mortars are machine-mixed, are hammered into the molds and must show in tension 12 kg. sq. cm. at 7 days and 16 kg. sq. cm. at 28 days. Vol. constancy is estd. with cold H₂O pats and LeChatelier tongs, not over 10 mm. expansion being allowed after heating at 100° for 6 hrs. One evapn. is made for SiO₂, Fe is pptd. with KOH, dissolved and reprecipitated with NH₄OH and CaO is weighed as sulfate. SO₃ detns. must stand for 24 hrs. For general work 1.2% SO₃ is permitted, while for work in fresh H₂O or in air up to 2% SO₃ is allowed. The MgO may not exceed 4%. Cf. C. A. 7, 1792; Burchartz, C. A. 7, 3651.

A. J. PHILLIPS.

Tests to determine shrinkage and time effects in reinforced concrete. F. R. McMILLAN. Univ. of Minnesota. *Eng. Contr.* 44, 306-10(1915); cf. C. A. 9, 1985, 3345.—Beams tested were 5½ in. deep, 30 in. wide and 12 ft. long between supports. Concrete consisted of 100 lbs. cement, 2 cu. ft. sand, 4 cu. ft. stone, hand mixed. Results show that shrinkage of ¾ to 1 in. in 100 ft. can be predicted when concrete is exposed to ordinary dry air of a heated building. Changes in moisture content will retard shrinkage and even cause swelling. The yielding of concrete under compressive stress with time is greater as the unit stress is greater and goes on indefinitely. The deformation was found to be 3-5 times that produced immediately upon application of load. The time yielding under stress combined with shortening due to shrinkage may result in deformations 15-20 times those expected from calcns. A. A. KLEIN.

Results of the testing of cement, sand and the concrete produced from their mixture. H. BURCHARTZ. *Mitt. kgl. Materialprüfungsamt* 32, 474-96(1914); *Chem. Zentr.* 1915, I, 811.—Tests were made of the sand, cement and the concrete to det. the qualities of the concrete, the strengths of various mixts., to establish the influence of the age on the hardening process and the relation between the properties of the mixts. and the strength of the concrete. Curves showing the tensile, compressive and bending strengths are given. Especially fine grinding does not necessarily give the highest strengths.

J. C. EVANS.

The setting and hardening of portland cement. H. SCHEIDLER. *Mitt. Deut. Port. Cement Ind.* 4, 13-4, 20-2, 25-8, 32-3(1915).—In the microscopic examn. of fine powders on slides with H₂O, for their hydration behavior, alizarin orange and cryst. alizarin in ammoniacal soln. were found suitable for CaO and chromotrop 2R and cyanin for Al₂O₃. Varied mixes of the silicates and aluminates were burned in Pt crucibles up to 1480° and examd. microscopically for their behavior in hydration. With 1.5 CaO.Al₂O₃ and CaO.SiO₂ no action was noted, but as the CaO in the silicate was increased the amount of gel formed likewise increased. In the mixt. 2CaO.Al₂O₃ with CaO.SiO₂ clusters of radiating needles were found which were not found in hydrated clinker. The plate crystals increased in size and number as did the amt. of gel with increase in the CaO content of the mixts. The combination 3CaO.Al₂O₃ with 2CaO.SiO₂ produced typical Ca silicate needles which were observed with a dark field illuminator. The latter pass over to a fine-grained gel. For comparison with Keiser-mann's formula for port. cement 3CaO.Al₂O₃ + 4(2CaO.SiO₂) (cf. C. A. 5, 1328), one mol. each of analcite, laumontite, chabasite, leucite and a synthetic zeolite CaAl₃-Si₂O₇ were mixed with 10 mols. of freshly burned CaO and observed on slides after mixing with water. The synthetic zeolite showed the least reaction but all gave gel and silicate needles after 5 days while no Ca(OH)₂ crystals were observed at all. From

sintering these same mixts. and a study of their structural formulas, it is concluded that the zeolite radical in cement raw mixes is broken down by the CaO to form $3\text{CaO} \cdot \text{Al}_2\text{O}_3 + 4(2\text{CaO} \cdot \text{SiO}_2)$ and by varying the CaO till a well sintered clinker was formed which would hydrate with H_2O , the boundary limit for good clinker was placed at 56.71 CaO, 12.91 Al_2O_3 and 30.38 SiO_2 . Comparative hydration tests of underburned, normal and overburned cements showed that the normal cements gave the most regularly developed crystals in the shortest time. The overburned material was slower in reacting while the underburned cement reacted very weakly even after a long time. From a comparison of the compressive strengths of 86 cements with their hydration behavior under the microscope it is stated that the value of the cement may be predicted from the amt. of plate, needle and gel formation taking place. The rate of cooling of the clinker influences the formation of silicate needles during hydration, since if the clinker is very rapidly cooled, the viscous silicate remains in a metastable condition and on mixing with water the gel formation takes place with the exclusion of other products. Further, $3\text{CaO} \cdot \text{SiO}_2$ sintered without the presence of Al_2O_3 dusted down and gave silicate needles on hydration, while with a burn in which Al_2O_3 was present only gel formation was noted on hydration. Ca aluminate hydrated as a gel and it is probable that the silicate needles and gel vary only in their H_2O content. All hydration products are referred to as plates, needles or gel and no optical data are given.

A. J. PHILLIPS.

The effect of soft soap on cement mortars and concrete. ANON. *Mitt. Dent. Port. Cement Ind.* 4, I, 7-9(1915).—A review with bibliography. The fatty acid of the soap not only combines with the CaO to make an impermeable mortar, but also by removal of CaO prevents the formation and growth of crystals of $\text{Ca}(\text{OH})_2$ which might cause disintegration.

A. J. PHILLIPS.

Preservation of cement in presence of oils and fats. S. CANEVAZZI. *Mitt. Dent. Port. Cement Ind.* 3, 429-30(1914); cf. C. A. 6, 3507.—Tension and compression tests are given on briquets stored for 20 months under pure and rancid olive oil. The results show that when 20% of the sand is replaced by fine ground puzzolana, there is no deterioration in the strength of the cement and only a loose spongy coat of soap is formed on the surface of the briquets.

A. J. PHILLIPS.

Microscopic study of concrete. N. C. JOHNSON. *J. Am. Soc. Mech. Eng.* 37, 516-25(1915); cf. C. A. 9, 1380. Discussion. J. R. FREEMAN, et al. *Ibid* 525-8.—Further investigation is called for on the solubility of the ultimate compds. resulting from the setting of cement. Attention is likewise called to several cases in which concrete did not set even after several weeks until a shock was administered such as the running of machinery or the working of air riveters on concrete forms. Recent investigations have shown that CaO and MgO, likewise Al_2O_3 and Fe_2O_3 , do not act chemically alike in cements; therefore they cannot be used as chem. equivalents in computing formulas. Cf. Upton, C. A. 9, 2137.

A. J. PHILLIPS.

Relative resistance to wear of concrete made of different aggregates. C. F. SHoop. *Bull. Univ. Minn.; Eng. Contr.* 44, 144-7(1915).—Different aggregates were used in a 1-2-4 concrete from which rings were made to fit a Talbot-Jones brick rattler, standard cast iron shot being used. The speed was adjusted to give a tumbling as well as abrasive action. In addition the rings were subjected to the abrasive action of horse-shoe calks. Comparative tests were made and tabulated for crushing flexure and shear. The results showed that concrete cured wet and kept wet showed minimum abrasion, as the shot were covered with a paste which acted as a cushion. With gravel concrete the gravel was kicked out forming pockets which wore to holes; with hard stones the cement bond wore away leaving an uneven surface and, further, cleavage lines in the stone were disadvantageous. Crushed stone gave a better bond than gravel and the

most evenly wearing surface was found with sandstone, as the bond and stone wore down together. In rattling with calks the % of wear was not found to be a direct measure of the value of the stone for concrete roads.

A. J. PHILLIPS.

The nature of high magnesia portland cements. P. H. BATES. *Mitt. Deut. Port. Cement Ind.* 4, 31-2, 43-5, 51-2(1915); cf. *C. A.* 8, 1653; 9, 2702. Discussion. R. DYCKERHOFF, C. GOSLICH AND M. GLASENAPP. *Ibid* 58-62.—Unsintered cements containing high MgO content show no harmful expansion while if the concrete is sintered expansion starts at the earliest in 1 yr. and the test interval noted by Bates is too short for conclusive results. The glassy material in clinker forms 20-25% of the whole and contains MgO, Fe and alkalis. With constant burning temp. the more MgO there is in the clinker the less fusible is the glass and the less well sintered is the clinker. In rich MgO mixts. a part of the MgO goes into the silicates and aluminates (cf. Klein and Phillips, *C. A.* 6, 3172) displacing some CaO so that free CaO remains in the clinker. Fe oxide in the presence of MgO goes into the glass with difficulty and tends to remain free (cf. Glasenapp, *C. A.* 8, 2236). From the strength test figures it is concluded that not over 7.4% MgO content in B.'s burns will give cements passing specifications. B.'s burns were more fusible than the usual cement raw mixes on account of the addition of feldspar which increased the amt. of alkali present. MgO also has a tendency to prevent the taking up of Fe by the clinker materials. The presence of spinel and montecellite in B.'s burns is considered as an indication that satn. of the clinker minerals by the bases present was not complete on account of insufficient temp. being used in burning.

A. J. PHILLIPS.

The use of coal tar in creosote. Report of Committee on Wood Preservation. *Proc. Am. Roy. Eng. Assoc.* 16, 825-7(1915).—Recognizing that the use of creosote-coal-tar mixts. for the preservation of timber is extensive, but not possessing sufficient data specifically to recommend their use, the committee proposes a specification covering refined coal-tar creosote solns. and recommends its use to those who desire to purchase such an oil. The purchaser should be permitted to exam. the coal tar before it is mixed with the creosote, as a detn. of the quality of the tar after its addition is difficult. Precautions are given for the use of those desiring to purchase crude coal tar and creosote and mix them at the treating plant. The crude tar should not contain over 5% free C, and not over 25% should be used. The mixt. should be made at 82.3°.

GEO. M. HUNT.

Water in creosote. Report of Committee on Wood Preservation. *Proc. Am. Roy. Eng. Assoc.* 16, 827-32(1915).—Water may become mixed with creosote (1) in the process of manuf., due to presence of water in the crude tar, condensation from steam or air used to agitate the tar in the stills, leaky condenser coils, steam pipes inside of oil lines or steam coils in storage tanks; (2) in transit, due to leaky steam coils in tank cars or leaky seams or bulkheads in ships; (3) at the treating plant due to the treatment of wet timber or steamed timber, leaky steam coils, and the use of a water seal in uncovered storage tanks. The detn. of water content is simple but great care must be used in sampling. Methods of sampling are discussed. The amt. of water in creosote may be reduced by (1) siphoning after settling, (2) boiling and condensing the distillate to save any oil passing over, (3) by centrifuging. The use of water-free oil is desirable but not always practicable. In good practice, up to 3% of water is permissible. Allowance should be made when over 3% is present, but oils containing over 6% should never be used.

GEO. M. HUNT.

Rapid drying and preservation of wood by Nodon's electric process. C. DANTIN. *Genie civil* 65, 98-101; *Bull. Agr. Intelligence* 5, 1650-2.—The process consists of stacking timber 3-5 ft. high and inserting an electrode mat between each layer. These are made of pliable galvanized wire netting covered with strong jute cloths, satd. with

water and connected so that the a. c. passes through the thickness of each layer of timber. The treatment lasts 1-2 days, and the wood is then air-dried for a few weeks. The cell sap is completely oxidized so that only resinous substances remain. The cellulose is so modified that it does not readily putrefy and inherent fungi and germs are destroyed. One cu. m. (35 cu. ft.) of wood requires 150 amp.-hrs. with an e. m. f. of 40 v. for wood in full sap and 80-100 v. in unbarked wood kept for some time. Wood of all kinds can be thus treated and when used for road paving is more durable than untreated wood.

Strength tests of structural timbers treated by commercial wood preserving processes. H. S. BERRY AND J. A. NEWLIN. Forest Products Lab., U. S. Dept. Agr., *Bull.* 286(1915).—Strength tests were made of 8 × 16 in. bridge stringers of longleaf pine, loblolly pine and Douglas fir, untreated and treated by com. creosoting processes. The pine was steamed 4 to 6 hrs. at about 30 lbs. pressure before injecting the creosote. Part of the D. fir was treated by the "boiling" process and part by the "steaming" process. In the former the wood was heated in creosote 21½ hrs. at 215° F. (atm. pressure) and in the latter it was steamed at 90 lbs. for 4¼ hrs., followed by a 20-inch vacuum for 18½ hrs. before the creosote was injected. It was found that the treatments given caused practically no loss in breaking strength in the longleaf pine. The breaking strength of the loblolly pine was decreased, probably not more than 17%. The av. breaking strength of the D. fir, boiling process, was reduced 33 to 39%, steaming process 35%. Small clear sticks cut from the beams after breaking also showed loss in breaking strength due to treatment. Other tests indicated that weakening in D. fir may be due to stresses caused by rapid and unequal shrinkage in large beams. Further tests are being made. The authors make the following deductions: (1) Timber may be very materially weakened by preservative processes. (2) Creosote in itself does not appear to weaken timber. (3) A preservative process which will seriously injure one timber may have little or no effect on the strength of another. (4) A comparison of the effect of a preservative process on the strength of different species should not be made unless it is the common or best adapted process for all the species compared.

Gao. M. HUNT.

The protection of wood against decay by means of paints and coatings. F. MOLL. *Kunststoffe* 5, 169-71, 182-5, 210-2, 219-22(1915).—A general review and discussion based on the patent literature. These are grouped as follows: (1) tar and bitumen materials, (2) rubber, (3) mixts. with linseed oil or varnish, (4) water glass mixts., (5) lacquers, (6) mixts. of tar with resin, etc., (7) mixts. of tar with CaO, cement, etc., (8) mixts. of tar with salts (Zn, Cu, etc.), (9) mixts. of petroleum with other materials (tars, etc.), (10) CaO, clay, cement, and gypsum. A chronological list of patents by countries is given. Bibliography.

F. W. SUMMERS.

Recent results obtained from the preservative treatment of telephone poles. F. L. RHODES AND R. F. HOSFORD. *Proc. Am. Inst. Elec. Eng.* 34, 2343-87(1915).—The preservatives consist of distillates of coal- or wood-tar; the efficiency increases with the % of antiseptic and H₂O-insol. constituents. Data are given for treatment under pressure, in open tank and by the brush method. All timber should be completely framed and dry before treatment. Proximate soil compn. and altitude exert some influence. Rates of decay, increase in life by treatment, effect of seasoning and characteristic damages caused by decay and by insects are discussed. In the brush method, the preservative, at 49°-65°, is applied to the butts of seasoned poles with a brush. A second coat is applied after the first has worked in. Only dead oil of coal tar was used in the open tank method. Butt ends are immersed in the hot preservative and kept there till bubbling ceases. Greater penetration results and poles show little decay. Analyses of the preservatives are given and show naphthalene to com-

pose 45-50% of the distillate. The conditions to which the top of the pole is exposed cause more rapid removal of the volatile constituents than occurs in the butt. Tables, figures and a bibliography are appended.

W. H. BOYNTON.

Resinates for preserving wood and textiles (VAN VLOTEN) 26.

Cements. A. DENNY and D. G. ANDERSON. Brit., 16,560, July 11, 1914. A cement consists of a mixt. of anhydrous gypsum and from 2 to 10% of cryst. FeSO_4 or the equiv. of anhydrous FeSO_4 or salt, containing FeSO_4 with or without 1-4% of slaked lime or portland cement, and filling materials such as sawdust, coke breeze, etc. A soln. of the sulfate may be sprayed upon the gypsum. The product may be used as a flooring for ships' decks.

21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

Vivian Byam Lewes. ANON. *J. Soc. Chem. Ind.* 34, 1077(1915); *J. Gas Lighting* 132, 243.—Obituary. E. H.

Chemistry of coal. J. P. WIBAUT. *Chem. Weekblad* 12, 758-65(1915).—W. reviews the following topics: the unsatd. compds. in coal, self-combustion, ability to form cokes, extn. with solvents, destructive distn., distn. at low pressure, inflammability, binding of N and origin of coal.

J. T. FLOHIL.

Methods of utilizing lignite. S. M. DARLING. *J. Gas Lighting* 131, 456-7(1915).—The article is a very satisfactory abstract of a report by D. on lignite of Southern Saskatchewan. The output of lignite in Saskatchewan is falling off from the former average of 200,000 tons annually, as lignite is not able to hold its own against coals. A large number of samples tested averaged 26.13 H_2O , 28.11 volatile hydrocarbons, 38.16 fixed C, 6.86 ash and 0.74% S. Exposure in warm air causes disintegration and slacking, while the tendency towards spontaneous combustion makes shipping and storing impracticable. Its light gases escape unconsumed, and it has no coking quality whatever. Its low % of S ensures absence of H_2SO_4 in burning and of H_2S in gasification. After the difficulties of carbonization are solved, lignite is found to yield good results by destructive distn. Early efforts gave a gas of poor illuminating value, unless burned in a mantle, but very serviceable for fuel and power-purposes: 15.9 CO_2 , 3.5 illuminants, 0.2 O_2 , 19.5 CO, 16.1 CH_4 , 43.9 H_2 , 0.9% H_2O , 3.2 c. p., 440 B. t. u. per cu. ft.; the residue (in a fine state of division) defied quenching. To get a large yield of oil, the process would be so slow as to be unprofitable, unless a continuous, slow heating retort be devised. The finally successful carbonizing bench is a vertical chamber oven, like a horizontal by-products oven, charged and discharged continuously. The crushed lignite is distributed to the several retort sections, and is later discharged and screened into bins in an atm. of (exhaust) steam in which it will not burn. Each layer or column of lignite in a retort section is 6 in. thick and has heat driven into it by heating flues on either side. A section holds 4 tons; an oven carbonizes 24 to 36 tons of raw lignite per 24 hrs. The gradual application of heat in carbonizing results in a substantial increase in the yield of hydrocarbon by-products, at high speed by a mechanical process. Rapid evolution of gas takes place at 700°-900° F. and evolution ends at 1000° F. Products per ton of lignite in round figures are 10,000 cu. ft. gas, 15 gal. oil or tar (water-free), 65 gal. ammoniacal liquor, 955 lbs. C residue, obtainable in good commercial practice. The fact that there is more gas from a ton of lignite than is required to carbonize the next ton offers several possibilities for disposal of a surplus heat value. On distn. of the oil or tar, the fractions are

11.5% light oils, 13.5% carbofic oils (some $C_{10}H_2$) 34.1% paraffin, and 24.5 hard pitch. Fifteen lbs. of $(NH_4)_2SO_4$ per ton of lignite are easily recovered by crystg. from H_2SO_4 soln. The dust and smaller sizes of the screened carbonized lignite must be briquetted; the larger lumps constitute an ideal producer-gas fuel. for the amt. of gas is equal to that from anthracite, while it is richer, has less tar and clinker, and burns more freely.

B. W. GRIMES.

The history of the development of water gas. O. B. EVANS. *Trans. Intern. Gas Congress 1915* (adv. copy), 35 pp.—The author gives a bibliography of the history of water gas mfr. He confines his paper to the description of the more important types of app. used in the past, pointing out the basic principles, advantages, and failures of each, and showing how the present app. has been evolved. The retort system was abandoned because of excessive fuel consumption and gas losses and inward leakages. This system was replaced by the generator retort system, in which the coke was heated by internal combustion, and the up and down run features introduced. The changes in app. necessitated by substituting bituminous for anthracite coal are described, such as coking the soft coal by waste heat or by the admixture of small quantities of secondary air. Principles of water gas operation are discussed: 1. The temp. of the carbureter and superheater is kept constant to 20°C . by large quantity of checker work and short blows and runs, and the gas oil is run in under only 20 lbs. pressure without preheating. 2. Up and down runs and blows now last about 3 and 2 minutes, respectively, thus keeping a more even temp. in the generator. 3. The blast is worked under 20 lb. pressure, and the length of the blow decreased, thus getting max. capacity for given investment and making towards good oil results. 4. With a high rate of blasting, careful provision for catching dust must be provided to prevent clogging of the checker work. 5. The installation of air and steam meters and thermo-electric pyrometers enables control of the process certain. 6. Proper selection of coal does not entirely do away with similar troubles. 7. The ash is easily fusible, it solidifies around the grate, while if it is difficultly fusible, the slag collects under up the walls of the generator. Automatic operation of a water gas set has been accomplished at Pensacola, Fla.

F. L. CALVERT.

Carbonate of potash for purifying gas. T. PETER. *J. Gas Lignite* 1915, 245-6 (1915, Dec. 16 no. 23, 57, 1915).—The dry purification of gas is becoming commonplace to gas managers, consequently they have exercised their skill in trying to supercede it. The result has been the finding of numerous processes or the use of HCN and Na_2S by the wet method. Preference is given to a salt of Na_2CO_3 on the reason that, during the whole course of the process no sediment is produced, the liquid remaining as clear as water. In the sequence of the purifying plant, the 3 washers are placed after the Na_2S washers. When our gas is treated with a Na_2CO_3 salt, the impurities are absorbed, and the gas leaves the washer in a purified state. The great merit claimed for the Peter system is the regeneration of the potash. Air passed through the acid salt, takes out the HCN and HCN , and the salt is again a working solution. Its production in equal is first established in the salt between Na_2CO_3 , Na_2S , and K_2CO_3 , the liquid thus becoming saturated; during regeneration the air takes out not only the HCN but also a part of the CO_2 . During chimney gases with the air and heating the salt liquid to 20°C . during regeneration will increase considerably the speed of the process. The solution is carried out with 100 lbs. water. The regeneration process is continued until a nitroprusside salt is fused with a nitric acid with the liquid.

J. V. JAMES.

Report of refractory materials research committee, 1914-5. I. J. COLLIER. *J. Gas Lignite* 1915, 277-285.—The members of the Refractory Committee representing the Institute of Mining and Metallurgy and the manufacturers have suggested the

matter of the removal of dust from "grog," and recommended no alteration in the specification that the "grog" employed in the manufacture of retort material must be free from dust and contain nothing that passes through the standard 16-mesh sieve (pieces of under $\frac{1}{32}$ inch linear dimension) prescribed by the Inst. Min. and Met.

B. W. GRIMES.

Benzene recovery from town gas supply. W. R. HERRING. *J. Gas Lighting* 131, 569(1915).—H. has studied the possibilities of recovering toluene from coal gas without depreciating the luminous or calorific value of the gas. At a small exptl. plant in Edinburgh he tried washing the gas in a Holmes rotary washer (1) with light grade coal-tar oil (sp. gr. 0.9862 and flash point 151° F.) and (2) with the same oil to which had been added 5% pure benzene (this mixt. distd. at 92° and contained no toluene). Using the washing oil not treated with C_6H_6 , the gas was reduced from 16.11 c. p. to 10.51 c. p. (or 34.7%) and from 585.3 B. t. u. (gross) to 559.1 B. t. u. (or 4.5%). With washing oil, treated with C_6H_6 , the gas was reduced from 16.08 c. p. to 15.06 c. p. (or 6.34%) and from 579.4 B. t. u. to 576 B. t. u. (or 0.58%). The most significant fact is that coal gas can be scrubbed of benzene and toluene with so little (4.5%) loss in heating value.

F. L. GROVER.

Measurement of illumination. ANON. *J. Gas Lighting* 132, 27-8(1915).—An app. is described for detg. the "equivalent" surface brightness of any sort of material.

F. L. GROVER.

Formal order establishing 520 B. t. u. as Canadian standard. ANON. *Am. Gas Light J.* 103, 164(1915).—The Dominion Government sets standard calorific value of gas as 520 B. t. u. per cu. ft. of satd. gas, burned in satd. air, and the products of combustion leaving the calorimeter at substantially the same temp. as the factors enter. Vol. of gas is measured at 60° F. and 30 in. pressure. Penalties for gas below standard range from \$10 to \$80, according to the size of the company. In effect, July 1, 1915.

F. L. GROVER.

Flameless surface combustion of gases. L. SCHMIDT AND F. KRIEGER. *Z. Beleuchtungsw.* 21, 85-6(1915).—Owing to the comparatively high pressure required for successful operation, surface combustion burners have not met with much favor in the home. This obstacle has been overcome in the following manner (cf. Ger. Pat. 280,040; C. A. 9, 1841): The pores of a porous cap of asbestos or the like are coated with a catalytic agent such as Pt black; the cap is fitted to an ordinary bunsen burner fed with low pressure illuminating gas. The cap sets snugly and all gas must pass through the "catalytic" pores. After opening the cock the gas is allowed to pass through the pores for a few secs. Thereupon a match is applied; the flame soon disappears as the asbestos heats up. Readily combustible substances such as gasoline will not ignite when its vapors are brought into contact with the glowing cap; accordingly this burner is to be recommended for labs. where combustible liquids are used. The efficiency of the bunsen burner for heating purposes is decidedly increased by the addition of the asbestos cap.

C. G. FINK.

The Elswick works of the Newcastle-upon-Tyne and Gateshead Gas Co. ANON. *J. Gas Lighting* 132, 20-3(1915).—The  shaped, direct fired and hand charged retorts of the Elswick Gas Works have been replaced by producer gas-fired vertical retorts. Plans and elevations of the new vertical retort houses and accessories are given. Figures showing differences between the old and new systems are given.

F. L. G.

Some considerations as to calorific value and calorific standards. J. T. DUNN. *J. Gas Lighting* 132, 34-5(1915).—D. shows that the "Argand" burner test for c. p. deals unfairly with the poorer gases, and that the luminosity test is neither necessary nor sufficient. The heat energy derivable from combustion of a unit vol. of gas is the

only rational standard, since most gas is used in gas engines, for heating, or for lighting by incandescent mantles. The "gross" calorific value (heat derived from combustion starting with gas and air at 60° F., and ending with the products of combustion at the same temp.) is an arbitrary fig. and does not really conform to the way gas is usually burned, but it is constant for each sample of gas. D. also points out that the value of gas for incandescent mantles depends upon the heat value per unit vol. of the gas and air mixt., and this is approx. the same whether the gas be poor or rich.

F. L. GROVER.

British practice in condensation, washing and scrubbing of coal gas. W. B. DAVIDSON. *Trans. Intern. Gas Congress 1915; J. Gas Lighting 131, 699(1915)*.—A comprehensive review.

B. W. GRIMES.

British practice in purification of coal gas. J. F. BELL. *Trans. Intern. Gas Congress 1915; J. Gas Lighting 131, 699-700(1915)*.—A comprehensive review.

B. W. G.

Blue water gas and deep fuel combustion. A. G. GLASGOW. *Trans. Intern. Gas Congress 1915; J. Gas Lighting 131, 705-6(1915)*.—Three laws of combustion may be developed as represented by the reactions: (1) $C + O_2 = CO_2$. (2) $CO_2 + C = 2CO$. (3) $2CO + O_2 = 2CO_2$. As commercially applied to gas manuf., deep-fuel combustion may be classified under 4 heads: (1) The continuous mfg. of industrial gas, in which incomplete-combustion products are used as a vehicle to convey the energy of the fuel to some point of useful application outside the generator. The gases must contain the max. amount of combustible CO. (2) Producer gas. This gas is the result of admitting to the bed of anthracite coal or coke a quantity of steam, so proportioned to the vol. of air that the desired temp. is maintained in the fuel-bed by a proper balance between the heat generated by the incomplete combustion with the O of the air to CO, and the heat absorbed by the decomposition of the steam to H_2 and CO. (3) The intermittent manuf. of water gas, in which the gas-making operation is frequently intermitted for a recuperating air blast, designed to restore to the fuel-bed the heat which has been previously extracted in decomposing the steam into water gas (H_2 and CO). (4) A "combustion" process, whereby any desired proportion of the heat energy developed during the air blast period is conveyed by the blast products to an extraneous point of application, while the remainder of such heat energy is stored in the fuel-bed for the subsequent decompn. of steam into H_2 and CO.

B. W. GRIMES.

The substitution of heating value for candle power as a standard of gas quality. R. S. MCBRIDE. *Trans. Intern. Gas Congress 1915 (adv. copy), 41 pp.* McB. shows that hardly 5% of the total gas consumed is in the open flame light, yet the candle power standard is only especially useful in detg. the quality of gas for this use. The quality of the 95% of the gas for the other uses depends almost entirely on the heating value, and its value should be judged by calorific tests. A gas of high candle power must also have high calorific power, but the converse is not true. The new system would be especially advantageous to the gas maker because of the greater ease of regular operation to meet the heat unit standard, and of the superiority in accuracy of heat measurements over candle power measurement. An economic discussion of the applicability of the heat standard follows.

F. L. GROVER.

A review of the present practices in the manufacture and distribution of gas by British undertakings. EDWARD ALLEN, W. B. DAVIDSON, J. FERGUSON-BELL, W. HOLR, F. W. GOODENOUGH AND J. BOND. *Trans. Intern. Gas Congress 1915 (adv. copy), 111 pp.*—This is a symposium consisting of five papers upon (1) condensation, washing, and scrubbing, (2) purification, (3) distribution, (4) sale, and (5) carbonization as practiced in the gas manufacture in Great Britain. Many photographs and drawings of English plants are inserted.

F. L. GROVER.

A coke oven expert's views on the recovery of benzene, toluene, etc., from coal gas. ANON. *J. Gas Lighting* 131, 502-3(1915).—The "expert" describes the theory and practice for recovering benzene and toluene from coke oven gas by the use of light creosote oils. The account is thorough and valuable. B. W. GRIMES.

The production and recovery of toluene from illuminating gas. ANON. *J. Gas Lighting* 131, 635-6(1915); cf. preceding abstr.—This question is rather a different problem for the coal gas engineer from what it is for the coke oven man on account of these considerations: (1) the necessity of leaving a certain quantity of benzene in the gas to give it the necessary calorific value and illuminating power and to prevent the deposition of $C_{10}H_8$, (2) the possibility of increasing the hydrocarbons in the gas without a decrease in the vol. of gas made per ton of coal carbonized, and (3) the best and most suitable method of recovery of the toluene which allows the benzene vapors to remain in the gas. After presenting the advantages and disadvantages of various methods of washing, the author concludes that creosote is commercially impossible for most coal-gas works. The "synthetic" process of Leo Vignon, in which lime is used as a catalyst in the carbonization of coal, presents great possibilities on the question of increasing the % of toluene in gas and tar, and lends itself especially to the "C" process of washing, at coal-gas works. During a 3 months' period at a medium-sized modern works using this process, increased yields and better quality have been noted in the production of gas, tar, coke, ammonia and toluene. B. W. GRIMES.

Weston-super-mare new gas works. ANON. *J. Gas Lighting* 131, 446(1915).—A compact detailed description is given of a modern gas works capable of producing 1,000,000 cu. ft. of coal gas per day, with provision for slight extensions which would increase the total output to 2,000,000. Mention is made of several commendable features. B. W. GRIMES.

Carbonizing mixtures of coal and coal dust. D. T. R. VAN LËNNEP. *J. Gas Lighting* 131, 520(1915).—From a mixt. of 80% of gas coal and 20% of fine dust a sufficient quantity of gas and a coke of good quality can be produced. The coke is better coked, less porous, and of greater resistance, and the gas has a higher calorific value than might have been expected. The distn. period is shorter than for gas coals only. The thorough mixing required is best obtained by first breaking the gas coal to a size of less than $1\frac{1}{2}$ in. B. W. GRIMES.

U-tube carbon dioxide indicator (CUNNINGHAM) 1. Determination of hydrogen in gas mixtures (BOSSHARD) 7. Electrical precipitation (DUSHMAN) 4. Estimation of traces of carbon monoxide in air (GAUTIER) 7. New filling material for gas washers (LUDWIG) 18. Gas *versus* electrically heated ovens (TROUT) 19.

Fuel for internal-combustion engines. T. FRANK. *Brit.*, 28,072, Dec. 5, 1913. It consists of 50% or less of one or more aliphatic hydrocarbons of high calorific value, such as peat oil, kerosene, or their distillates, and the unrefined carbinols produced from raw peat, i. e., fusel oil and the lower alcs. The carbinol and hydrocarbon are preferably mixed as vapors and condensed together. The peat may be treated in the app. described which comprises a disintegrator, a steam heater and agitator to reduce the mass to mud, a steam-jacketed vessel in which the mud is sprayed, agitated, and heated with acid to liberate suitable carbohydrates, and an autoclave. Subsequently, the mass is neutralized, fermented, pressed, and distilled in known manner.

Destructive distillation. OIL & CARBON PRODUCTS, LTD. *Brit.*, 15,368, June 26, 1914. In a process of effecting destructive distillation, condensable volatile products are sepd. from solid carbonaceous material such as coal, shale, or peat by moving such material under non-oxidizing conditions through a retort, the various regions of which

are maintained by indirect heating at temps. increasing from the end at which the material is introduced, and by causing the gases evolved from the various portions of the material to pass into contact with relatively cooler portions of the material in its solid or partly vaporized state, whereby condensed volatile matter is obtained in, and can be removed from, the retort in liquid form. The gases may be conveyed by a gaseous medium, which may be the washed and purified product from the retort. The temp. at the hottest part of the retort need not be more than about 600°. A suitable app. is specified.

Destructive distillation. R. F. STRONG. Brit., 15,980, Aug. 21, 1913. Peat, nut-shells, sawdust, shale, coal, or other carbonaceous materials are distd. in a series of superimposed retorts, the uppermost of which is a masticating retort. Cf. C. A. 9, 371.

Gas producer. E. FLEISCHER. Brit., 10,408, Apr. 27, 1914. Bituminous fuel, after passing through a preliminary distn. chamber, is preheated in a compartment before reaching the main combustion zone from which the hot gas is withdrawn by a main outlet pipe. Air is supplied at a point near the bottom, and a secondary supply of air, preferably mixed with steam, is admitted higher up and serves to burn that portion of the gas which passes through the compartment towards a secondary outlet; the hot combustion products serve to distil the fuel in the preliminary distn. chamber.

Coking. F. LAMPOUGH. Brit., 15,892, July 2, 1914. In an app. for the low-temp. distn. of coal, the coal is introduced into the system of retorts by an improved measuring hopper of the kind provided with an air-lock. The rate of supply through the hopper may be regulated by means of a variable speed gear.

Metallurgical coke. L. FRANCK. Brit., 28,941, Dec. 15, 1913. For a coke low in S, part of the usual lime addition to the coal before coking is replaced by a P compd. such as phosphorite, phosphate chalk, apatite, or vivianite. A further addition consisting of Mn ore such as MnO_2 may be made for the purpose of oxidizing the S compds. and causing them to be carried away by the gases. To increase the content of phosphide of Fe in the coke, Fe compds. may also be added.

Water gas. DELLWIK-FLEISCHER WASSERGAS GES. and P. KOSTER. Brit., 884, Jan. 12, 1914. In the process described in 304, 1914 (C. A. 9, 1686) after the fuel has been subjected to an air blast in a downward direction, steam is supplied at the bottom of the fuel bed, and steam and air at a point midway of the fuel bed, the water-gas outlet being at the top.

Drying peat. THOS. RIGBY. Can., 164,844, Sept. 14, 1915. A wet pulp of peat is digested under pressure sufficient to prevent ebullition until its H_2O is rendered freely expressible, the treated pulp is spread in a thin layer, suction is applied until it has acquired sufficient solidity for handling as a solid, and then it is further dried. Cf. C. A. 9, 3126.

Recording consumption of coal. M. BRESLAUER. Ger., 284,028, Oct. 15, 1913. The app. comprizes a tilting container set in the masonry work and serving to receive a feeding charge and deliver it into the fire box, together with a counting mechanism actuated thereby. During charging of the container the opening in the masonry work is closed on the fire box side, while the opening is closed at the outer surface during delivery of the charge to the fire box.

Briquetting. C. FOHR and E. KLEINSCHMIDT. -Ger., 284,789, June 20, 1913. Addition to 263,158 (C. A. 7, 3831). Briquetting with bituminous binders, according to the parent process, but with the use, instead of pitch, of other binders (asphalt, thick tar, resin) which are blown directly into the material to be briquetted after being atomized and dried to a powder by cooling.

Gas generator. A. BORMANN GEB. BLUMCHER. Ger., 284,702, Nov. 18, 1913. Constructional details of a generator with indirect gas heating.

Revoluble grate generator. J. PINTSCH, AKT.-GHS. Ger., 284,264, Mar. 27, 1914. The shaft and the revoluble grate are ring-formed.

Grate for gas generators. H. GORHTZ. Ger., 284,447, Mar. 24, 1914. A revoluble ash pit is provided.

Coke ovens. E. FUHRMANN. Ger., 284,039, Apr. 29, 1913. A device is provided for closing the discharge openings.

22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

The light-sensitiveness of petroleum asphalt. PAUL GÖDRICH. Vienna. *Chem. Ztg.* 39, 832(1915); cf. *C. A.* 9, 3127.—Eight % solns. of hard pitch in C_6H_6 were filtered to remove the insol. C, and Zn plates were covered with a film by pouring the soln. over them and evapg. the C_6H_6 . Printing under a negative and developing in turpentine oil showed that only paraffin-free pitch is sensitive. Soft pitches gave no image. Sulfuring with S_2Cl_2 to 12% S destroyed the sensitiveness, in contradistinction to natural asphalt in which the sensitiveness is increased by S. Cf. *C. A.* 7, 1804. J. H. M.

Contributions of the chemist to the hardwood distillation industry. S. W. KATZENSTEIN. *J. Ind. Eng. Chem.* 7, 940-2(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc. E. H.

Contributions of the chemist to the naval stores industry. JOHN E. TREPLE. *J. Ind. Eng. Chem.* 7, 931-2(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc. E. H.

What chemistry has done to aid the utilization of wood. S. F. ACREE. *J. Ind. Eng. Chem.* 7, 913-5(1915).—An address delivered at the Seattle meeting of the Am. Chem. Soc. E. H.

Use of coal tar in creosote 20. Water in creosote 20. New filling material for fractionating towers (LUDWIG) 18. Deodorization of oil refinery waste (HESSER) 14. Oil regions of northwestern Mexico (GARFIAS) 8. Oil pools of Oklahoma and Texas (GARDNER) 8.

Benzine substitute. H. PLAUSON and P. SCHRÖDER. Brit., 4,340, Feb. 19, 1914. Brown coal or lignite is mixed with an equal proportion of a hydrocarbon, such as naphtha, a small amt. of alkali or alk.-earth nitrate is added, and the mixt. is sprayed into a distn. chamber in the presence of air and steam at a temp. of 600-700°. Low-boiling products are obtained.

Distilling mineral oil residues. W. SUMPF. Brit., 16,383, July 9, 1914. Mineral oil residues are mixed with peat dust, oily waste, and similar porous substances and are distd. at 900-1000°. The app. comprizes 2 retorts provided with perforated sheet metal containers running on rail-like ribs. The retorts are first brought to a bright red heat, and the charged containers are then inserted. The vapors pass from the upper retort to the lower retort by a pipe, and are collected from the lower retort by a perforated pipe.

Distilling mineral oil residues. W. SUMPF. Brit., 16,384, July 9, 1914. Mineral oil residues are mixed with refractory inorg. substances, such as wrought-Fe turnings, and are distd. at high temps. The turnings may be placed in a retort maintained at a

bright red heat, the residues being run into the retort continuously by means of a perforated pipe.

Cracking heavy hydrocarbons. E. GRAEFE and R. v. WALTHER. *Brit.*, 25,510, Nov. 7, 1913. The hydrocarbons are distd. under a pressure of about 20-30 atms. For this purpose an autoclave heated by a Pb bath may be employed, the pressure being obtained by closing a valve in the vapor outlet pipe during the initial heating, and afterwards adjusting the valve to maintain the pressure during the distn. The resulting gases and vapors may also be heated under pressure in a sep. large chamber in order to effect the combination of the H with the unsatd. hydrocarbons. A series of autoclaves may be used, the oil flowing from one to the other. The products are led to a condenser for the sepn. of gasoline, etc.; the uncondensed gases are gradually compressed for the successive sepn. of petr. ether and liquid illuminating gas, the residual uncondensed gas being used for heating, lighting, or power purposes.

Freeing cracked mineral oils from malodorous and resinifying substances. ALLGEMEINE GES. FÜR CHEM. IND. *Brit.*, 3,572, Feb. 11, 1914. This is effected by treatment with a salt of a heavy metal having a condensing action, such as SnCl_4 , ZnCl_2 , Fe_2Cl_6 , or CuSO_4 , and then distg. The oil and salt may be heated together, and the salt removed before distn. The residue left in the still is a viscid mass which ultimately solidifies to a glass-like mass.

Cracking hydrocarbons. L. HIRSCHBERG and POTENTIAL DEVELOPMENTS, LTD. *Brit.*, 4,573, Feb. 21, 1914. The voluminous Cr_2O_3 obtained by calcining Cr salts of volatile bases, such as NH_4 chromate or dichromate, is employed as the catalyst in the conversion of heavier hydrocarbons into lighter hydrocarbons. The process is effected by passing the hydrocarbon as finely divided liquid, or vapor, or gas, over the Cr_2O_3 at a dull-red heat. Other catalysts may be employed in conjunction with the Cr_2O_3 , e. g., Pt black, Ni, Cu, Pd, or Mn oxide, also carriers such as asbestos, silica wool, coke, fire-brick, etc. The hydrocarbon treated may be mixed with steam, H, air, or inert gas. Suitable hydrocarbons for treatment are: bituminous and mineral oils, such as crude oil, tars, tar oils, residuum oil, solar oil, paraffin oil, benzine, etc.; hydrocarbon waxes, such as ozokerite, paraffin wax, or ceresin; hydrocarbons from coal, etc., such as coal tar, bitumen, asphalt, water-gas tar, anthracene, creosote, naphthalene, etc.; gases containing hydrocarbon vapors, such as crude coal-gas or natural gas. The vapors resulting from the process are condensed and treated in any suitable manner by fractional distn., cracking, scrubbing, washing, refining, rectifying, etc. According to examples, light oil and gas are obtained from kerosene and creosote oil; also, according to the provisional specification, benzene is obtained from anthracene oil. Suitable app. is specified.

Atomizing burner. R. O. KEWITZ. *Ger.*, 284,293, Apr. 3, 1914.

Burner for liquid fuel. I. LERTORA. *Ger.*, 284,446, Jan. 25, 1914. The burner is provided with a multiple atomizing device which is operated by air or steam, and with a ring of exit nozzles which produces a spreading mixt. of combustible material. The pre-atomized mixt. is conducted through small nozzles, each of which extends, at an angle, into one of the delivery nozzles, wherein further atomization is effected.

Oil-fired heating furnace. GEBR. PIERBURG. *Ger.*, 284,738, July 8, 1914.

23. CELLULOSE AND PAPER.

A. D. LITTLE.

Sulfite waste liquors and their utilization. W. KIBY. *Chem. Ztg.* 39, 212-4, 261-3, 284-5, 307-8(1915).—In the usual processes for obtaining fermentable sugars

from wood by hydrolysis with acids under pressure, the sugar undoubtedly results from the hydrolysis of the cellulose of the wood. It is not conceivable, however, that fermentable sugars present in waste sulfite liquor could have been formed from the cellulose of the wood. Pressures higher than those used in the sulfite cooking process are necessary for the hydrolysis of wood cellulose and, furthermore, SO_2 is a poor hydrolyzing agent for cellulose. The fermentable sugar in waste sulfite liquor most probably is derived from other carbohydrates present in the wood and represents merely a residue of the sugar which was formed and again decomposed during the cooking process. It follows that proper regulation of the sulfite cooking process to decrease decomposition of sugars formed would have a favorable effect on sugar yields. A step in this direction is König's process in which a preliminary mild cook for the purpose of sugar production is followed by a more severe cook for the purpose of cellulose production. The earliest important processes for the production of alc. from waste sulfite liquor were those of Ekstrom and Wallin. The yields claimed by Ekstrom, namely, 115 liters abs. alc. per ton of cellulose, are higher than can be accounted for by the amt. of fermentable sugar in the waste liquors and are to be attributed to alc. fermentation of yeast food added. The Strehlenert, the Rinman and the Achenbach processes for the utilization of sulfite liquor are of importance. The Landmark process for the production of alc., which depends upon the freeing of the waste liquor from SO_2 , evap., neutralizing and fermenting with the addition of milk as a yeast food, possesses certain advantages but the rate of fermentation is exceedingly slow. Fermentation would be hastened by aeration. A by-product of this process is a ligno-casein containing 65% of casein, which is stated to be suitable for paper size. The residue, after fermentation, is dried for fuel purposes. Generally speaking, no utilization of waste sulfite liquor can be considered complete unless full recovery is made of the sugars present. Economic operation requires (1) concn. of liquor, (2) fermentation, (3) distn. in well designed still. Operation and performance of a suitable still and rectifier is described in some detail.

V. NUNEZ.

Toughening action of nitric acid upon filter papers. CLAYTON BEADLE. *Chem. News* 112, 143-4 (1915).—The tips of filter papers may be very conveniently toughened to resist filtration by suction by placing them in a dry funnel and treating them with a small vol. of HNO_3 (d. 1.42) for a few seconds. When filter papers are toughened all over in this manner the rate of filtration is but $\frac{1}{3}$ that of the untoughened. When the apex only is toughened, the rate of filtration is at first much higher than that of the untoughened paper but is lowered to an equal value when water is filtered. V. N.

Alkali cellulose. COURTAULDS, LTD. and L. P. WILSON. Brit., 14,675, June 18, 1914. The treatment with oxidizing agents, as described in 13,055, 1914 (C. A. 9, 3130), is assisted by the addition of a catalyst, such as the oxides or hydroxides of Fe, Ni, and Co. *E. g.*, wood pulp is soaked in FeSO_4 soln., pressed and dried; the mass is then treated with NaOH soln. in the usual way, and allowed to oxidize in the usual boxes, or by treating with a current of air. Or wood pulp is treated with NiSO_4 soln., pressed, and dried; the mass is then treated with NaOH soln. containing Na_2O_2 . The products obtained by these treatments may then be treated with CS_2 for the production of the xanthate.

Boiling cellulose. J. O. LUNDBERG. Ger., 284,628, June 4, 1914. An app. is specified for use in carrying out the process of boiling cellulose, by the sulfate treatment, with the employment of preheated boiling liquor.

Solutions of cellulose acetate. BADISCHE. Ger., 284,672, Jan. 16, 1914. Cyclohexanone and its homologs may be employed to advantage as solvents in the manuf. of varnishes of nitrocellulose. Cyclohexanone has been found suitable also for the soln.

of cellulose acetate sol. in acetone or only softened by acetone. The soln. of cellulose acetate in cyclohexanone may be dild. directly with benzene and its homologs, but a small addition of acetone permits also the use of this diluent or its homologs, so that cheaper solns. can be obtained. *E. g.*, a lacquer is obtained by dissolving 1 part of acetone-sol. or acetone-softened cellulose acetate in 50 parts of cyclohexanone. The soln. can be used for finishing wood, metal, etc. For dipping, 1 part cellulose acetate is dissolved in 25 parts of cyclohexanone, and this soln. is dild. with 25 parts of a mixt. of 3 parts acetone and 8 parts of toluene. Cf. *C. A.* 9, 3359.

Cardboard with glossy surface. E. BERGERHOFF. Ger., 284,527, Sept. 27, 1914. The surface to be treated is covered first with a sheet of paper or other material of a transparent nature or rendered transparent by satn. with oil or fat, whereupon varnish is applied to the surface of the transparent layer. By reason of the action of the oil or fat on the paper, the pores of the latter are closed completely so that the varnish, while adhering firmly, nevertheless does not penetrate.

24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

Contributions of the chemist to the explosives industry. CHARLES E. MUNROE. *J. Ind. Eng. Chem.* 7, 945(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc. E. H.

Comparative action of explosives. I. Introductory. A. STETTACHER. *Z. ges. Schiess-Sprengstoffw.* 10, 193-5(1915). II. "Initial" and "brisant" explosives. *Ibid* 214-6.—Definite weights of fulminate of mercury, lead azide, and tetranitromethylaniline were detonated and the explosive action and pressure detd. from the effect on an iron base. The tetranitromethylaniline had the strongest splintering and deforming action and lead azide the least. In a similar manner comparison was made of the intensity of explosion for tetranitromethylaniline, picric acid, fulminate of mercury, lead azide and a mixt. of fulminate of mercury and KClO_3 . The "brisant" explosives showed the greatest effect on the iron base. Of the "initial" explosives, only fulminate of mercury showed any impression on the base. In a 3rd expt. tetranitromethylaniline, trinitrotoluene and silver azide were fired under identical conditions. The trinitrotoluene made a large hole in the iron support whereas the silver azide made only a very slight impression. III. Pressure effect of nitroglycerin and the aromatic nitro compounds. *Ibid* 229-32. From the decompn. reaction of nitroglycerin, trinitrotoluene, and tetranitromethylaniline it is seen that the largest fraction of the total energy is set free in the explosion of nitroglycerin. Nitroglycerin decomposes more slowly than either of the others but gives a higher heat of decompn. Trinitrotoluene is second in speed of detonation and lowest in heat evolution. The intensity of the explosion of trinitrotoluene is not affected by covering with sand or water but is increased by admixture of KClO_3 . O. L. THOMAS.

Loading of percussion caps for projectiles. O. HAGEN. Dresden. *Z. ges. Schiess-Sprengstoffw.* 10, 177-8, 195-7, 210-14, 232-5, 267(1915). R. P. CALVERT.

Explosion on the "Benedetto Brin." *Z. ges. Schiess-Sprengstoffw.* 10, 276(1915).—The explosion is thought to have been produced by spontaneous combustion of nitrocellulose or nitroglycerin powder on board the ship. The article gives a review of recent marine explosions which may be attributed to the same cause. R. P. C.

Nitrocellulose explosives. C. CLAESSEN. Brit., 24,713, Oct. 30, 1913. Nitrocellulose is gelatinized by means of not more than 30% of nitro compds. of benzene,

toluene, or phenol without the use of volatile solvents, the gelatinization being effected by heat and rolling pressure. The product can be molded.

Blasting detonators. J. HARLÉ. *Brit.*, 15,355, June 26, 1914. Detonators for string-like fuses, the tubular cover of which may be metallic or textile, are composed of tetranitropentaerythritol, alone or mixed with other ingredients. The other ingredients may be nitrobenzene, nitrotoluene, trinitrotoluene, nitrophenols, or nitrated amines.

Charges of fusible explosives. G. ISSLER. *Brit.*, 29,152, Dec. 17, 1913. The molds, while in a vertical position, are filled with the fused explosive, and then caused to rotate about a vertical axis, and under the centrifugal action, to assume a more or less horizontal position, whereby the charge is simultaneously cooled and compressed, solidification beginning at the outer end.

Waterproof blasting cartridges. S. LASZCZYNSKI. *Brit.*, 16,208, July 7, 1914. Waterproof paper cartridge cases are made by passing the overlapping longitudinal edges of the paper between 2 seam-crimping wheels after the manner of cigaret tubes, similarly crimping the overlapping folded or star-shaped edges of 1 end of the tube, then stiffening this end by a coating of chrome-glue soln. dried after its application, and finally dipping the whole case into linseed-oil varnish. The explosive charge, when of the "Sprengel" type, is contained in a paper wrapper perforated to facilitate impregnation, and made of slightly smaller diam. than the internal diam. of the case to permit easy insertion and removal of the charge.

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Progress in the field of artificial organic colors in the year 1914. L. LEHMANN. *Chem. Ind.* 38, 205-11, 251-7 (1915).—A review of patents. F. W. SMITHER.

Coal-tar dyes and the Paige bill. BERNHARD C. HESSE. *J. Ind. Eng. Chem.* 7, 963-78 (1915).—An address. E. H.

Dyeing artificial silks. ERNEST C. T. BICK. *Textile World Record* 49, 119-20 (1915).—Dyeing of artificial silks varies in many particulars from the dyeing of vegetable fibers. For bleaching the usual methods for cotton may be employed, especial care being taken that no Cl is left in the material. In dyeing Chardonnet silk with basic dyes, it is unnecessary to mordant previously with tannin or Sb salts, unless special fastness to washing or acid is required. In this process the bath is first charged with 5-10% AcOH, the skeins given several turns in this, removed, the dyestuff added, the skeins returned and the bath gradually heated to 77°. Viscose and cupro-ammonium silks are mordanted with 2-4% tannic acid and 0.5-1% HCl for 2 or 3 hrs. at 49° and fixed in a bath containing "half the amt. of Sb salts as tannic acid used." The dyeing is done as described for Chardonnet silk. In applying other methods for dyeing cotton to dyeing artificial silk, it is necessary to add 1-2% of sulfonated oil to increase penetration and soften the thread. The temp. is kept below 77°. When special fastness is desired, vat colors are used, or the shade is obtained by producing insol. azo colors on the fiber. The latter method is carried out by padding the hanks, 2 lbs. at a time, in a receptacle containing an alk. soln. of naphthol A S and turkey red oil; then after whizzing, padding 2 lbs. at a time in a diazotized soln. of fast red G base. The fastness to light, Cl, and acids of goods dyed by this process is even better than by alizarin red. Artificial silk containing oil must be scoured before dyeing. L. W. RIGGS.

Acid "tendering" of cotton cloth. J. H. LESTER. *J. Soc. Chem. Ind.* 34, 934-6 (1915).—Expts. were made with strips of cloth 2.5 in. wide, tested on a Goodbran

machine adjusted to 6 in. between the clamps. Samples were treated with HCl or H₂SO₄ of various strengths and dried by ironing. The degree of tenderness caused by the 2 acids is about the same. The max. amt. of free HCl allowable in cotton cloth appears to be 0.01%. Only the severest tests, such as ironing before laundering, show this amt. of acid to have any tendering effect. In some cases, dependent upon the future use of the goods, a larger amt. of acid may be tolerated, but always less than 0.1%.

L. W. RIGGS.

A gaseous-conductor lamp for color matching. D. McFARLAN MOORE. *Elec. World* 66, 1160(1915); *Elec. Rev. West. Elec.* 67, 949(1915).—The lamp consists of a straight glass tube in an elongated sheet-metal case with screw mogul base for the ordinary lighting circuit. CO₂ is generated automatically within the tube itself, a small bulb about 1 in. long near each electrode and containing CaCO₃ supplying the gas when resistance wires embedded in the CaCO₃ become heated to the proper degree through a shunt connection. The gas column, 1 ft. long and 7/8 in. in diam., appears as a solid bar of light of intense whiteness. Available foot-candles near the tube total more than 200, thus making the app. suitable for the very closest color discriminations. The degree of vacuum is automatically held to 0.001 mm. of Hg and the app. will stand wide line-voltage fluctuations without disarrangement. The app. is particularly useful for correct color matching in the night shifts of the dye and textile industries. Diagrams and spectro-photometric curve of the CO₂ spectrum are given. [The full paper will appear in *Trans. Illum. Eng. Soc.*]

I. C. MATTHEWS.

Production of silk in the larvae of *Bombyx mori* (FIGORINI) 111. Resinates for preserving wood and textiles (VAN VLOTEN) 26. Conversion of the natural flavone coloring matters into pyranol dyes (WATSON) 10. Some aminoazoimido bases and their azo dye derivatives (KYM) 10.

Dyes. S. HEAP & SONS and W. MARSHALL. Brit., 15,820, July 2, 1914. Artificial silks are first prepd. with tannin materials and then dyed with basic dyes; the dyeings may be after-treated with metallic salts. According to an example, the material is prepd. with tannic acid, dyed with methylene blue, and after-treated with tartar-emetic. The process may be applied to hanks or piece goods, or to mixed fabrics containing artificial silk and cotton, etc.

Dyes and intermediate products. SOC. OF CHEM. IND. Brit., 15,949, July 3, 1914. Indamines are obtained by condensing with carbazole, or its *N*-alkyl or *N*-aryl derivs. or nuclear substitution products thereof, arylsulfiminooarylenechloroimides of the benzene or naphthalene series in the presence or concd. H₂SO₄; the product obtained from *p*-toluenesulfiminophenylenechloroimide is specified. Leucoindamines are obtained by reducing the above described indamines. Sulfuretted dyes are obtained by heating the above described indamines or leucoindamines with alkali polysulfides in the presence or absence of Cu or Cu compds. Products sol. in alkali sulfides and products insol. or difficultly sol. in alkali sulfides but sol. in hyposulfite vats are obtained; both series of products dye cotton blue shades. *p*-Toluenesulfo-*p*-phenylenediamine and 1-*p*-toluenesulfamino-2-Cl-4-aminobenzene are converted into the corresponding chloroimides by treatment with Na hypochlorite and Cl, respectively.

Vat dyes. BADISCHE. Brit., 26,690, Nov. 20, 1913. Vat dyes are obtained by subjecting to the action of an alk. melt naphthalene-1,8-dicarboxylic imide, or a halogen or a *N*-alkyl or *N*-aryl deriv. thereof, or acenaphthenequinone mono- or dioxide, or a halogen deriv. thereof. The dyes may be subsequently halogenated; or those derived from naphthalene-1,8-dicarboxylic imide itself, or its halogen derivs.,

may be alkylated or arylated, or may be first halogenated and then alkylated or arylated.

Vat dyes of the anthracene series. BADISCHE. Brit., 1,425, Jan. 19, 1914. The vat dyes obtained by treating anthracene-1,9-dicarboxylic imide, or a halogen deriv. thereof, with an alk. melt, are subsequently alkylated or aralkylated in the imido group.

Azo dyes. BAYER & Co. Brit., 21,932, Sept. 29, 1913. The dyes are obtained by combining diazo, diazoazo, or tetraazo compds., or intermediate products from 1 mol. of a tetraazo compd. and 1 mol. of an azo dye component, *e. g.*, benzidineazosalicylic acid, with the condensation products from aminonaphthols or their sulfonic acids and sulfonyl chlorides of *o*-phenolcarboxylic acids described in 22,854, 1913 (C. A. 9, 2152).

Secondary disazo dye. KALLE & Co. AKT.-GES. Brit., 4,656, Feb. 23, 1914. The diazo compd. of 1-naphthylamine-2-sulfonic acid is combined with α -naphthylamine, rediazotized and combined with 2-amino-5-naphthol-7-sulfonic acid in alk. or neutral soln. The product dyes cotton violet shades, becoming blue on diazotization on the fiber and development with a naphthol.

Primary diazo dyes. BAYER & Co. Brit., 29,567, Dec. 22, 1913. The diazo compds. of *o*-aminophenols or their substitution products are combined in alk. soln. with the monoazo dyes produced by combining diazotized anthranilic acid or homologs or substitution products thereof with 2,5,7-aminonaphtholsulfonic acid or its alkyl or aryl derivs. in such a manner that the azo group is in the same nucleus as the amino group.

Sulfuretted dyes. AKT.-GES. FÜR ANILIN-FABRIKATION. Brit., 15,752, July 1, 1914. Sulfuretted dyes are obtained by heating with S or a polysulfide, mixts. of a nuclear alkyl deriv. of 4-hydroxydiphenylamine and a compd. yielding an amine on reduction, preferably a nitro, azo, or azoxy compd.

Preparing fibers for spinning. C. SUTTIE. Brit., 16,183, July 7, 1914. The *Phormium tenax* or other like fiber-bearing leaves or stalks to be treated are gripped in holders carried by an endless band and traversed across the face of a drum comprizing 2 sets of blades sepd. by a plain portion. While passing the plain portion, each holder is turned to present a fresh length of material to be treated, and means are provided for opening and closing the holder and changing the position of the grip of the holder on the material.

Fibers from papyrus. P. HOKRING. Brit., 6,971, Mar. 19, 1914. The papyrus is cut to lengths of about 10 in., torn up in machines similar to rag engines used in paper mills, and heated for several hrs. with H_2O at 40–50°, fresh H_2O being supplied 2 or 3 times. The material is then pressed and heated in H_2O to which has been added an emulsion of fatty matter, such as castor oil or oil of palm kernels. The longer fibers are sepd. from the shorter fibers by straining, and, after drying, they are broken, combed, and heckled, and then converted into threads in known manner. The short fibers may be used for paper making. Old or dried reeds may be heated under pressure.

Fabric for aviation apparatus. BRITISH EMALLITE CO. Brit., 1,049, Jan. 14, 1914. A fabric invisible or indistinctly visible is formed of films of cellulose acetate or like compd. Materials are added to modify the refractive index of the compd. so as to render invisible a reinforcing material, such as silk or cotton fibers placed between the sheets. In an example, a compn., comprizing 110 g. of acetate or hydroacetate of cellulose, 35 g. of a mixt. composed of equal parts of β -naphthol, Et ether of β -naphthol, and benzenesulfonamide, 880 g. of C_2H_5Cl , and 120 g. of alc., is spread on glass, and very fine silk tulle placed upon it while still moist. This is stripped off when dry and placed, tulle side downwards, upon a second moist layer of the compn. spread on glass, and, when dry, the completed fabric is removed from the glass.

Coating fabric with an adhesive material. F. STOFFEL. Brit., 15,262, June 25, 1914. The process is effected without modifying the properties of the fabric. Gelatin, in a pasty or thick liquid condition, is applied to the back of the fabric by means of an air spray. The expansion of the compressed air causes cooling, coagulation, and almost complete drying of the particles of adhesive before reaching the fabric.

Anthraquinone. CHEM. FABRIK GRIESHEIM-ELEKTRON. Ger., 284,083, Feb. 15, 1914. Addition to 283,213 (C. A. 9, 2599). Cf. C. A. 9, 2986.

Anthraquinone. CHEM. FABRIK GRIESHEIM-ELEKTRON. Ger., 284,084, Mar. 19, 1914. Addition to 283,213 (C. A. 9, 2599). The HNO_3 specified in the parent specification (cf. *supra*) may be substituted by Cl and N oxide compds.

Anthraquinone. CHEM. FABRIK GRIESHEIM-ELEKTRON. Ger., 284,179, Mar. 28, 1914. Anthraquinone and its derivs. are manufd. by acting on anthracene or its derivs. with NO_2 in the heat and in the presence of solvent or diluent with the addition of Hg salts.

Tetrachlorodihydroanthracenes. FARBW. V. M. L. & B. Ger., 283,106, Nov. 16, 1912. To obtain the pure 9,9,10,10-tetrachloro compd. and the pure 2,3,9,10-tetrachlorodihydroanthracene, anthracene or 9,10-dichloroanthracene is treated at a low temp. in CHCl_3 or $\text{C}_2\text{H}_5\text{Cl}_4$, or at a higher temp. in benzene, toluene, or other hydrocarbons, with Cl. Both of these products serve as initial material in the manuf. of tech. valuable intermediate products.

Bleaching fiber. DEUTSCHE GOLD- UND SILBERSCHNEIDE-ANSTALT V. ROESSLER. Ger., 284,761, Feb. 21, 1913. The fibrous material is bleached with alk. solns. evolving O.

Fulling animal fibers. TEXTILTECHNISCHES BUREAU INH. ARNO LEHMAN. Ger., 284,694, Nov. 4, 1914. Solns. of malt, malt preps. (such as diastafor), glucose, and grape sugar, but especially the highly diastatic malt preps., have been found to possess strong felting properties, and they find application, alone or in combination with soda, soap, etc., for fulling animal fibers. The action depends upon a marked softening of the fibers which materially facilitates felting, so that the fulling process is shortened about $\frac{1}{3}$ the time formerly required. E. g., for the treatment of 120 kg. of over-coating, 2 kg. fulling soap (64% fat content), 3 kg. calcined soda, 0.400 kg. diastafor (extra strong), are dissolved in 140 liters of luke-warm H_2O ; the material is sprayed uniformly for 2 hrs., with this soln., while it is on the fulling machine.

Preparing nettle plant fiber for spinning. O. RICHTER and F. PICK. Ger., 284,704, Feb. 7, 1914. The pectin lamellae enclosing the bark fiber is destroyed by macerating the bark removed from the plant, at 30-40°, in 5-27% NH_3 soln., heckling the freed fiber in the dry or wet state, then cooking it for 1 hr. in a soap bath, and finally again crushing and heckling the mass in the dry or wet state. The pectin lamellae can be destroyed also by extg. the green or dry and softened bark, after removal from the plant, with ordinary H_2O for 2-3 hrs., to remove the contained sugars, and then retting it for 10-72 hrs. After extg. the sugar, the mass may be heckled while wet, or dried and crushed and then heckled. Fruit sugar can be obtained from the ext. liquor as a byproduct.

26. PAINTS, VARNISHES AND RESIN.

A. H. SABIN.

Contributions of the chemist to the paint and varnish industry. MAXIMILIAN TOCH. *J. Ind. Eng. Chem.* 7, 938(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc.

E. H.

Contributions of the chemist to the lead industry. G. W. THOMPSON. *J. Ind. Eng. Chem.* 7, 937-8(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc. E. H.

Iron oxide reds. ANON. *Farben-Ztg.* 21, 9-11(1915).—A general article on prepn., use, etc. E. W. BOUGHTON.

Is the old name "boiled (gekochte) linseed oil" applicable to modern resinat oil? C. NIEGEMANN. *Farben-Ztg.* 21, 12-3(1915).—Continuation of the discussion of this question (cf. *C. A.* 9, 1848). E. W. BOUGHTON.

What is pure boiled linseed oil? ANON. *Farben-Ztg.* 21, 11-2(1915).; see preceding abstr. E. W. BOUGHTON.

Protecting bright articles from rust. A. L. HASS. *Am. Machinist* 43, 770(1915).—As a preventive to rust formation on machines and other articles which are shipped for some distance, H. mentions the old method of coating with lead and tallow; due to the acidity of the tallow, such a coating must be removed at the earliest opportunity. A new method as adapted to buckles, rings, and harness fittings has given excellent results. Cheap varnish dild. 2 or 3 times with methylated spirits and made up when required is put into an oil drum, minus 1 end, of 6³/₄ to 10 gal. capacity and 12 in. in diam. so that the drum is ¹/₄ full. Articles to be treated are placed in a smaller drum similarly constructed, and are thus immersed. The smaller vessel is removed and the articles, shot out on a wire draining surface, are ready for packing in 15 min. The process is cheap, effective in bulk, coating does not alter the goods, and is a protective coating against tropical temps. I. C. MATTHEWS.

Rust prevention and protective coatings. M. BOTTLER. *Kunststoffe* 5, 232-4(1915).—A brief discussion of corrosion, together with a review of patented coating processes. F. W. SMITHER.

Electrically heated japanning ovens. C. F. HIRSHFELD AND W. D. DYGERT. *Elec. World* 66, 930-2(1915).—Data on the construction and operation of large elec. ovens. C. G. F.

Resinates for preserving wood and textiles. H. K. VAN VLOTEN. *Chem. Weekblad* 12, 160, 483-4(1915).—Most of the soln. for the impregnation of wood are sol. in water and therefore less efficient than the insol. soaps. The author calls attention to the resinates, which he considers as preferable, on account of their insolubility in water and reasonable price. As a solvent, linseed oil and resin oils of different fractions may be used, especially when only protection against the influence of the weather is required. Cu and Hg resinates, dissolved in gasoline, turpentine, kerosene, etc., may be applied as a protection against moisture and, on account of their poisonous nature, against damage by insects. Textiles may be impregnated in the same way.

J. T. FLOHIL.

Binder for pigments. CHEM. TECH. FABRIK J. LORENZ & Co. Aust., 2,655, Mar. 20, 1914. Carnauba wax or montan wax, or a mixt. of both, with or without the addition of stearin or NH₄OH, is saponified to obtain a dough-like mass, then mixed with a pulverulent mixt. of casein and borax, whereupon the required softening of the mass is effected by means of the usual oil or varnish additions. Finally the product is dried and ground in order to obtain a powder which may be incorporated readily with water-color solns.

Painters' size. F. BECKMANN. Brit., 4,567, Feb. 21, 1914. The size consists of 100 parts CaO and 50 parts sugar, with the addition of potato flour and dextrin to render the mixt. more easily miscible with H₂O, and to prevent the formation of lumps.

Varnish or linoleum masses. REICHOLD, FLÜGGER & BOECKING. Brit., 15,595. June 29, 1914. See Ger., 282,959 (C. A. 9, 2460).

Phenol-aldehyde resins; varnishes. CHEM. FABRIKEN DR. K. ALBERT and L. BEREND. Brit., 15,875, July 2, 1914. Phenol-aldehyde resins are rendered sol. in fatty oil by melting with natural or artificial resins or fatty oils or a mixt. thereof; colophony, wood oil, turpentine resin, copals, cumaron resins, and hardened and esterified resins may be employed. The phenol-aldehyde products used may be either fusible or infusible when heated alone. The resins or fatty oils may be added to the reaction mass before or during the manuf. of the phenol-HCHO resins. Oil varnishes are prepd. by heating the oil-sol. product with fatty oil until a soln. is obtained which is clear in the cold state and is not clouded by addition of benzine or turpentine oil.

Resinous condensation products. HEINEMANN, H. C. HARVEY and H. W. ROBINSON. Brit., 28,187, Dec. 6, 1913. Phenol or cresols and HCHO or its polymers are first heated without a condensing agent to yield a liquid oxybenzyl alc., and this product is further heated in an open vessel with SO_2 soln. The product can be rendered insol. by further heating or treatment with a basic catalyst.

27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

Preparation of the Wijs iodine solution. W. FAHRION, Stuttgart; HUGO DUBOVIKZ, Budapest; C. NIEGEMANN, Cologne. Chem. Ztg. 39, 744(1915).—A discussion. Cf. C. A. 9, 2820. J. H. MOORE.

Contributions of the chemist to the art of soapmaking. MARTIN H. ITTNER. J. Ind. Eng. Chem. 7, 935-6(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc. E. H.

Yeast fat, a new source of fat. A. WELTER. Seifenfabrikant 35, 845-6(1915).—Delbrück and his workers in Berlin have discovered a process of making protein from sugar by the addition of NH_4 salts and certain yeasts. It is already possible to make yeast contg. 50% protein which is well suited for fodder. This yeast is found to contain up to 4% fat which can be increased. Lindner of the Inst. of Fermentology, Berlin, has produced yeast organisms which contain 17% of fat on the dry basis. The fat extd. from yeast is liquid and produces a good curd soap. It is thought that the fat is produced by a transformation of the sugar. The question of digestibility is being investigated by Voltz. E. SCHERUBEL.

English export soaps. J. DAVIDSOHN. Seifenfabrikant 35, 814-5(1915).—Analyses of a blue mottled and a yellow soap. The former was made from 50% coconut and 50% peanut oil and is filled with 13% of $\text{Na}_2\text{Si}_4\text{O}_9$. The yellow soap was made from coconut or palm kernel oil filled so as to contain 27 to 28% $\text{Na}_2\text{Si}_4\text{O}_9$; it was colored with aniline dye. E. SCHERUBEL.

Bone grease and its preparation for use in the soap industry. Q. ROSANER. Seifenfabrikant 35, 815-6, 829-30(1915).—A discussion of well-known methods of handling this substance. E. SCHERUBEL.

The chemist and the packing-house products industry (LOWENSTEIN) 12.

Albumin from oil press residues. V. GRAFE and K. PECHE. Aust., 9,908, Nov. 20, 1913. The malodorous oils, fatty acids, and their decompn. products, contained in the residues, are removed by sapon. and washing, whereupon the residues are extd. by albumin solvents.

A fodder base and albuminous matter from oil press residues. V. GRAFE and K. PRACH. Aust., 6,090 and 7,789, July 24 and Nov. 24, 1914; cf. 9,908, *supra*. After sapon. of the oils and conversion of the fatty acids into soaps, the albumin in the alk. soap soln. is sepd. by neutralization. The sapon. of the oils and fatty acids is effected by oxides or hydroxides of polyvalent metals such as the alk. earth metals, which form insol. soaps, whereupon the granular soap ppt. is sepd. by straining from the albumin.

Hydrogenating fats. - C. ELLIS. Brit., 16,600, July 11, 1914. In the hydrogenation of fatty bodies, such as edible oils, H is bubbled through the melted fat in the presence of a catalyst, and the fat is moved in a direction across the path of travel of the H current. A suitable app. comprizes a closed reaction vessel for holding the fat, provided with a pipe at the bottom for introducing H. The oil is agitated and moved more or less horizontally by propellers carried by a rotating shaft, and contact between the H and the fat may be increased by stationary baffles or screens arranged to alternate with the propellers, and by bells mounted on the rotating shaft. The catalyst may be mixed with the oil and may consist of a catalytic metal either alone or on a carrier; or it may be introduced as NiCO with the H.

Continuous hydrogenation of unsaturated fatty acids, or esters thereof. BADISCHE. Brit., 2,307, Jan. 28, 1914. As catalyst is employed Ni, Co, or Fe, or mixts. of these metals with one another or with agents promoting the activity of the catalyst. The process is effected under pressure of at least 30 atms. and preferably over 50 atms., the catalyst being supported in the pressure vessel so as not to mix with the substance treated. The prepn. of the catalyst may be effected by reduction of an O compd. of the metal by means of H under pressure in the app. which is subsequently used for the hydrogenation of the fatty acid, etc. According to examples: finely divided Ni, prepared by reduction of the oxide or carbonate at a low temp., is supported on a carrier in the pressure vessel, or Ni pieces, wire netting, or wool is suitably held therein, and cottonseed or linseed oil is passed into the vessel and treated with H at 100° under a pressure of 120 atms.; NiCO₃ or Ni(OCO.H)₂, mixed with Al₂O₃ and formed into balls or spread on a carrier, is placed on perforated trays in a cylindrical high pressure app., and reduced at 220-250° by means of H under pressures of 30-100 atms., the reduced metal is allowed to cool in the atm. of H to about 80°, and a stream of the oil to be hydrogenized and H under pressure are then introduced into the app.

Catalytic hydrogenation and dehydrogenation of carbon compounds. BADISCHE. Brit., 2,308, Jan. 28, 1914. These processes are effected in the presence of metallic Fe, Ni, Co, or Cu, mixed with a compd. of F, Te, or Sb. The F, etc., compd. may be mixed with a compd. of the catalytic metal, or a compd. of the catalytic metal may be soaked in a soln. of the added compd. or an insol. fluoride. A compd. may be pptd. in the presence of a compd. of the catalytic metal. The catalytic metal may be in finely divided or compact state, and carriers may be employed. According to examples: NiCO₃ is mixed with Na silicofluoride soln., and the product is dried, reduced by H, and employed in the hydrogenation of linseed oil; Al, Ca, or K silicofluoride, BaF₂, Ca borofluoride, or K Ti fluoride may be used; Ni wire netting is cleaned with dil. HNO₃, treated with NH₄ silicofluoride soln. and Al(NO₃)₃, dried, and reduced; NiCO₃ is soaked in a soln. of NH₄ tellurite, or K pyroantimonate, and the product is reduced and employed in the hydrogenation of cottonseed oil or mineral oils.

Hydrogenation of fats and oils. J. DEWAR and A. LIEBMANN. Brit., 15,668, June 30, 1914. The fats and oils are treated with H in the presence of a catalyst distributed over a mass or fibrous and coherent material or yarns or fabrics made therefrom, and arranged so that the fibers will not become sepd. from one another. With this arrangement the tedious operation of filtration is avoided. The fibrous material

may consist of cotton, hemp, flax, or jute, wool, silk, or similar natural organic fibrous materials, or even artificial silk, *e. g.*, viscose silk freed from S. Sponge also may be used. Sepn. of the fibers is prevented by enclosing the masses between screens of gauze or other suitable material, or by securing with wires or threads; or if yarns or fabrics are used, these may be wound round or otherwise secured to the blades of an agitator or to fixed supports. If strongly adherent masses of fibrous materials, such as cotton, silk or flax, or yarns or fabrics made therefrom, be used, the masses may be left free to move in the liquid, but the products of hydrogenation are not so satisfactory. If Ni, Co, or Cu is used as the catalyst, the oxide or carbonate of the metal is distributed on the support, and the catalyst produced before or during the process of hydrogenation. In the latter case, it is advantageous to proceed according to the process described in 12,982, 1913 (*C. A.* 8, 3869), in the case of the Pt group metals, the additions being effected by impregnating the materials with a Pt or like salt soln., and then treating with a hot alk. soln. of HCHO. In examples, cotton or linen yarn, or bleached artificial silk yarn freed from S, or asbestos cord is passed through a soln. of Ni and Cu carbonates, and after squeezing, treated with soda soln. and dried. The material is wound on a Ni gauze cylinder or on the blades of the agitator, and placed in an autoclave with the oil. In another example, silk yarn, on which Ni and Cu carbonates were distributed as in the previous examples, is wound on the plates of an agitator and washed, first with H₂O, then with Ni acetate soln., and finally with H₂O.

Disinfecting soaps. SCHÜLKE & MAYR NACHFOLGER, DR. RAUPENSTRAUCH. *Brit.*, 20,818, Sept. 15, 1913. Liquid or solid disinfecting soaps sol. in H₂O are produced by adding *p*-chloro-*o*-cresol, mixed or not with *p*-chloro-*m*-cresol, to soaps after or during sapon. The combination may be assisted by the addition of EtOH, glycerol, or other alc., and H₂O. Castor oil potash soaps mixed with soaps made from palm-nut, coconut, earth-nut, or rape or like oils are preferred, but soda or resin soaps may be used. *p*-Chloro-*o*-cresol of the high degree of purity required may be obtained as white felted needles *m.* 50–51° and *b.* about 230°, by treating 108 kg. of *o*-cresol with 71 kg. of liquid SO₂Cl₂ in the cold or at a temp. sufficiently low to prevent side-chain substitution, washing with H₂O to remove inorganic products, slowly distilling off with steam the *o*-chloro-*o*-cresol, drying the residual crystals, treating them with H₂SO₄ of 1.85 sp. gr. for about 4 hrs. at about 100° to sulfonate the *p*-chloro-*o*-cresol, dissolving in at least 100 kg. of H₂O and driving off the unaffected dichlorocresol with steam, heating to dryness whereby the sulfonic acid is decomposed, and finally melting the crystals with steam and running off the first liquid, which may possibly contain a little *o*-chloro-*o*-cresol. Cf. *C. A.* 9, 531.

28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

The quantitative determination of sugar by reduction of copper solutions. R. VAN MELCKEBEKE. *Chem. Weekblad* 12, 823–6(1915).—A loss of wt. of Cu₂O occurs in the detn. of sugar by the reduction method, due to the reduction of Cu₂O by the C of the burning filter. Oxidation with HNO₃ does not wholly correct this loss as Cu disappears with the acid fumes. M. therefore recommends the following procedure: Ppt. Cu₂O in the usual way, collect on a filter and wash; place the funnel over a Pt dish, dissolve the Cu₂O with a few drops of HNO₃ and carefully wash with hot water into the dish. Evap. the soln. of Cu(NO₃)₂ on the water bath, dry and convert into CuO by heating to redness. A loss of more than 1 mg. was not found after heating for 30 min. over a blast flame. Cu soln. according to Scheller gives better results than Fehling soln., as the absorption of copper by the filter paper in the latter method is very

annoying. An ash-free filter of 12 cm. diam. through which 50 cc. of Fehling soln. were filtered was washed with 500 cc. of cold H_2O . After ignition 3 mg. ash remained. A similar test with Scheller's soln. gave 0.5 mg. ash. J. T. FLOHIL.

Extension of the sugar-reduction table. N. SCHOORL. *Chem. Weekblad* 12, 481-2(1915); cf. C. A. 7, 282.—An addition to Schoorl's iodometric method for the detn. of reducing sugars. A table is given for arabinose, xylose, galactose, mannose and rhamnose. J. T. FLOHIL.

Experiments on the determination of sucrose by single and double polarization in the chemical control of white sugar manufacture by the Battelle process. H. S. WALKER. *Intern. Sugar J.* 17, 467-71(1915); cf. C. A. 9, 975.—(1) Solns. of pure sucrose may be boiled with lime with no appreciable loss. (2) Solns. of invert sugar when heated with lime yield decompn. products whose lime salts in neutral or faintly acid soln. have a weak negative rotation, but on treatment with strong acids (as in Clerget method) assume a strong positive rotation. (3) Adding these decompn. products to a soln. of sucrose causes a slight apparent loss in direct polarization, and a marked loss in sucrose by Clerget. (4) In case invert sugar has been decompd. by lime in the presence of sucrose, the apparent loss of sucrose, both by direct and Clerget, is greater than when the invert sugar is decompd. alone and then added to the sucrose soln., the loss by Clerget being much more pronounced than by direct polarization. (5) As great or greater apparent losses of sucrose occur when invert sugar with or without sucrose is allowed to stand a sufficient time with lime in the cold as when heated, the loss, however, being greater when decompn. occurs in the presence of sucrose. (6) Clerget process is inapplicable to cane juices which have been boiled with lime, owing to glucose decompn. products giving too low results. (7) The Clerget process applied to pure sucrose solns. of the concn. of cane juice gives results higher than the direct polarization by about 0.3% of the total sucrose present. This should be allowed for in comparing the direct polarization of juices whose glucose has been destroyed by lime with Clerget detns. on the original juice. A. GROSS.

The handling of cane damaged by frost. WM. E. CROSS. *Revista industrial y agricola de Tucuman; Sugar* 17, No. 10, 34-6(1915).—The damaged cane should be ground as soon as possible after removal from the windrow as atm. conditions cause rapid deterioration. The raw juice should be clarified immediately after extrn. and great care should be exercised in keeping the mill and tanks scrupulously clean in order to avoid infection. High acidity of the juice is partially neutralized with Na_2CO_3 and the juice then clarified with S fumes and CaO as usual. The Na_2CO_3 forms salts which are less meclassigenic and troublesome than the Ca salts. The boiling of the juice will depend upon the extent to which the cane was damaged. If the juice takes on a foamy appearance and refuses to boil, it is too badly fermented to be workable at a profit, and steps should be taken to have the cane cut lower thereafter, to prevent a recurrence of the trouble. A considerable quantity of molasses of comparatively high purity is obtained and if it is left standing for a long period in crystallizers or tanks, a fairly large yield of sugar can often be obtained therefrom. The presence of the gum dextran produced by fermentation (but rarely met with in the frozen cane of Louisiana) may cause serious errors in the detn. of the sucrose due to its high positive rotatory power. A method given is to weigh out the normal wt. of the juice for the analysis, clarify with Pb subacetate and make up to a vol. of 100 cc. with 60% EtOH (or greater strength if much gum is present). The soln. is filtered and polarized as usual. The acidity of the juice is detd. with 0.1 N NaOH using phenolphthalein as indicator. The number of cc. of NaOH required to neutralize 10 cc. of the juice is termed the "acidity" of the juice. A. GROSS.

Practical points in drying sugar beets. H. CLAASSEN. *Deut. Zuckerind.* 40, 383(1915); through *Wochschr. Zentralver. Rübensuckerind.* 53, 342.—The stirrers wear faster than when drying pulp, and must be made heavier. Instead of the regular chips, smooth flat slices should be made to prevent excessive loss of juice and burning of the finest material. The furnaces should be allowed much excess air so that the CO_2 in the flue gas is not over 5%; the temp. of the gases leaving the furnace should be not over 800° . They may be cooled to $100\text{--}120^\circ$ before leaving the drier. The dried slices must be cooled to $60\text{--}80^\circ$ and be dried to less than 10% H_2O ; otherwise they pack and heat, and may even completely carbonize. There is a loss of from 1.0 to 1.5° in polarization and 0.3–0.8% in dry substance, the latter perhaps more apparent than real. In normal times it would not pay to dry beets directly, unless toward the end of a campaign when the beets became rotten or frozen and are therefore difficult to work up for sugar. Such beets when dried make satisfactory fodder.

W. L. BADGER.

Determination of the yield in drying sugar beets, and the behavior of marc on drying. A. HERZFELD AND O. SCHREFFELD. *Z. Ver. Zuckerind.* 65, 311–20(1915).—A sample of dried beet flour gave 11.27% marc, from which the marc of the fresh beets was calcd. as 2.96%, a figure much lower than ordinary. If the beets had 4% marc, the marc in the flour should have been 15.2%. Errors in the marc detn. are of 3 kinds: (1) Pectins easily pass into colloidal soln. and run through the filter. (2) It is possible that during the ripening period the pectins become more or less hydrated and consequently lose wt. on drying at high temps. (3) On heating with H_2O parapectic acid is formed, and this is a strong enough acid to invert sucrose and partly or entirely to destroy the invert in the course of such a process as drying beet chips. Marc was detd. in fresh beet pulp in the usual way (drying to const. wt. *in vacuo* at 108°), and also in the same pulp after it had been dried at various temps. Pulp dried in air at 100° gave 20–30% less marc than the same pulp when fresh. This was due to the fact that some marc was rendered sol. by heating and not to thermal decompn. with loss of wt., since samples of pure marc obtained from fresh pulp only began to decompose with loss of wt. when heated 15 hrs. at 160° . Samples of marc obtained in the usual way, when subjected to a repetition of the original detn. lost about 13%. That is, marc is rendered partially sol. by drying in a vacuum at 108° . Marc dried in air at 140° lost 20% when subjected to a redetn. Marc heated *in vacuo* at 108° with an equal wt. of pure dry sugar lost 0.5% on drying and 20% on a redetn.; heated with sugar in air to 120° for 70 hrs. marc showed some decompn. (brown color) and a loss of 10% on a redetn.; while when it was heated to 140° with sugar there was considerable charring and more marc was found on redetn. than had been taken. High temps. evidently cause a reaction between marc and sugar forming easily decompd. substances. It would seem that in view of the sensitiveness of marc to comparatively mild treatment, it would be desirable to have very exact directions laid down for the marc detn.

W. L. BADGER.

Report of progress in sugar beet trials. J. W. INCE. N. Dakota Agr. Expt. Sta. *Bull.* 113, 251–69(1915).—This bull. reports results of analyses and gives information regarding the cultural treatment and climatic conditions under which 106 samples of sugar beets were grown.

R. C. ROARK.

The use of dried beets for sugar extraction. H. CLAASSEN. *Centr. Zuckerind.* 23, 1002(1915); *Wochschr. Zentralver. Rübensuckerind.* 53, 468(1915).—Wiechmann has advocated this, but C. refers to the fact that there is always some loss of sugar on drying and on storing, that much marc previously insol. is readily sol. in H_2O after drying, and that invert is present in the dried material. Assuming the most favorable

conditions for drying, no advantage can be found for this process when costs are considered.

W. L. BADGER.

Innovations in dry liming. H. EBERHARDT. *Deut. Zuckerind.* 40, 10(1915); through *Wochschr. Zentraber. Rübensuckerind.* 53, 69.—The CaO descends slowly in a thin layer down a spiral while the juice is rapidly pumped in the opposite direction. The time of contact is 18 min. Flakes of CaO are carried up by the juice and quickly dissolved; insol. material falls to the bottom and is removed by a screw conveyor. A CaO weigher may be dispensed with, and the outlet valve set to allow the juice to escape with any desired alkalinity.

W. L. BADGER.

Continuous saturation. FR. RASMUS. *Deut. Zuckerind.* 40, 265(1915); through *Wochschr. Zentraber. Rübensuckerind.* 53, 263.—An upright closed cylinder, 2.4 m. diam. by 4 m. high, has inside it another concentric fixed cylinder and hanging between the two a movable cylinder. Juice enters at the top and flows down between the outer and movable cylinders, up between the movable and inner, and out the center. Coils are arranged in the annular spaces to direct the CO₂ against the moving liquid. The movable cylinder rotates and to both it and the fixed cylinders are fastened flat stirring arms. There is no deposit in the app. even if it is stopped. A definite alkalinity can be maintained with great ease, and the utilization of the CO₂ is unusually high.

W. L. BADGER.

The latest prescribed rules for chemical control in the cane sugar factories in Java. H. C. PRINSEN GEERLIGS. *Louisiana Planter* 54, 269-70, 284-5(1915); cf. *C. A.* 9, 2990.—Methods are given for the sampling and analysis of bagasse, raw, mill, residual and clarified juices, filter press mud and sirup.

A. GROSS.

A study in the chemical control of cane sugar factories. IV. NOEL DEER. *Intern. Sugar J.* 17, 460-2(1915); cf. *C. A.* 9, 3374.—A control formula for available sugar is given as $100 s(j - m)/j(s - m)$, where s , j , and m represent the purities of raw sugar, sirup and molasses, resp., and are distinguished by the suffixes a , g , and r , to denote whether reference is made to the absolute, the gravity or the refractive standards. This formula is applicable to detns. of sugar only and can not be used with polarizations. In applying this formula it is essential that all purities and quantities of sugar be referred to sugar % and not to polarization; all purities must be referred to the same standard of reference, when gravity and refractive standards are used all detns. of solids must be made in the appropriate concn.; sugar lost in press-cake and mechanically is regarded as available in the proportion indicated in the formula; no attempt is made to fix arbitrarily a value for the purity of waste molasses. The formula is intended to be used with the purity actually observed in each factory. By "available sugar" is meant that proportion of the sugar originally present in a sirup of purity j , which must be removed at a purity s , to leave a residue of purity m . D. notes as erroneous the impression prevalent in many cane sugar laboratories, that the difference between Brix and total solids and also between polarization and sugar % is not great in juices and raw sugars and that no great error is introduced if the 2 former detns. be used, but that with molasses total solids and sugar % must be used. This reasoning is considered faulty because the seemingly small differences in juices and sugars refer to a very large wt. of material, the apparently large differences in molasses being referred to a much smaller wt. of material, and also because the basis of reference is made in one instance to Brix or grav. solids, and in the other to total solids or abs. solids. Owing to this confusion of ideas, D. has frequently accused many factories of obtaining more sugar than the analyses showed possible.

A. GROSS.

Simple device for sampling juices from the first carbonation. ZSCHEYE. *Deut. Zuckerind.* 39, 1044(1914); 40, 12, 63(1915); through *Wochschr. Zentraber. Rübensuckerind.* 53, 69.—About 1.15-1.20 m. above the juice level in the carbonation tank,

an angle cock and funnel are attached, the funnel about 25 cm. high and 20 cm. in diameter. When the CO_2 is turned on, if the cock is opened, foamy juice blows into the funnel. The funnel is about $\frac{1}{2}$ filled and then at intervals the cock is quickly opened and closed so that the level of juice in the funnel rises a few cm. each time. When the juice no longer rises on opening the cock it has an alkalinity of 0.07-0.08 and the carbonation is finished. If CO_2 is passed longer the juice level in the funnel will fall on opening the cock and the alkalinity will be found below 0.07. During the test any device for beating down foam must be stopped. In Z.'s factory, this test has made it possible to employ any unskilled labor on the carbonation station. *Discussion.* CLAASSEN, BANDO. C. does not believe that a uniform alkalinity can be carried when only the height of the foam is tested. He warns against supplanting control with phenolphthalein by such an empirical method. Z.'s method cannot be used at all with continuous carbonation, which, C. thinks, is to replace carbonation in sep. pans. B., who has used a system similar to Z.'s for some years, said the continual opening of the cock may cause the funnel to run over. So B. substitutes an observation window, 30 X 8 cm., at the foam level. As soon as the alkalinity reaches 0.07 the level of the foam can be plainly seen to fall at once. If satn. takes longer than usual the glass shows the reason at once. If too much CaO has been added, the motion of the foam is unchanged; if the gas line is stopped or the pump slow, the motion of the foam is less violent than usual. The glass must be so mounted as to be easily changed, for it needs cleaning every 2 days.

W. L. BADGER.

Systems for dealing with condensation from heating and evaporating plant. E. W. KERR. *Louisiana Bull.* 149; *Intern. Sugar J.* 17, 474-6(1915); see C. A. 9, 869.

A. GROSS.

Corrosion of iron parts in the return of diffusion waters to the battery. SCHIRMER, EGGELING, ZSCHEYE. *Deut. Zuckerind.* 40, 9(1915); through *Wochschr. Zentralver. Rübensuckerind.* 53, 68.—S. found that most Fe parts subjected to the action of the returned H_2O scarcely lasted one campaign. Neutralizing the H_2O with $\text{Ca}(\text{OH})_2$ caused such difficulties in filtering and boiling that it had to be abandoned. E. found that sand was not responsible for the corrosion, and adopted the following method: mash with fresh water, press with returned water, and lead the waste waters over a cooling surface where CaO is added (enough surface is provided so that no CaO returns to the plant). No Fe parts have corroded through since this was adopted. Z. adds the condensed water to the returned battery water, thus reducing the acidity by the NH_3 . Keeping the returned water as cool as possible helps. Brass or bronze should replace Fe wherever possible.

W. L. BADGER.

Pulp catchers. GEHRKE, ZSCHEYE. *Deut. Zuckerind.* 40, 9(1915); through *Wochschr. Zentralver. Rübensuckerind.* 53, 68(1915).—G. uses the Joerning and Sauter pulp catcher for returning water to the battery. H_2O from the pulp-sump passed a conical pressed brass screen with $\frac{3}{4}$ mm. slots, and then passed to the pulp catcher where daily 130 cwt. of 9% dry substance were recovered. The sieve of the catcher needed frequent renewals, but this was done during Sunday stoppages and the screen cost little. Z. used a 2 mm. screen instead of the $\frac{3}{4}$ mm., and had equally good results in the pulp catchers. In returning diffusion water, the greatest difficulty is caused by the material which passes the pulp catcher. It consists of sand or earth with little org. substance, but there seems to be no way of removing it. Z. finds any type of pulp catcher on the market suitable for the return of waste waters.

W. L. BADGER.

Vacuum apparatus for sugar factories. II. E. W. KERR. *Louisiana Planter* 54, 217-21(1915); cf. C. A. 8, 2502, 2964, 3730; 9, 2721.—Several types of condensers are shown and described. Owing to the low thermal conductivity of H_2O , it is necessary to spray the water into as fine a condition as possible in order that its temp. may be

raised to that of the steam in the shortest possible time. The most satisfactory way is to convert the H_2O into spherical drops though it is not uncommon to break it up into sheets. An objection to the overflowing of H_2O in sheets of varying thickness is that the curtains of H_2O thus formed may result in an appreciable resistance to the flow of vapors from one end of the condenser to another. The author has found a difference of as much as $1\frac{1}{2}$ in. of Hg between the two ends of the condenser. The rate of evapn. and the amt. of vapors given off from vac. pans depends upon several factors such as the quantity of heating surface, whether coil or calandria, the steam pressure, the vac. the cleanness of the heating surface, the product being boiled whether firsts, seconds or thirds and the av. time the heating surface is on. In tests made by the author, an evapn. of 18 lbs. per sq. ft. of heating surface per hr. was obtained. The amt. of vapor a condenser of given dimensions will condense and the vac. it will maintain are functions also of the air pump capacity. If the latter is not sufficient, the vac. will be low no matter how well the condenser itself is designed. The finer the water is sprayed in the condenser, the smaller also the condenser will have to be. A graphical log of a coil vac. pan test shows that the rate of H_2O evapn. is consistent. A. G.

Changes of the starch in potatoes during drying. H. I. WATERMAN. *Chem. Weekblad* 11, 332-7 (1914).—Drying at $40-50^\circ$ causes a greater change of starch into sugar than drying at 60° and higher. The content of H_2O -sol. carbohydrates was detd. after cold water extn. by polarization before and after inversion, followed by a detn. of the reduction power with Fehling soln. When the potatoes were dried at $40-45^\circ$, 14.8% starch and 2.25% sucrose were found; when they were dried at 60° , 18.3% starch and 1% sucrose. The N content was the same in both cases. Reduction and polarization proved that almost all of the sugar consisted of sucrose. Sucrose crystals were obtained from an alc. ext. Potatoes were ground and made into a pulp with iced H_2O . The liquid was filtered and the sugar detd. No glucose nor invert sugar was found; sucrose was 0.4%. The potatoes were then dried at 35° , 45° , 55° and 105° and yielded, resp., 3.3%, 2.1%, 1.6% and 0.4% of sucrose, only very small amts. of other sugars being present. The fact that during the drying at 105° no increase of sugar had taken place is attributed to the suspension of the enzymic action at this temp. J. T. FLOHL.

Starch, and its employment in industry. RUDOLF MATTHIAS. *Grimma. Chem. App.* 2, 223-6, 233-5, 245-7 (1915).—Descriptions, with 13 cuts, of app. for making starch from potatoes and corn and its conversion into sirup, dextrin and glucose. Dimensions of app. for making 11 tons of glucose per 24 hrs., and general directions for operating, are given. J. H. MOORE.

Dextrin; glucose. F. E. RUDMAN. *Brit.*, 16,562, July 9, 1914. Starch, farina, or the like is converted into dextrin, or, by longer treatment into glucose, by first mixing the starch with an acid or the like by delivering the powder in a spray or shower into a container, into which the acid or the like is sprayed, and simultaneously or subsequently heating the mixt.

Evaporating sugar saps. F. HALLSTRÖM and O. F. BRANDT. *Ger.*, 281,720, June 4, 1913. Addition to 265,676 (*C. A.* 8, 1884). An app. is specified for evapg. sugar saps and other liquids which suffer from protracted overheating.

30. RUBBER AND ALLIED SUBSTANCES.

R. T. STOKES.

Permanence of rubber goods in storage. DROSTE. *Pharm. Zig.* 60, 328-30 (1913).—As the result of numerous expts. to det. the durability of rubber products

in storage, the following conclusions were drawn: (1) Higher temps. not exceeding 32° apparently exercise no deleterious influence. (2) Low temps. to -8 to -10° harden the gum but do not necessarily produce permanent injury. (3) So far as external influences are concerned, all samples showed similar behavior, deterioration manifesting itself in the same way and at the same rate. (4) Moisture affects tubing neither favorably or otherwise. In cases where samples had free access to air, especially at elevated temps., a yellowish gray color gradually developed, the material becoming coated with fungi. (5) Tubing deteriorated in direct sunlight even when coated with paraffin and with exclusion of air. In the presence of moisture, the samples became sticky. (6) In diffused sunlight, tubing became fissured and brittle at the end of 2 yrs. and 9.5 mos. (7) Other samples remained unimpaired in the course of 3.5 yrs. exposure to air but with exclusion of light. The expts. show further that rubber products in general are unfavorably influenced in storage; that, while the effects of air alone are very slight, light is harmful under all conditions, especially direct.

W. O. E.

Synthesis of caoutchouc. A. HEINEMANN. Brit., 15,572, June 29, 1914. MeOAc is employed instead of EtOAc in the process described in 18,506, 1912 (C. A. 8, 585).

Vulcanizing caoutchouc. BAYER & Co. Brit., 12,661, May 22, 1914. Natural or artificial caoutchouc or caoutchouc-like substances are vulcanized in the presence of such NH_3 derivs. of a basic reaction, other than those which liberate free NH_3 under the conditions of vulcanization, or such nitrogenous organic bases, other than piperidine or its homologs or derivs. of these bases, as possess a dissociation const. in aq. soln. greater than 10^{-8} . Examples of the bases which may be used are NaNH_2 , benzylamine, naphthylenediamine, quaternary NH_4 bases, the addition product of NH_3 and acetaldehyde, and *p*-phenylenediamine.

Rubber substitute. J. BAUER. Brit., 1,171, Jan. 15, 1914. The substitute is made by mixing comminuted animal tissue, such as sinews, after heating with an astringent soln. such as ZnCl_2 or HCl , with starchy matter, such as powdered tapioca. The dough thus formed, after being dried, is preferably mixed with a small proportion of rubber latex or a soln. of rubber or resin, *e. g.*, 6-12% of rubber dissolved in turpentine. The product is heated until it is tough, and may be applied as a dressing to leather, canvás, or other fibrous base.

Coagulating latex. DUNLOP RUBBER Co. and E. MOSINGER. Brit., 16,096, July 6, 1914. Latex is coagulated by the addition of a soln. of Al, Bi, or Zn chloride or mixts. of these. About 1 g. of 1 or more of these salts is dissolved in 10 cc. of H_2O , and the soln. is stirred into 100 cc. of latex.

Rubber tires. CONTINENTAL-CAOUTCHOUC- UND GUTTA-PERCHA-COMPAGNIE. Ger., 283,937, May 29, 1914. Press for their manuf.

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CHEMICAL ABSTRACTS

Vol. 10.

JANUARY 20, 1916.

No. 2

I. APPARATUS.

L. C. JONES.

An electrically heated pressure apparatus for the investigation of fusion and transition phenomena of salts, salt mixtures, metals and alloys. ERNST JÄNECKE. *Z. physik. Chem.* 90, 257-64(1915); cf. *C. A.* 10, 143.—An electrically heated pressure app. is described, by means of which fusion and transition points may be detd. from the relation between pressure and temp. Four diagrams and photographs of the app. are given in the text. The pressure, up to 20,000 kg. upon the piston, is not the universal pressure, and, therefore, the pressure-temp. points of the condition diagram cannot be detd. directly. As the friction in the pressure app. is often increased to a large extent by the flowing of the compressed substance, the pressure loss of the press is of importance.

H. JERMAIN CREIGHTON.

Simple gas burner for small laboratory furnaces. D. A. RANDALL. Baker Univ., Baldwin City, Kansas. *J. Ind. Eng. Chem.* 7, 873(1915).—The burner is made from standard pipe fittings. A 12 in. length of 2 in. pipe has a cap, drilled with as many $\frac{1}{8}$ in. holes as possible, screwed on one end. On the other end is a $2 \times 2 \times \frac{3}{4}$ in. tee. Low pressure air, $\frac{1}{2}$ in. water, is admitted through the 2 in. opening of the tee. Into the $\frac{3}{4}$ in. side opening is screwed a $\frac{3}{4} \times \frac{1}{4}$ in. reducing bushing which has been tapped out large enough to screw a $\frac{1}{4}$ in. pipe clear through. A $\frac{1}{4}$ in. ell on the end of this pipe faces toward the drilled cap and admits the gas. The burner gives a very steady flame and temp. high enough for assay work.

F. A. HARVEY.

Two burners for the demonstration and study of flame spectra. P. E. BROWNING. Yale Univ. *Am. J. Sci.* 40, 507-8(1915).—A salt-mouth bottle is fitted with a 3-hole stopper. Gas flows in by a glass tube in 1 hole; the second hole is fitted with a glass tube drawn out to a tip, over which a porcelain tube is supported, leaving a space between the stopper and tube for air to enter and mix with the gas as in a Bunsen burner. A thistle tube extends through the third hole with its lower end dipping into a soln. containing the salt whose spectrum is desired and a mineral carbonate. When a little HCl is added through the thistle tube the CO_2 evolved carries with it enough of the soln. to color the flame. The second burner differs from the first only in that the gas evolved is H. The soln. is acidified and a Zn tube fastened to a glass rod extending through the stopper so that the Zn may be raised or lowered. The colored flame obtained from either burner persists as long as gas is evolved.

F. A. HARVEY.

Extraction apparatus. A. A. BESSON. Basel. *Chem. Ztg.* 39, 860(1915).—A small wide-neck flask with a constriction at the base of the neck on which the thimble rests. A modified Storch cooler is in the short neck above the thimble, the app. being small enough to weigh on analytical balances.

J. H. MOORE.

A new apparatus for fat extraction. I. SELECTER. La. Agr. Expt. Sta., Baton Rouge, La. *J. Ind. Eng. Chem.* 7, 871-2(1915).—The app. is made in 3 parts, reservoir below, extn. section in the middle and condensing section above; each is fitted into the next by a ground glass joint. The reservoir is a 75 cc. Erlenmeyer flask. The extn. section is a straight glass tube 5 in. by 1 in. in which the ordinary Schleicher and Schüll⁶

capsule, with weighed sample, is placed. The condensing section consists of an 18×1.5 in. outer glass tube with upper flanged end and a waist, just above the ground glass joint to the extn. section, which supports a Soxhlet extn. tube with syphon outlet. Above the Soxhlet tube and hanging from the upper end of the outer tube by means of a flange is a tube, 12×1 in., with 2-hole stopper and inlet and outlet tube for the cooling water. This tube is drawn out to a point so that the condensed ether or other solvent drips into the Soxhlet tube, which thus fills up and periodically empties through the syphon flooding the sample tube. Results are given showing that the new app. gives greater uniformity than straight extn. or the Soxhlet method. It is also more rapid. The recovery of the solvent is easy and rapid and the cost of the app. small.

F. A. HARVEY.

Portable titrating table. R. E. OZIAS. U. S. Customs Service, N. Y. *J. Ind. Eng. Chem.* 7, 872-3(1915).—Standard soln. bottles of 2500 cc. capacity are let down into a table top and rest on a shelf 5 in. underneath. These bottles are connected with Squibbs automatic burets and a piping system whereby air under pressure from a Good-year air bottle can be used to force the solns. into the burets. A relief valve opened when the buret is full fixes the soln. at the proper level. White tiling is placed under the buret tips.

F. A. HARVEY.

A new test-tube stand. K. HOFMANN. *Z. angew. Chem.* 28, I, 368(1915).—This test-tube stand is intended particularly for use in lectures as the liquids in the tubes may be seen from top to bottom. The bottom of the stand is slightly raised in front, and attached vertically to this bottom is a back containing six half-round grooves in which the test tubes rest. This stand is supplied in porcelain with black, white or black and white backs, the selection of which depends upon the color of liquids to be shown in test tubes.

H. R. GUNDLACH.

A simple apparatus for filtration under diminished pressure. JAMES C. IRVINE. Univ. St. Andrews, Scotland. *Biochem. J.* 9, 321-2(1915).—The app. consists of a cylindrical tube with a delivery stop-cock at the lower end, the upper part being expanded into a bulb. A side-limb carries a three-way stop-cock, and connects with the pump. The filter funnel (or Gooch) is attached to this filter tube. This modification is particularly recommended for the sepn. of small quantities of cryst. matter from sirupy solutions.

B. HOROWITZ.

A sterile siphon tip protector. I. C. HALL. *Science* 42, 700(1915).—A bell-shaped cap is made by cutting the bulb of a 50 cc. pipet in the middle, leaving attached to each bell a tube 5-7 cm. long for union with the siphon tube, and drawing into this tube by means of a rubber tube, another glass tube of such size that when the rubber tube is released its elasticity binds the two together. The covered end of the smaller tube is then adjusted even with that of the bell tube and the rubber tube cut off, or used to connect to the siphon of the bottle. To prevent the lodgment of upwardly floating particles of lint upon the drop of liquid at the point, a test tube about 2.5×15 cm., with lip removed, is fitted by means of thin rubber, either inside or outside the bell. During use the protector may be protected by fastening it to another test tube. In certain cases a few drops of HCHO may be used in the protector.

F. W. S.

The sublimator and its use. F. F. EXNER. *J. Assoc. Official Agr. Chem.* 1, 208-9(1915).—The substance to be sublimed is weighed out into a 10 oz. Erlenmeyer flask, which is supported on a wire gauze, with asbestos, and heated gently with a small Bunsen flame. Condensation takes place on a closely coiled glass tube extending down through a cork into the flask. The lower end of the cork is protected by a layer of tin foil. An expansion tube with a cotton plug in its upper end extends through a 3rd hole in the cork. To use the app. the glass coil is dried and weighed, then put in

place in the flask. A slow current of water is passed through the coil and the caffeine or other substance slowly sublimed. It condenses on the cooled tube. After condensation is complete and the app. cool the tube is removed, a current of alcohol, then ether, then dry air, is passed through and it is dried in a desiccator and weighed. It is also necessary to weigh the expansion tube as there is usually 0.6 to 1.5 mg. in this tube.

F. A. HARVEY.

Electrically operated gas valve. ZENO OSTENBERG. San Francisco. *J. Ind. Eng. Chem.* 7, 872(1915).—O. describes a valve which has been in successful operation for a year and a half.

F. A. HARVEY.

A thermostat for moderate and high temperatures. J. L. HAUGHTON AND D. HANSON. *Engineering* 100, 378(1915); see *C. A.* 9, 3145.

E. H.

The measurement of high temperatures in practice. H. WILDA. *Feuerungstechnik* 3, 233-6, 247-9(1915).—The different types of pyrometers for industrial purposes are considered, methods for their use for special purposes being given together with the measures necessary for accurate results. The types considered are thermoelectric, resistance, optical, calorimetric and melting (Seeger cones, etc.).

H. R. G.

A new direct-reading viscosimeter. R. F. MACMICHAEL. Seattle, Wash. *J. Ind. Eng. Chem.* 7, 961-3(1915).—The fluid to be tested is held in a cup which can be rotated by means of a small d. c. or a. c. motor; the speed control is of the phonograph type. A small elec. heating coil brings the fluid to the desired temp. in place, after which the level is adjusted to a definite mark. A disk is suspended in the fluid by means of a torsion wire. The angle through which the torsion head must be turned to bring the disk back to the zero position when the motor is running is measured. The graduations on the torsion head are such that practical units, abs. units, and sp. viscosity may be obtained at one reading. The calibration can be checked and motor speed adjusted by the use of standard solns. of sugar sirup. The accuracy of the instrument under ordinary working conditions is 0.5% and by extra precautions may be made greater. The time required for a reading is very short. Colloidal solns. such as glues, gums, starch solns., gelatin, also mixts. such as catsup, etc., may be tested successfully.

F. A. HARVEY.

A cylinder friction and lubrication testing apparatus. A. E. FLOWERS. *Proc. Am. Soc. Testing Materials* 15, II, 399-414(1915).—F. describes, with cuts, an app. which is capable of testing cylinder lubricants at various rates of feed under piston-ring pressures from 2 to 9 lbs. per sq. in. and at steam temps. up to 426.6°. The cylinder has an 8-in. bore, the stroke is 8 in., and the app. is run at speeds up to 300 r. p. m. The results of tests are plotted showing the actual readings as taken and the effects of steam pressure, steam temp., and cylinder-wall temp. with and without steam, on the friction coeff. for 2 different lubricants.

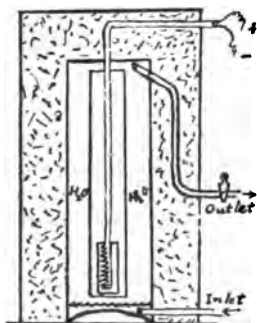
F. W. SMITHER.

Bardill sampling machine. J. O. BARDILL. *Eng. Mining J.* 100, 803-4(1915).—This machine was designed for sampling wet and sticky mill concentrates and similar materials. The principal elements are a turret and its wormgear drive, incased in an oil-tight housing. A cutter arm is pivotally mounted on the turret and revolves in unison with it, except through about 40° in each revolution, when it is held stationary by a vertical detent bolt. The relative motion between the turret and the cutter arm effected during this 40° period of inactivity of the cutter arm produces tension in a coil spring, which is exerted between the turret and pivoted cutter arm. A cam underneath the rim of the turret releases the detent bolt at the proper time, causing the cutter to pass rapidly through the stream owing to the spring action independently of the motion of the turret. The action of the cutter arm is extremely rapid, and it is suddenly stopped by its opposite end coming in contact with a rubber

buffer post. This clears the cutter of any material that might adhere. The material is deposited in a receiving box properly placed. The power required is so slight that the turret may be operated through its entire revolution, and against the spring action, by turning the wormshaft by hand. The machine may easily be made into a self-contained, portable affair by mounting a small driving motor on the base plate.

F. W. SMITHER.

Heat losses of various electrically heated laboratory boilers. AD. RITTERS-HAUSSEN. *Elektrotechn. Z.* 36, 300-2 (1915).—An illus. description of several types of boilers, elec. heated. Cooling curves for each type are shown. It was found that the most efficient boiler had its heating unit centrally located near the bottom and completely submerged in the H_2O ; the feed cock is kept open and the outlet cock is closed. By direct calorimetric detn. an efficiency of 94% was obtained with this type (see fig.); a boiler with the unit laterally placed showed 82% efficiency, and one with the unit under the bottom of the boiler 66%. A 200-l. boiler with an efficiency of 94% is cheaper in Germany than a gas-heated boiler when the cost of electricity is 5 pfennig (1.25 c.) or less per kw.-hr.



C. G. FINK.

"Imperial" vacuum pump. ANON. *Power* 42, 711 (1915).—A sectional view of this pump is given. It is designed for condensing and other service where a high degree of vacuum is desired. Corliss-type intake valves are so placed in the cylinder head that the clearance is exceptionally low. The action of the valve is positive and quick, and, being independent of the intake pressures, the pressures within and without the cylinders are as nearly equal as possible. The intake ports are large and direct, which, together with the water-jacketing of the valve, tends to cool the intake gases. Lubrication is by the bath system. A duplex construction is also described.

W. E. RUDER.

Liquid measuring devices. H. WINKELMANN. *Z. angew. Chem.* 28, I, 363-4 (1915).—The device described measures liquids by weight, and is used for the measurement of large quantities. The liquid scale depends on the principle of automatic weighing with the help of two tilting vessels, which can be alternately filled or emptied by means of an automatically working dividing scale. The accuracy attained is $\pm 1.0\%$ but with additional devices an accuracy of $\pm 0.1\%$ may be obtained. The app., with the exception of the knife edges on which the tilting vessels rest, has no parts subject to wear that would influence the accuracy of measurement, which are common to most other liquid measuring devices.

H. R. GUNDLACH.

Drying chambers and ovens of modern construction heated directly with steam or gas. H. WINKELMANN. *Chem. App.* 2, 257-9 (1915).—A general discussion, without cuts, of the principles on which such app. should be constructed. J. H. M.

Apparatus for the determination of phytosterol (WAGNER) 12. An electroplating barrel 4.

Gas-analyzing apparatus. U. S., 1,157,866, Oct. 26. J. W. HAYS and C. W. HAYS. A gas-analyzing app. of the type shown in U. S. pat. 1,153,912 (*C. A.* 9, 2998) is enclosed in a bath of H_2O which is maintained at const. temp. while the app. is in use and thus uniform temp. of the gas is secured during measurement and absorption.

Siphon pump for handling acids or other corrosive liquids. A. FERRARIS. U. S., 1,159,201, Nov. 2. Cf. *C. A.* 9, 2010.

Acetylene generators. R. BERCHEN. U. S., 1,159,159, Nov. 2.

Acetylene generator. J. M. HOOVER. U. S., 1,161,675, Nov. 23.

Acetylene generator. L. WAGSCHAL. U. S., 1,159,814, Nov. 9.

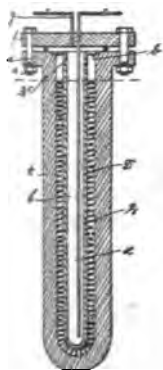
Acetylene generator. A. D. LONG and L. D. HARPER. U. S., 1,159,968, Nov. 9.

Acetylene generator. F. F. NOVAK. U. S., 1,162,708, Nov. 30.

Apparatus for generating and storing acetylene. O. K. STUART. U. S., 1,160,668, Nov. 16.

Oxygen generator. W. F. MUEHL. U. S., 1,160,524, Nov. 16. KClO_3 or a mixt. yielding O on heating is placed in the receptacle 48 and heated by an elec. resistance heater 51 to produce O, especially for immediate use while still warm in removing C from internal combustion engines.

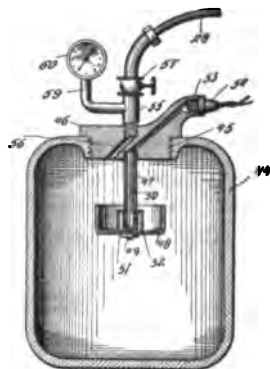
Apparatus for effecting reactions with hydrogen under pressure. M. PIER. U. S., 1,159,865, Nov. 9. To prevent leakage of H, a layer of molten Wood's metal or other readily fusible alloy, D, is maintained between the inner wall B and the outer casing A (which may be of Fe or steel). The inner wall B may be of porcelain or metal. The app. will withstand 150 atms. pressure without leakage.



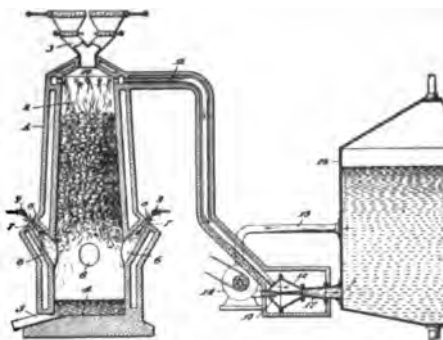
Apparatus for cooling, drying and electrically ozonizing air. J. STREYNIS. U. S., 1,162,415, Nov. 30.

Apparatus for making carbon-black by sooty gas flames. G. L. CABOT. U. S., 1,162,131, Nov. 30.

Apparatus for purifying used lubricating oils. F. E. CORWIN. U. S., 1,161,197, Nov. 23. The oils are strained and washed and metallic particles are removed magnetically.



Smelting ores or incinerating garbage. W. R. HESLEWOOD. U. S., 1,160,509, Nov. 16. Crude petroleum is used as fuel at the burners 8 and solid fuel also may be used in the furnace. Ore to be smelted or garbage, etc., to be incinerated is supplied from the hoppers 3 and H_2O circulated from the tank 16 through the nozzle 13 maintains a draft from the outlets 10 and pipe 11.



Rotary kilns. E. C. R. MARKS. Brit., 17,145, July 20, 1914. In a rotary kiln for treating ores, cement, etc., of the kind in which the burning and cooling zones are formed in the same rotating tube, means, *e. g.*, Fe ribs or projections, are provided in the cooling zone for facilitating the interchange of heat between the material and the cooling air. The fuel supply tube or nozzle, which extends over a considerable portion of the cooling zone, is formed of thin sheet metal and is supported at one end only.

Electric hygrometer. C. LÜBBEN. Ger., 284,867, Feb. 22, 1914. A member,

the elec. resistance of which is dependent upon the moisture, is brought into contact with the gas under examn. and introduced, as resistance, in an elec. circuit.

Electrically heated cathode for discharge tubes. SIEMENS & HALSKE, AKT.-GHS. Ger., 285,031, June 23, 1914.

Regulator for gas condensers and pumps. GEBR. MEER. Ger., 284,946, Mar. 19, 1912.

Glass atomizer for liquids. K. HENNICKE. Ger., 284,980, Sept. 15, 1914.

Tube stamping machine. MASCHINENFABRIK HOCHDORF, FREY & CIE. Ger., 284,991, May 6, 1913.

Surface condensing plant. F. L. RICHTER. Ger., 284,833, Mar. 19, 1912.

Heated container for molten material to be used in spraying apparatus. METALLATOM, G. M. B. H. Ger., 284,832, Mar. 19, 1914.

Apparatus for dressing fine ore and coal. F. JÜNGST. Ger., 284,536, Aug. 21, 1914. Addition to 283,921 (C. A. 9, 2473).

Crucible furnace. A. ERICHSEN. Ger., 284,914, Jan. 9, 1914.

2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS.

Assistants: E. B. MILLARD and A. B. CARTER.

Graphical representation of the relation between atomic weight and velocity of vibration of elementary atoms at their melting points and the natural system of elements in such graphs. P. P. VON VEIMARN. *J. Russ. Phys. Chem. Soc.* 47, 481-9 (1915).—This is a brief supplement to von V.'s work on contractive and expansive energies (C. A. 9, 2832), and in greater detail will be incorporated into the book he is prepg. on the subject. It is shown that instead of representing the periodic law, as is customary, by a curve on which atomic wts. (A) are plotted against abs. m. p. (T_s), it is better to use as coördinates A and T_s/A or still better A and $\sqrt{T_s/A}$. In the latter case the curve resembles the one given by Biltz (C. A. 5, 3745) but is much simpler and more clearly brings out certain regularities, B. having vitiated the simplicity of the graph by introducing the factor 2.12. All the conclusions drawn by B. follow in a simpler manner from von V.'s graph, and in addition to this the latter shows that the value of $\sqrt{T_s/A}$ (3.73) for H brings this element in near relation to those elements (P, As, Se) which under ordinary conditions appear in both the metallic and metalloid states. In the book will be given several other graphs of the periodic system.

H. M. GORDIN.

Valence and complex compounds. I and II. G. POVARNIN. *J. Russ. Phys. Chem. Soc.* 47, 217-62, 501-28, 989-1036 (1915).—Werner's theory of the constitution of complex compds. is criticized because (1) it necessitates the assumption of 2 kinds of valences, principal and supplemental, with a further differentiation of groups into ionogens and non-ionogens, thus making 3 varieties of affinity bonds; (2) it assumes a difference between atomic and mol. unions; (3) it assumes that while the number of principal valences of an element depends on the position of the latter in the periodic system, the number of its supplemental valences is in no way related with this system; (4) it makes it very difficult in many cases to predict the number of possible isomers, since the coördination number, not being dependent on the periodic system, cannot even approx. be fixed beforehand; (5) the theory explains only the structure of the inner sphere where atoms or groups are linked directly to the central atom, but fails to show how this sphere is united with the outer sphere where union with the central

atom is through the intermediacy of other atoms. To overcome these difficulties P. proposes an hypothesis consisting of the following postulates: (1) The atoms themselves are complex systems of positive and negative affinities in unequal amts., so that an element is positive when the positive charge exceeds the negative, and negative when the reverse is the case. While the value of the excess is not known, we may indicate the greater charge by 2 signs and the lesser by 1. An atom of H, *e. g.*, is represented as H^{++} , while that of Cl as Cl^{--} . (2) The valence of H is n where n is any whole number greater than 1, so that the max. valence of any element is n times the number of the group to which it belongs in the periodic system. Assuming $n = 2$ will suffice for the present. The formula of a mol. of H is therefore $(H^{++} ::::: + + H)$, and that of Cl $(Cl^{--} ::::: - - Cl)$, while that of HCl is supposed to be $(H^{++} ::::: - - Cl)$. As shown by these examples, in a mol. of H or Cl the satn. of opposite affinities takes place between pairs of unequal charges, while in HCl (and similar cases) the opposite charges satg. each other have the same value; in other words, in a mol. of H or Cl both affinity bonds have the same value, each consisting of 2 positive charges linked to 1 negative, but in HCl 1 bond consists of 2 positive charges satd. by 2 negative ones, while in the other bond 1 positive sats. 1 negative bond. Of these 2 bonds in HCl the 1st consisting of 2 pairs of opposite charges may be assumed to be more stable than the other consisting of single opposite charges. Hence when a dissociating agent acts on a mol. of H or Cl the dissociation will in most cases be complete, while the same agent acting on a mol. of HCl will more frequently cause halving of the bonds, removing the less stable bond only, and leaving intact the more stable one, thus giving the group $(H^{++} ::::: - - Cl)$, with liberation of free polar affinities capable of uniting with other atoms, or groups to form complexes. This explains the formation of complexes between mols. (3) The bonds between atoms have the power to oscillate, always tending to form such compds. as are most stable under the given conditions. 4. Cycles of 4 or 6 members are the most stable and have the stereofoms and the coordination numbers assigned to them in W.'s system. P.'s hypothesis has the following advantages: All bonds are of the same type, there being no difference between principal and supplemental valences; the difference between atomic and mol. complexes disappears, all union being atomic; all valences being regulated by position in the periodic system, the prediction of the number of isomers of a compd. is facilitated; the formation of complexes between mols. of different substances is readily explained by halving the number of total valences and by the presence of free polar affinities. This is illustrated by constitutional formulas of such a vast number of compds. as cannot be given in abstr. form. A few examples may suffice: H_2O may have the

following formulas: $H \cdots \cdots O \cdots \cdots H \cdots \cdots$ and $H \cdots \cdots O \cdots \cdots H$.

Of these the 2nd is the active form capable of existing only in union with other

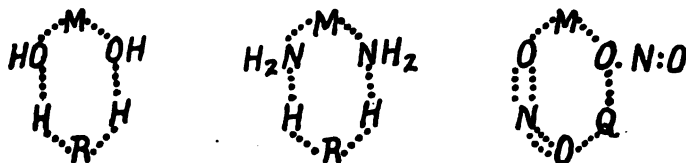
groups, giving compds. like $H \cdots \cdots R \cdots \cdots H$. Similarly NH_3 has the inactive form

$H \cdots \cdots N \cdots \cdots H$ and the active form $H \cdots \cdots N \cdots \cdots H$. The formula of

NH_4Cl is therefore In the same way HNO_3 has the forms

and $\text{O}::\text{N}::\text{O}::\text{H}$. With a central atom M and

either a metalloid R or a metal Q we may have the complexes $\text{M}(\text{H}_2\text{O})_2\text{R}$, $\text{M}(\text{NH}_3)_2\text{R}$ and $\text{M}(\text{NO}_2)_2\text{Q}$ whose structures (omitting to indicate the free polar affinities) respect. are:



For $\text{CoCl}_2 \cdot \text{H}_2\text{O}$ the following formulas are possible: $\text{Cl} \cdots \text{Co} \cdots \text{Cl} \cdots \text{H}$ and and

$\text{H}::\text{Cl}::\text{Co} \cdots \text{O} \cdots \text{H}$. Of these the 1st is to be preferred as

better accounting for the easy removal of H_2O (by drying), since in this formula the H and the OH are nearer to each other. With P.'s free polar valences it is not necessary to assume that in Gombert's triphenylmethyl the central C is trivalent. For the other complexes and for the various speculations of P. the original must be consulted.

H. M. GORDIN.

Leakage of gases through quartz tubes (and Jena glass tubes). E. C. MAYER. *Phys. Rev.* 6, 283-91(1915).—No indications of leakage through Jena glass were obtained for temps. up to 800° , above which the glass became too soft for measurements. At the higher temps. it was not feasible to use pressures differing much from that of the atm., on account of softening. No leakage was found for quartz with H or O at atm. pressure and room temp. A quartz tube of the transparent variety was pervious to H at temps. from 330 to 710° and pressures from 740 to 780 mm. Hg. For N and O no leakage could be detected for pressures less than one atm. N did not seem to escape until a temp. of about 430° was obtained. At const. temp. the results for all gases showed considerable increase in leakage with increasing pressures. Under approx. equal conditions H leaks most rapidly and N least rapidly. It may be assumed that if quartz contains occluded gas, this gas is in equil. and forms a constituent part of the quartz itself. The occluded gas does not affect the diffusion process in any other manner.

E. B. MILLARD.

Transference number of the iron ion in ferrous chloride solution. A. STEPNICZKA-MARINKOVIC. *Monatsh.* 36, 831-43(1915).—The app. employed was that of Hopfgartner (*Z. physik. Chem.* 25, 119(1898); *Z. Elektrochem.* 4, 445) except that in place of the anode flask a 60 cc. U-tube was used with the Cd anode in the shorter arm. (The app. is not further described in this paper.—ABSTR.) HCl was used at various small concns. to prevent hydrolysis and delay oxidation. No attempt seems to have

been made to keep the temp. const. during the series; the individual expts. are at 14.0 to 22.5°. Total chloride was detd. by titration with AgNO_3 in the presence of NH_4SCN , Fe by standard I and $\text{Na}_2\text{S}_2\text{O}_8$, acid by difference. Values of the transference number of HCl were taken from Landolt-Börnstein's tables to correct for the transport of Cl ions from HCl, and the transference number of the Fe calcd. by difference. The anode portion only was analyzed, and only a single sample of the "middle portion" was analyzed, so that the possibility of mixing has not been considered. A large % change in concn. was produced, in some cases as great as 50%. It was found that the loss in wt. of the Cd anode did not agree with that calcd. from a Ag coulometer in series with the app., but since the difference was not greater than 3.6% in any case, a correction was applied for this, and the Ag coulometer was dispensed with. Twelve expts. were carried out at approx. N , 12 more at 0.5 N , and 12 at 0.172 N . The values for the cation transference number at these concns. were 0.300 ± 0.003 , 0.326 ± 0.005 , and 0.375 ± 0.006 , resp. Extrapolation to zero concn. gave 0.414 as the transference number, and from this the mobility of the Fe^{++} ion was calcd. as 46. From a calcn. after Riesenfeld and Reingold (*Z. physik. Chem.* 66, 672) the hydration of the Cl ion was 21 mols. of H_2O and that of the Fe ion 60 mols. H_2O . E. B. MILLARD.

Transference number of iron ion in ferric chloride solution. K. HOPFGARTNER. *Monatsh.* 36, 751-69(1915); cf preceding abstr.—The app. and method were essentially the same as above. HCl was again used to prevent hydrolysis, total Cl detd. by the Volhard method, Fe by titration with standard I, and acid by difference. In all, 60 expts. were made with concns. of Fe from 0.14 to 1.6 N , with the HCl between 0.06 and 0.19 N . From 30 expts. at 0.14 N the mean value for the transference number of the cation was 0.384 ± 0.003 , with the individual values between 0.414 and 0.358. The acid concn. was without influence on these values. At approx. 0.44 N the mean value for the cation was 0.359 ± 0.003 , and at the higher concns. 0.292 ± 0.004 . Extrapolation to zero concn. gave 0.396, corresponding to a mobility at 18° of 43 for Fe^{+++} . This points to the fact that the mobility of a highly charged cation is no greater than that of an "isomeric" ion with a smaller charge. This does not agree with Bredig (*Z. physik. Chem.* 13, 237(1894)) who gives $\text{Fe}(\text{CN})_6''' = 89.6$ and $\text{Fe}(\text{CN})_6'' = 90.3$. An increase in mobility with increasing charge is possibly prevented by an increase in hydration which more than compensates the increased charge. An equiv. of Cl ion at 0.137 N carries 6 mols. of H_2O and an equiv. of ferric ion 21 mols. No explanation of the smaller hydration of this ion than of ferrous ion was found, though possibly the presence of HCl may have influenced the hydration. E. B. M.

Anent a certain hypothesis on the condition of salts in solution. A. N. SAKHANOV. *J. Russ. Phys. Chem. Soc.* 47, 434-9(1915).—A criticism of Bogorodskii's theory of soln. (*C. A.* 9, 2178). The theory fails satisfactorily to explain those facts for the explanation of which the ionic hypothesis has been devised. According to B. a salt $\text{MR}(\text{M} = \text{metal}, \text{R} = \text{acid radical})$ is hydrolyzed by H_2O to mols. of $\text{M}(\text{OH})_n(\text{H}_2\text{O})_x$ and $\text{RH}_n(\text{H}_2\text{O})_y$, giving 2 mols. in soln. for 1 of solute taken, thus accounting for the factor i in vant Hoff's equation, but since salts of strong acids and strong bases are less hydrolyzed than those of weak acids and weak bases, the value of i (lowering of f , p , osmotic pressure, etc.) ought to be less for the former than for the latter, which is contrary to experience. For acids and bases B. assumes a depolymerization of $(\text{H}_2\text{O})_n$, but gives no reason why salts do no such thing. B. is taken to task for relying on the data of 2 authors which are admittedly in discord with those of other most reliable investigators. As to the concordance of the values of i as calcd. from thermochem. data with those calcd. upon the basis of B.'s theory, B. failed to give the concns. of his soln., so that his values are purely accidental. For certain salts such concordance does not exist at all. H. M. GORDIN.

Some electrochemical properties of solutions. A. BOGORODSKII. *J. Russ. Phys. Chem. Soc.* 47, 379-93(1915).—B. reiterates his claim that his theory of soln. (*C. A.* 9, 2178) as adequately explains the various phenomena accompanying soln. as the ionic hypothesis, and draws into the discussion the phenomena treated in the article referred to, those given in the preceding abstr., the heat of neutralization, diffusion, the origin of e. m. f. and the action of neutral salts in soln. on metals. H. M. G.

Depression of the freezing point. V. A. VIL'DE AND A. YA. BOGORODSKII. *J. Russ. Phys. Chem. Soc.* 47, 373-9(1915).—The abnormal depression of the f. p. of electrolytes in dil. soln., indicating the presence of almost double the number of mols. of solute taken, is usually explained by assuming a dissociation of the solute into ions. Citing from literature the numerous objections to the ionic hypothesis, V. and B. reject it, and offer the following explanation of the phenomenon: Liquid H_2O has the



formula H_2O-CH_2 , in which O is tetravalent. In connection with Thomsen and Gantsch's view of the existence in the soln. of HCl in H_2O of an hydronium group H_3O ($H_2O + HCl = H_3OCl$), it is assumed that when an acid HR or a base MOH is dissolved in H_2O the reactions are, resp.: $(H_2O)_2 + HR = H_2O.R + H_3O.OH$; $(H_2O)_2 + MOH = H_2MO.OH + H_3O.OH$, giving 2 mols. for each mol. of acid or base taken. Similarly the soln. of a salt in H_2O is: $(H_2O)_2 + MR = H_2O.R + H_2MO.OH$. In concd. soln. the 2 mols. resulting from 1 of salt retain their opposite chem. natures, forming 1 undissociated mol., either $H_2MO.O(R)(H).OH$, or $(H_2MO)(RH_2O)OH$, while in dil. soln. or at an elevated temp. the 2 mols. are free. This explains why hydrates like $MR.2H_2O$ or $MR.H_2O$ sometimes sep. out when the soln. of MR in H_2O is warmed. The production of $H_3O.OH$ by warming $(H_2O)_2$ also accounts for the greater elec. cond. of hot than cold H_2O , while the complete dissociation of $(H_2O)_2$ into simple H_2O mols. at a still higher temp. accounts for the absence of cond. in steam. Further corroboration was found in detns. of the lowering of the f. p. of anhydrous AcOH by dissolving in it CuO. The results showed that the depression was 1.37 times greater than corresponds to 1 mol. of CuO, so that we must assume that the hydrate $(AcO)_2Cu$ formed in the reaction gives off some of its H_2O to the acid, producing from 100 mols. of hydrate 37 mols. of anhydrous salt, 37 mols. of hydronium acetate and 6 mols. of undissociated hydrate. H. M. GORDIN.

True specific volume and the number of molecules in homologous series of organic compounds. W. HERZ. *Z. Elektrochem.* 21, 457-8(1915); cf. *C. A.* 9, 3000.—Assuming that the mols. are spherical, the vol. actually occupied by them may be expressed as a function of the dielectric const. of the liquid by means of the equation $\mu = (D - 1)(D + 2)$, where μ is the vol. On dividing μ by the d., the true sp. vol. is obtained. This has been calcd. from existing data for a number of series of compds. In each homologous series the dielectric const., as well as the μ and sp. vol. values, decrease as the series is ascended. In the light of the rule expressing the power of a liquid to act as a dissociating solvent, this means that the solvent power decreases also as the series is ascended. The rule fails completely for the hydrocarbons, since their dielectric consts. are practically the same, and of small magnitude. A mean value of the mol. radius was calcd. as 10^{-8} cm., and from it values of the number of mols. in a were calcd. for each series. The numbers decreased as the series was ascended, that at least the principle of the calcn. was correct. Avogadro's N was found to be 60×10^{21} . E. B. MILLARD.

Lecture experiment to demonstrate a case of decrease of reaction velocity with increase of temperature. ANTON SKRABAL. *Z. Elektrochem.* 21, 461-3(1915).—"reaction" is the resultant of the 3_2 reactions taking place when HIO_3 and H_2SO_4

mixed: (I) $\text{IO}_3' + 3\text{SO}_3'' = \text{I}' + 3\text{SO}_4''$, (II) $\text{IO}_3' + 5\text{I}' + 6\text{H}^+ = 3\text{I}_2 + 3\text{H}_2\text{O}$, (III) $\text{I}_2 + \text{SO}_3'' + \text{H}_2\text{O} = 2\text{I}' + \text{SO}_4'' + 2\text{H}^+$. If the reaction is carried out with NaHSO_3 and HIO_3 , it has a normal temp. coeff., which may be shown by immersing 2 sep. portions of the mixt. in baths of different temps. If an excess of Na_2SO_4 is added, the mixt. in the cooler bath flashes blue in the presence of starch several min. before that in the warmer bath. For 12 and 30° the difference was quite marked. The final condition of equil. is not noticeably dependent on the temp. E. B. M.

New form of dilution law for electrolytes. G. v. GEORGIEVICS. *Monatsh.* 36, 771-94(1915); *Z. physik. Chem.* 90, 340-58(1915).—An equation similar to $C_i^n/C_s = K$ has been used in most discussions of the "diln. law." In this paper values of n have been calcd. for numerous acids and salts, and it was found that most mineral acids at equal concns. had similar values. Increase in n values was perhaps due to the adsorption of H_2O by the undissociated mols., or the formation of a H_2O film over the ions. There was a parallelism between the values of n and the viscosity of the solns., and hence the values are detd. by the affinity between the acid and H_2O (cf. C. A. 9, 2171, 2340). No such similarity between affinity for H_2O and n was found for salts, where the values were somewhat more uniform. In the absence of influences which render the equation invalid, the diln. law is $C_i/C_s = K$, but some of these influences (such as hydration, affinity of the electrolyte mols. for H_2O , etc.) may cause the n values to be as great as 7.8 in place of unity. E. B. MILLARD.

Interpretation of the labile portion of the theoretical isotherm. G. BAKKER. *Z. physik. Chem.* 90, 359-80(1915).—A mathematical paper. H. J. C.

Determination of the fusion points of calcium sulfate dihydrate, barium chloride dihydrate, sodium carbonate monohydrate, sodium tetraborate pentahydrate, copper sulfate hydrates and carnallite by means of the electrically heated pressure apparatus. ERNST JÄNECKE. *Z. physik. Chem.* 90, 265-79(1915); cf. C. A. 10, 132.—The m. ps. of the above mentioned hydrates have been detd. by means of the electrically heated pressure app. The m. p. of gypsum and of carnallite agrees with previous detns. Detns. have been made for the first time of incongruous m. ps. of $\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$, $\text{Na}_2\text{B}_4\text{O}_7 \cdot 5\text{H}_2\text{O}$, $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and $\text{CuSO}_4 \cdot 3\text{H}_2\text{O}$. From the data obtained, the existence of an incongruous m. p. of $\text{CuSO}_4 \cdot \text{H}_2\text{O}$ and the formation of an unknown hydrate with less H_2O ($\text{CuSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$) are probable. H. JERMAIN CREIGHTON.

The transition points of silver nitrate, ammonium nitrate and potassium nitrate. ERNST JÄNECKE. *Z. physik. Chem.* 90, 280-95(1915); cf. preceding abstr.—The known transitions of AgNO_3 , NH_4NO_3 and KNO_3 have been confirmed by means of an electrically heated pressure app., and a new modification for KNO_3 has been found. The transitions are only partially manifested by an uneven change in the pressure. In many cases the change was found gradual over a temp. interval, and the pressure curve before and after rectilinear. In such cases the intersection of the rectilinear portions corresponds to the transition point. H. JERMAIN CREIGHTON.

The transition phenomena of isomorphous mixtures of potassium chloride-sodium chloride and silver chloride-sodium chloride and their complete condition diagram. ERNST JÄNECKE. *Z. physik. Chem.* 90, 296-312(1915); cf. preceding abstr.—New transition points have been detd. in the isomorphous system KCl-NaCl , by means of the electrically heated pressure app., and the app. has also been used to det. the unknown transition curve for AgCl-NaCl mixts. H. JERMAIN CREIGHTON.

The transitions of the metals tin, zinc, bismuth, cadmium, copper, silver, lead and antimony, determined by means of the new electrically heated pressure apparatus. ERNST JÄNECKE. *Z. physik. Chem.* 90, 313-39(1915); cf. preceding abstr.—The values found for the transitions of Sn, Zn, Bi, Cd, Cu, Pb and Sb by Cohen and his

co-workers have been confirmed. A new transition of Ag has been found, and it has been shown that this is in good agreement with previous expts. It is pointed out that the explanation of the transition interval is found in Smits' new theory of allotropy. It is shown that it is these transition intervals that have hitherto prevented the recognition of these transitions by means of heating and cooling curves.

H. JERMAIN CREIGHTON.

Thermal analysis of binary mixtures. E. BAUD. *Bull. soc. chim.* 17, 329-45 (1915); cf. *C. A.* 7, 1316; 8, 605.—Heats of mixing have been detd. for 33 mixts. of 14 org. compds. of widely differing types at several concns., and a set of substances has been found for which the heat of mixing may be expressed by the equation $dQ = K \cdot x(1 - x)$, where x is the mol. fraction of one of the constituents and K is a const. for each pair of substances. Mixts. of cyclo- C_6H_{12} with C_6H_6 , C_2H_5Br , $CHCl_3$, $n-C_6H_{14}$, and $HOAc$, and of C_6H_6 with C_2H_5Br , obeyed this rule but most of the other substances did not. In most of these latter cases dQ had a max. value at $x = 0.5$, or in an equimolar mixt. Only those substances which follow this modified law of Biron were considered as physical mixts., the others were influenced either by chem. reactions, depolymerization or association. In the ideal cases it is possible to predict roughly the soly. of the solid form of one of the components in the liquid of the other from their phys. properties. The exptl. method was not described. E. B. M.

Negative-hydroxide sols. H. FREUNDLICH AND W. LEONHARDT. *Koll. Chem. Beihefte* 7, 172-211 (1915).—Colloidal solns. of $MoO(OH)_3$ ($MoO_3 \cdot H_2O$ in original but correction in *Kolloid-Z.* 17, 112 (1915) gives $MoO(OH)_3$) and of V_2O_5 were investigated. The sol of $MoO(OH)_3$ was prepared according to Pechard (*J. B.* 1894, 1222) by reducing $KMoO_4$ with HI and pptg. with NH_4OH . The sol showed distinct colloidal properties. It did not dialyze through parchment, was coagulated with electrolytes and the wandering of the particles toward the anode showed a decided negative charge of the particles. Expts. on the coagulation of the colloid showed that a total pptn. by means of addition of electrolytes was not possible. The sol remained yellow, due most probably to the existence in the original sol of larger and smaller particles which coagulated with more or less ease. Instead of detg. the amt. of electrolyte necessary to cause total coagulation of the colloid, the amt. of electrolyte which will just produce a cloudiness in the sol in a given time ("Trübungswerte") was detd. The results obtained were as expected from negative colloids (predominating influence of the cation). The "Trübungswerte" diminishes with increasing valences. Of cations with the same valences only those with valences of 2 and 3 gave the same value for the "Trübungswerte." The monovalent cations decreased in value 100-fold in the order from Li to Cs . Organic cations and the heavy metal cations react more strongly than their valences call for. The ease with which the coagulates, produced by the addition of different electrolytes, can be reconverted to the colloid form is in proportion to the coagulability of the electrolyte. Coagulates formed by monovalent cations are easy to peptize while those of the higher valent cations are more difficult to reconvert to colloidal form. The lower the temp. the easier the reversibility. The colloidal soln. of V_2O_5 was prepared according to the method of A. Ditte (*Compt. rend.* 101, 699 (1885)) by moderately heating NH_4VO_3 in a Pt crucible, and also according to the method of W. Biltz (*Ber.* 37, 1098 (1904)) by pptg. the V_2O_5 from NH_4VO_3 with HCl . The colloid V_2O_5 is negative. The surface tension of the colloidal soln. is about the same as that of H_2O . In reflected light the sol appears to contain small, shiny crystals and it shows strong rotation of polarized light. This is because the colloid particles are elliptical instead of round. Crystals could not be carried out because not all of the V_2O_5 was coagulated. Part of the V_2O_5 was not in colloidal form. For this reason the values were detd. as in the $MoO(OH)_3$.

expts. and similar results obtained. Expts. to reconvert the coagulates to colloidal form gave results similar to those in the case of $\text{MoO}(\text{OH})_3$. The coagulation of the negative V_2O_5 sol by the positive $\text{Fe}(\text{OH})_3$ and $\text{Al}(\text{OH})_3$ sols and *vice versa* was studied. There is no sharp point of relative concns. where coagulation takes place. A smaller amt. of V_2O_5 sol is necessary to coagulate the $\text{Fe}(\text{OH})_3$ or $\text{Al}(\text{OH})_3$ than was found using As_2S_3 and Sb_2S_3 sols. Evidently there is a relatively greater charge of electricity in the V_2O_5 sol than in the As_2S_3 or Sb_2S_3 sols.

W. F. ZIMMERLI.

Studies on the molecular statics of emulsions and their connection with the Brownian movement. M. v. SMOLUCHOWSKI. *Sitzb. Akad. Wiss. Wien, Abt. IIa* 123, 2381-405(1914).—Mathematical. Formulas are deduced which represent quant. the variation with time in the number of particles of an emulsion in a given volume, their agreement with Svedberg's observations being satisfactory. The phenomena are analogous to the Brownian movement and these formulas may be used for the indirect detn. of the Brownian mobility.

G. L. WENDT.

An absolute determination of capillarity constants with the Jäger apparatus. E. MARTIN. Univ. Vienna. *Sitzb. Akad. Wiss. Wien, Abt. IIa* 123, 2491-507(1914).—To eliminate the untrustworthy constant β in Jäger's formula, M. derives the following formula for the capillarity constant: $\alpha = aa_1gs/2(a - a_1)[H + 2(a - a_1)/3]$, in which α and a_1 are the radii of the capillaries, H the vertical distance between their tips, s the sp. gr. of the liquid, and g the gravitation const. This formula gives the following values for α : ether 18.36, EtOH 22.18, $\text{C}_6\text{H}_5\text{CH}_3$ 29.82, C_6H_6 29.23, H_2O 72.80, 18.34% NaCl soln. 78.71, 15.22% NaCl soln. 77.81, CS_2 33.87, CHCl_3 29.21. Small variations from the vertical position have no effect, but the plane of the orifice should always be normal to the axis of the capillary.

G. L. WENDT.

Heat and the occupation of space. G. A. HAGEMANN. *Z. Elektrochem.* 21, 493-5(1915).—The mol. vol. of Ca is 25 cc. ($d. = 1.6$), that of H_2 is 22480 cc., and the mol. vol. of the resulting CaH_2 ($d. = 1.7$) is 24.78 cc. The 22.5 l. of H has completely disappeared, it has lost its space-filling energy without being at abs. zero, or the H atom has become so small that it can find place for itself within the Ca atom. Brönsted has calcd. (on grounds to be published later) that the heat of formation of CaH_2 is a multiple of 11400 cal., and measured the heat as 45100. There is also thought to exist a compd. CaH with a heat of formation of 2×11400 cal., or half of that for CaH_2 . The total "volume energy" of H_2 is accordingly 45600 cal., and $E_H = 22800$ cal. The quantity of heat 11400 cal. appears to have special significance, for when 2 vols. of H_2 and 1 vol. of O_2 combine to form H_2O vapor the heat is 57000 cal., or 5×11400 . If this quantity of H_2O vapor is cooled to 4° another 11400 cal. of heat is given out, total 68400 cal. H. attempts to answer the question, "where does this heat come from?" and claims that it cannot come equally from the O and H , since they have different latent heats of evapn. Since at 100° the H_2O vapor occupies the same vol. as the H_2 from which it was formed, it may be assumed that all of the heat came from the O , and that its vol. has become so small that it can find space within the vol. of the 2 H atoms. It is impossible to say whether this is the total energy of the O , but the mol. vol. of O gas is 14 and that of liquid O is also 14. (No units are given, but presumably liters in the first case and cc. in the second.—ABSTR.) The O in H_2O_2 was also calcd. to be in the form of ozone, from the contraction in vol. during its formation from H and O .

E. B. MILLARD.

Period of induction and passivity of zinc. M. TZENTNERSHVER AND YUL. DRUKHER. *J. Russ. Phys. Chem. Soc.* 47, 439-69(1915); see *C. A.* 9, 3160. H. M. G.

Metastability of sodium. ERNEST COHEN AND G. DE BRUYEN. *Chem. Weekblad* 12, 92(1915).—In *C. A.* 9, 987 the temps. should read in both cases 0° to 90° instead of 70° to 80° .

E. H.

Electrostatic measurement of electrode potentials. A. W. EWELL. *Phys. Rev.* 6, 271-82(1915).—The electrolyte was contained in a glass or quartz flask of 50 to 150 cc. capacity, covered outside (except the neck) with a metallic film of Ag or Al which could be connected to the earth, to an electrometer, or to a source of known potential. If the electrode was initially at zero potential, it would acquire a potential equal to its natural abs. potential with reference to the particular electrode when that electrode was earthed and introduced into the electrolyte. A charge of somewhat different potential would be induced upon the metallic film upon the outside of the flask, and the deflection of the electrometer would be proportional to this potential, and thus the potential of the electrolyte could be obtained from a calibration of the electrometer. Losses of charge due to poor insulation rarely exceeded 2% per min. Volta effects were believed to have been eliminated, as well as static charges on the electrolyte. After standing some hrs. it was assumed that the electrolyte had the same potential as the surrounding wire cage. The potential of Zn in N $ZnSO_4$ was -1.05 ± 0.02 v.; for Zn in 0.5 N H_2SO_4 , -1.04 v.; Ag in N $AgNO_3$ was $+0.49 \pm 0.03$ v.; Cu in N $CuSO_4$, -0.02 v., and Cu in 0.5 N H_2SO_4 , -0.05 v. The results indicate that the potential of a metal in a homogeneous soln. of one of its salts at N concn. is about 0.5 v. more negative than the value deduced from the electrocapillary method and usually found in tables. Increasing the concn. of the salt soln. contained in a glass vessel appears to lower the potential of an electrode of the metal of the salt. E. B. MILLARD.

Products of addition and photochemistry of hydrated chromic chloride. V. V. KURNIOV. *J. Russ. Phys. Chem. Soc.* 47, 469-81(1915).—Under the influence of light

the green hydrate of $CrCl_3$ gradually changes to the violet:
$$\left[\begin{array}{c} Cl_2 \\ Cr \\ (H_2O)_4 \end{array} \right] Cl + 2H_2O = \left[Cr(H_2O)_6 \right] Cl_3$$
 (cf. Werner and Gubser, *Ber.* 34, 1579). The change was followed

spectrometrically and by detns. of the changes in elec. cond., both showing gradually increasing ionization. This is in accord with K.'s views on chem. compds. in general and mol. complexes in particular as outlined by him in former publications (*C. A.* 6, 1409) and in his book "Theory of Ammoniates," Ekaterinoslav, 1905. H. M. G.

Polychromatism of silver. R. E. LIESEGANG. *Z. wiss. Phot.* 14, 343-6(1915).—Similar to the behavior of $AgCl$ -gelatin mixts. on treatment with developers, $AgNO_3$ -gelatin hydroquinone mixts. on solidifying give a sequence of colors passing from yellow to blue. The rapidity of this change is increased by increased $AgNO_3$ concn. and temp. and decreased by additional gelatin. The age of the hydroquinone soln. has considerable influence. The color changes are ascribed to the increase in the size of the Ag molecular complexes. This property of Ag is applied in the R. y Cajal method of impregnating brain sections with silver by alternate immersions in $AgNO_3$ and hydroquinone solns. E. C. MCKELVY.

Measurements of the wave lengths on the international system in the arc spectra of the elements in the red and infra-red. L. JOAZE M. EDER. *Sitzb. Akad. Wiss. Wien, Abt. IIa* 123, 2289-311(1914).—Tables are given enumerating the lines between λ 8560 and λ 6341 for the elements: Li, Na, K, Cs, Rb, Ca, Sr, Ba, Zr, La and Ce.

G. L. WENDT.

Single-line spectra of the elements. J. C. MCLENNAN. *Engineering* 100, 344-5(1915).—Non-luminous vapors of Hg give a strong, symmetrically spaced band at 1849.6Å., a diffuse complex band at 2338Å. (consisting of a band extending from 2313 to 2320, one at 2326 and a wider one between 2330 and 2338Å.) and an asymmetrical band at 2536.72. Expts. confirmed the work of Wood and Guthrie as to the existence of a

strong asymmetrically spaced band at 2288 and a narrow, sharply defined one at 3260.17Å. Non-luminous Zn vapor gave a strong symmetrically spaced band at 2139.3, and a very narrow, sharp one at 3075.99Å. Spectra consisting of a single line can be obtained with Hg, Cd, Zn and Mg vapors if these were bombarded with electrons having kinetic energies acquired in potential falls of between 5 and 10 v. The wave lengths of these single lines were Hg 2526.72, Mg 2852, Zn 3076, Cd 3260. If the vapors of these metals were bombarded with electrons having slightly greater kinetic energies, the many-lined spectra were emitted. These points are further discussed in *C. A.* 9, 3155. E. B. MILLARD.

The magnetic rotation of the plane of polarization in titanium tetrachloride. L. H. SIERTSEMA. *Verslag Akad. Wetenschappen* 23, 1259-64(1915).—In the abstract of this paper in *C. A.* 9, 3165 the formula "CCl₄" at the beginning should read "TiCl₄." E. J. C.

Magnetochemistry of inner-complex compounds. J. LIFSCHITZ AND E. ROSENBOHM. *Z. Elektrochem.* 21, 499-501(1915).—A new, independent, and generally applicable method of demonstrating inner complexes is the detn. of magnetic susceptibility. The following values of $\chi \times 10^{-8}$ were detd. to within 1% by the Curie method: Cu(OAc)₂·2NH₃ + 7.00, Cu(CH₃NH₂CO₂)₂ + 6.39, Cu(CH₃CHNH₂CO₂)₂ about +4.00, CuCl₂·2C₆H₅N + 4.80, CuCl₂·2 (antipyrine) + 2.76, Cu(CH₃OH.CO₂)₂·H₂O + 7.08. The inner-complex Cu salts give either much higher or much lower values than the normal salts. Surprising differences are obtained with conjugated alkali and alk. earth salts, especially chromoisomeric compds. Pascal (*C. A.* 6, 2599, 2710) found differences between the magnetic susceptibilities of the red and colorless Ag salts of tribromophenol. Changes in the sign of the susceptibility are found in isomers with different distributions of the secondary valences, as in the salts of diphenylthioviolic acid, but the differences are very small when the chromoisomeric compds. have similar inner structures. The greatest differences are not due to a change from oximinoketone back to nitrosoenol, but to the different satns. of the secondary valences. E. B. MILLARD.

Conversion tables for Saybolt universal, Engler and Redwood viscosimeters. C. W. WADNER. *Proc. Am. Soc. Testing Materials* 15, 284-94(1915).—Report of an extended investigation to det. the necessary factors, which are given. E. W. B.

3. RADIOACTIVITY.

WILLIAM H. ROSS.

Radioactivity of underground waters in Providence and vicinity. P. B. PERKINS. Brown Univ. *Science* 42, 806-8(1915).—Measurements of the radioactivity of the waters from 13 springs and wells in Providence and vicinity gave values which, when expressed in equiv. amts. of Ra, varied from 0.03 to 57.93 $\times 10^{-10}$ g. of Ra per l.

W. H. ROSS.

Practical methods for the determination of radium. II. The emanation method. S. C. LIND. Bur. Mines. *J. Ind. Eng. Chem.* 7, 1024-9(1915); cf. *C. A.* 9, 1714.—Methods are given for the chem. treatment and other manipulations involved in preparing Em for electroscopic measurements. A soln. containing an excess of Ba in a rather high concn. of HNO₃ is recommended as the best medium for storing Ra in soln. without danger of loss through pptn. Ra solns. for use in analysis and which are low in Ba and HNO₃ should therefore have these reagents added before allowing to stand to collect Em. In cases where no Ba but an excess of a Ba precipitant, as sulfate, is present, it is suggested to add a suitable vol. of the Ra sample to a soln. containing

Ba in excess; the ppt. is filtered off, and the filtrate acidified with HNO_3 , boiled and sealed; the ppt. of BaSO_4 is fused with $\text{Na}_2\text{CO}_3\text{-K}_2\text{CO}_3$ mixture, sealed in a glass tube for a known time, and the accumulated Em then drawn into the electroscope by suction before and after treatment of the fusion with HNO_3 heated to boiling. For convenience the filtrate may be sealed at the same time as the fused ppt. in order that both lots of Em may be introduced into the same electroscope. Instead of boiling the fused mass in acid as in the analysis of Ra-bearing BaSO_4 , or other insoluble material, fusion may be employed both before and after the collection of the Em if preferred.

W. H. ROSS.

The ionization tracks of alpha rays in hydrogen. J. C. McLENNAN AND H. V. MERCER. Univ. Toronto. *Phil. Mag.* 30, 676-83 (1915).—Photographs made by the method of C. T. R. Wilson (*C. A.* 7, 932, 1661, 2157) are reproduced showing the paths of α -rays from Po in H. The paths are similar to those in air, and show the same sharp deflections due to individual at. encounters, but there is no evidence of the path of the ionized H nucleus which is supposedly given a high velocity by the impact (cf. Marsden, *C. A.* 8, 2307). The ionization clouds may be obtained equally as well by the condensation of alc. vapor as of water vapor.

G. L. WENDT.

The velocities of the alpha particles from thorium active deposit. A. B. WOOD. Univ. Liverpool. *Phil. Mag.* 30, 702-10 (1915).—The magnetic deflection of the α -particles from the active deposit of Th indicates a ratio between the velocities of those from Th C_1 (range = 4.8 cm.) and those from Th C_2 (range = 8.6 cm.) of 0.832. On Geiger's relation ($v^3 = kR$) this value should be 0.826 if the accepted range is correct; W. proposes that the true range for Th C_1 is 4.95 cm. A comparative deflection of the α -particles from Ra C shows their velocity on the same scale to be 0.932, which agrees with Geiger's relation. Using Rutherford's value for this last velocity, 1.922×10^9 cm./sec. (*C. A.* 9, 21), the velocity for the rays from Th C_1 is 1.714×10^9 , and from Th C_2 , 2.060×10^9 cm./sec. The photographs indicate that Th C_2 gives about twice as many α -particles as does Th C_1 . There is no evidence for a difference in mass of the 2 sets of particles.

G. L. WENDT.

Ionic mobilities in hydrogen. A. M. TYNDALL. Univ. Bristol. *Phil. Mag.* 30, 743-4 (1915).—A discussion of the work of Haines (*C. A.* 10, 13) which confirmed and amplified some measurements previously published by Chattock and the author (*Phil. Mag.* 19, 453 (1910)).

G. L. WENDT.

Galvanic cells with lead isotopes. G. v. HEVESY AND F. PANETH. Radium Inst., Vienna. *Monatsh.* 36, 795-803 (1915); cf. *C. A.* 9, 175.—If in an exactly compensated cell, $\text{HgCl} \mid \text{Pb}(\text{NO}_3)_2 \mid \text{PbO}_2$, the $\text{Pb}(\text{NO}_3)_2$ soln. is replaced by a similar soln. of $(\text{Ra G})(\text{NO}_3)_2$, prepared from Hönigschmid's pure Ra G from Morogoro (*C. A.* 9, 3026), there is no change in the compensation greater than 10 microv. The e. m. f. of the cell, $\text{PbO}_2 \mid \text{Pb}(\text{NO}_3)_2 \mid (\text{Ra G})(\text{NO}_3)_2 \mid (\text{Ra G})\text{O}_2$, is less than 10 microv. The diffusion potential between $(\text{Ra G})(\text{NO}_3)_2$ and $\text{Pb}(\text{NO}_3)_2$ is probably less than 1 microv. Ra G and Pb are therefore electrochemically replaceable.

G. L. W.

Atmospheric electricity. LII. Measurements of the mobilities and coefficients of recombination of ions in the open atmosphere. K. W. F. KOHLRAUSCH. Univ. Vienna. *Sitzb. kais. Akad. Wiss., Wien, Abt. IIa* 123, 2321-48 (1914).—Using a tubular ionization chamber with a Wulff electrometer and a sensitive anemometer, K. found by the stream method that the mobility and the coeff. of recombination of ions in the open atm. are const. within 15%, are independent of meteorological conditions and are always proportional to each other. The mean values found for the mobility and the coeff. of recombination of the ions are, resp., 1.05 cm./sec. per v./cm., and 1.69×10^{-1} . The number of ions is greater in cloudy weather and with rising air currents but de-

creases with a rise of relative humidity. Mean values at Seeham in Salzburg are 664 for positive ions, and 648 for negative ions. Both a high wind and a heavy rain increase the number of negative ions faster than the positive, and the mobility of the former is lessened so that the air takes up a negative charge. G. L. WENDT.

Copper and tungsten X-ray target. W. D. COOLIDGE. U. S., 1,162,341, Nov. 30. The target is formed of a body portion of Cu with a facing of wrought W autogenically joined with the Cu. Cf. C. A. 9, 3027.

Apparatus for producing Röntgen rays. REINIGER, GEBBERT & SCHALL, AKT.-Ges. Ger., 285,184, Dec. 28, 1911. Cf. C. A. 9, 1877.

Operating Röntgen rays. REINIGER, GEBBERT & SCHALL AKT.-Ges. Ger., 284,445, Feb. 5, 1914.

Röntgen tubes. BRANDMAIER. Ger., 285,200, Apr. 3, 1914. Insulating material is disposed within the tube in such manner as to prevent, as much as possible, discharges along the surface of the glass.

Cooling devices for Röntgen tubes. VEIHA-WERKE M. B. H. Ger., 283,983, Feb. 11, 1914. A cooling jacket is fitted over the cathode neck. Air, precooled, is used as the cooling medium.

High tension rectifier for Röntgen tubes. SIEMENS & HALSKE. Ger., 284,836, Oct. 31, 1912.

Simultaneous operation of several Röntgen tubes. POLYPHOS ELEKTRIZITÄTS-Ges. M. B. H. Ger., 284,583, June 28, 1913.

4. ELECTROCHEMISTRY.

COLIN G. FINK.

Wilhelm von Siemens. H. GOERGES. *Elektrotechn. Z.* 36, 390-1(1915).—Biographical sketch. C. G. F.

The electrochemical industry in Russia. ANON. *Chem. Trade J.* 57, 366(1915).—Russia has exported large quantities of Mn ore to Germany and imported Al, Al products and ferro-alloys from there. The industry may be developed in Russia by making use of the natural water power and the extensive lignite and peat deposits. W. H. BOYNTON.

Review of the English electrical industry. C. P. SPARKS. *Electrician* 76, 282-5 (1915).—Includes chapters on insulating compds., incandescent lamps, elec. instruments, etc. C. G. F.

Steel making in electric furnace. J. H. GRAY. *Iron Age* 96, 1238-9(1915).—A general discussion of the properties of elec. furnace steel. There are 40 elec. furnaces in America, 27 of the Heroult type. The av. size is greater than that of the European furnaces. W. H. BOYNTON.

Electric steel furnace of new design. R. S. WILE. *Iron Age* 96, 866-8(1915).—The Wile furnace is designed for 3-phase systems because most of the supply systems are 3-phase. Two electrodes enter at the top and one at the bottom. This gives better circulation than the 3-top electrode type of furnace and also facilitates the melting of the cold charge. The bottom electrode is graphite covered with a conducting mixt. of magnesite and tar. The furnace is operated with few abnormal variations of load and can be easily regulated by hand. This furnace is in successful operation in melting Sn from Bolivian concentrates, Ni-Fe alloys and Co for stellite. A typical run shows

the total time of melting and refining cold scrap to be $4\frac{1}{4}$ hrs., with a consumption of 868 kw.-hrs. per ton and an electrode consumption of \$0.50 per ton. The product was a 0.12% C steel. Drawings and photographs are given. W. E. RUDER.

Electric steel direct from titaniferous iron ores. ANON. *Iron Age* 96, 1416 (1915).—An account of the steel produced direct from Fe ore in an elec. smelter at Belleville, Ont., Can. A preheater, consisting of 2 wrought Fe pipes within to allow the charge to slide easily down the heated portion, utilizes the heat from the waste gases of the smelter. The furnace is charged from the upper floor into the preheater, the charge being Fe ore, limestone and charcoal, crushed to pass a 1-in. mesh. It operates on a 2-phase current, the transformers being connected by what is known as the Scot connection. The ore treated is practically free from S and P and contains 7.5 Ti, 0.11 V, 0.34 Ni with some Cr and Mn and 50% Fe. It is claimed that by this process W, Cr and other alloys for high speed tool steel can be made directly in 1 operation by the mixing of the crude ores. The capacity of the furnace is 1 ton; a 3-ton unit for making tool steel and steel castings is contemplated. I. C. MATTHEWS.

Electric steel in Germany. ANON. *Elec. Rev. West. Elec.* 67, 982(1915).—The total production of elec. steel in Germany in 1914 was 90,000 tons, only 5,800 tons less than the total output of crucible steel. Twenty elec. steel plants were in operation, 10 having Siemens-Halske furnaces, 7 Heroult furnaces, 2 Nathusius furnaces, and 1 a Keller furnace. Of these 20 installations, 8 are producing high-grade elec. steel to supplant crucible steel, and the remaining 12 use the elec. furnace to melt ferro-Mn. Four of these 12 are of the induction type, 3 are Heroult, 2 are Keller furnaces, while one each of the Rombach, Girod and Nathusius types are employed. C. G. F.

Germany's electric steel output much increased. ANON. *Iron Age* 96, 1447 (1915).—Production statistics with special reference to the effect of the war.

I. C. MATTHEWS.

Electrical applications of aluminium. J. W. RICHARDS. *J. Elec. Power Gas* 35, 288(1915).—On a practical basis Al may replace Cu conductors by increasing the diam. $\frac{1}{4}$. The Al conductor will have 48% of the wt. of the Cu it replaces. This increased diam. is objectionable in windings where space is important. It is also harder to make good contact with Al than with Cu, especially in chem. plants and so it must be more frequently cleaned. For equal conducting power an Al cable is 0.8 as strong as Cu. This is more than offset, however, by the fact that Al is only half the wt. of Cu. The increase in span can therefore be increased 50% with the same dead wt. on the supports and the same factor of safety. The saving in supports, insulators and erection cost is in general far more important than the cost of the cable itself. Near the coast both Al and Cu should be insulated to prevent corrosion. W. E. RUDER.

Commercial nitrogen fixation; a polemical note. S. PEACOCK. *Chem. Eng.* 22, 147-8(1915); cf. *C. A.* 9, 1431.—No N-fixation process yet proposed can compete with coke by-product NH_3 . A combination process which will fix N and accomplish one or more additional useful purposes is needed. The end-product must be constant in compn., sol. in H_2O , not deliquescent, and yield products not readily assuming undesirable forms. The factory cost must be less than 5 cents per lb. of combined N figured as NH_3 .

W. H. BOYNTON.

The electrolysis of nitric, sulfuric and orthophosphoric acids, using a gold anode F. H. JEFFERY. Cambridge, England. *Trans. Faraday Soc.* (advance copy) 9 pp. (1915).—Using an electrolyte made by dilg. each 100 cc. HNO_3 (d. 1.42) with 100 cc. H_2O , and a Pt cathode, Au was dissolved from the anode, forming a green compd. which was reduced to metallic Au by the H_2 dissolved in the Pt cathode. In all the other expts. the cathode was inclosed in a porous cup. The anolyte (550 cc.) was

mechanically stirred. Acids of various concn. and various currents and c. ds. were used. The anolyte and catholyte were the same. No Au was deposited on the cathode, but Au penetrated part way through the porous cup, causing a purple color. The Au went into soln. as complex anions. Small lemon-yellow crystals were recovered, and proved to be auri-nitric acid, $\text{HAu}(\text{NO}_3)_4 \cdot 3\text{H}_2\text{O}$. 0.0104 gram-atoms of Au dissolved per faraday, when the current was 1 amp. and the anode area 2×4.61 sq. cm., but when the current was 0.5 amp., then 0.0113 g.-atoms dissolved. Using an electrolyte made by dilg. each 100 cc. HNO_3 (d. 1.42) with 200 cc. H_2O , a current of 1 amp. and an anode area of 2×7.10 sq. cm., 0.0118 g.-atoms Au went into combination per faraday. A red-brown powder sepd.; it was a mixt. of hydrated Au_2O_3 and Au_2O . Next, still more dil. HNO_3 was used with a current of 1 amp. and anode area of 2×9.80 sq. cm.; Au going into combination was 0.0114 g.-atoms per faraday. The same brown powder sepd. With acid corresponding to 1 cc. HNO_3 to 10 cc. or more of H_2O , hydrated Au_2O_3 was formed, but no aurous compd. With dil. acids, the catholyte was reduced to NH_4NO_3 , which diffused to the anode, and there produced an explosive compd. Two concns. of H_2SO_4 were used, one of equal vols. of concd. acid and H_2O , and the other of 1 vol. acid to 7 vol. of H_2O . The anolyte turned green and Au went into soln. as complex anions. The more concd. anolyte contained fine yellow Au powder. There was no Au deposit on the cathode, but a brown deposit composed of hydrated Au_2O_3 and Au_2O formed at the anode. Using a 15% soln. of H_3PO_4 , a current of 1 amp. and an anode area of 2×6.84 sq. cm., it was found that no Au was deposited on the cathode, the anolyte remained colorless and the same brown deposit formed on the anode.

SHERMAN EASTMAN.

Nickel plating. F. C. MATHERS, E. H. STUART AND E. G. STURDEVAND. *Trans. Am. Electrochem. Soc.* (advance copy) (1915).—The following bath gave best deposits: $\text{Ni}(\text{NH}_4)_2(\text{SO}_4)_6$ 4%, NiSO_4 14%, H_3BO_3 1–3%, MgCl_2 2% and $(\text{NH}_4)_2\text{C}_2\text{H}_3\text{O}_7$ 0.2–0.3%. At a c. d. of 1.6 amp. per sq. dm., this bath plates a thickness of 0.0025 cm. (0.001 in.) in $1\frac{1}{4}$ hour. The addition of H_3BO_3 increases the current that can be used without blackening or burning the deposit. The $(\text{NH}_4)_2\text{C}_2\text{H}_3\text{O}_7$ keeps the soln. clear and free from sludge (Fe_2O_3 and sulfates from anodes), making possible the use of a more shallow tank and less soln. The expts. were carried out in 350 cc. beaker using about 300 cc. for the plating bath. Two anodes (92% Ni + 6% Fe) or Ni strip (98%) were used. It is best to use the purest Ni for anodes (electrolytic Ni) to avoid impurities coming into the bath which give discolored deposits. The anodes were suspended by Pb strips and placed in cloth bags. The distance between anodes was 4.5 cm.; from cathode to each anode was 2.25 cm. The cathodes were of sheet Cu. Electrolysis was at room temp. The addition of MgCl_2 or NiCl_2 makes the anode corrosion approx. theoretical.

Z. SMILOVICI.

The economy and efficiency of copper cyanide. C. H. PROCTER. *Foundry* 43, 199 (1915); see *C. A.* 9, 1151.

H. W. GILBERT.

Making the silver solutions. O. A. HILLMAN. *Metal Ind.* 13, 416–7 (1915).— $\text{KAg}(\text{CN})_2$ soln. contains 6 oz. KCN and 3 oz. Ag per gal., and is prepd. by using a warm strong soln. of KCN and a sheet Fe coil or brass cathode within a porous cup. The soln. is afterwards dild. to the proper strength. The cathode surface is equal to that of the anode. Anode hooks and cathode connections are large enough to carry the full amp. capacity of the dynamo to prevent overheating and undue resistance. The metal content is detd. by evapn. of 1 qt. to dryness, mixing the residue with an equal quantity of NH_4Cl and melting in a crucible. The Ag button should weigh 15 dwt. CS_2 dissolved in NaOH and KCN, NH_4HS , BaS or Sb_2S_3 prevents occlusion of H at the cathode and gives a hard and bright deposit. Peeling and spotting out are traced to improper cleaning or a poor "strike."

W. H. BOYNTON.

New form of electroplating barrel. ANON. *Iron Age* 96, 979(1915).—The equipment consists of a barrel suspended on top of a tank and a machine in which the nails, screws, rivets, or other material are washed, drained and dried. The barrel consists of a black rubber-like substance which has the tensile strength of metal and is non-absorbing. It has no moving parts immersed. The work is removed, when the plating is completed, by shifting the belt to a loose pulley. It is automatically emptied into the washing machine. The barrel is fed and the starting lever moved, which automatically closes the door. While the second batch is plated, the first is washed and dried. The washing and drying app. consist of 3 drums for washing, draining and drying, resp. The drying drum has a separate inner half perforated cylinder. The material mixes with sawdust and is carried to the second portion where the sawdust is sifted into the outer shell. One man can operate 3 or 4 barrels. W. H. B.

Supports for storage-battery cells. ANON. *Elec. World* 66, 1316(1915).—To the bottom of each cell case, along the longer sides, are attached 6-in. wood strips which transfer the wt. of the cell to the supports. The latter consist of conical shaped porcelain bases with glass caps containing oil rings. Between the bases and caps and between caps and cell cases crossed strips of Pb are placed, thus distributing the pressure uniformly over the surface of the glass and the porcelain. With 123-plate cells rated at 9150 amp. on the 1 hr. discharge rate 6 insulating supports are used. A cut is shown. I. C. MATTHEWS.

An arrangement to throw a battery out of circuit when charging current is interrupted. B. CAPRARO. *Elec. World* 66, 1317-8(1915).—An automatic device for throwing in the battery in the charging circuit when the generator starts and out again when it is shut down. The outfit operates with a current of from 2 to 14 amps. A diagram of wiring connections is shown. I. C. MATTHEWS.

Nickel-iron-alkaline cells for high-discharge-rate and submarine service. ANON. *Elec. World* 66, 1103-4(1915).—The compn. of the electrodes and the chem. reactions during battery charge and discharge are the same as in the case of the Ni-Fe alk. cells used on land. The batteries differ only in details of construction. The principle of the battery is the oxidation and reduction of metals in an electrolyte (KOH) which does not dissolve and will not combine with either the metals or their oxides. The following electrochem. action takes place in the cell. In first charge: $\text{Fe}_2\text{O}_3 + 6\text{K} + 3\text{H}_2\text{O} = 2\text{Fe} + 6\text{KOH}$ (negative); $3\text{Ni}(\text{OH})_2 + 6(\text{OH}) = 3\text{NiO}_2 + 6\text{H}_2\text{O}$ (positive). In discharge: $3\text{Fe} + 8(\text{OH}) = \text{Fe}_3\text{O}_4 + 4\text{H}_2\text{O}$ (negative); $6\text{NiO}_2 + 8\text{K} + 4\text{H}_2\text{O} = 2\text{Ni}_2\text{O}_4 + 8\text{KOH}$ (positive). In recharging: $\text{Fe}_3\text{O}_4 + 8\text{K} + 4\text{H}_2\text{O} = 3\text{Fe} + 8\text{KOH}$ (negative); $2\text{Ni}_2\text{O}_4 + 8(\text{OH}) = 6\text{NiO}_2 + 4\text{H}_2\text{O}$ (positive). The positive element consists of alternate layers of $\text{Ni}(\text{OH})_2$ and Ni flake inclosed in $\frac{3}{16}$ in. perforated steel tubes 4.5 in. long. Twenty of these clamped in a frame form a positive subgrid. The negative element is Fe_3O_4 mixed with a little Hg packed in flat, perforated, rectangular pockets $2\frac{3}{16} \times 1.2 \times \frac{1}{16}$ in. The negative subgrids contain 16 pockets. The main grids are made up of steel frames to which are welded the subgrids, the standard grids being 3 subgrids wide and 5 to 6 high. Each pair of subgrids (positive and negative) is rated at 15.6 watt hr. when discharged at 4.44 amp. to 1 v. The cells are compact, rugged and light in wt. and plates cannot be injured or short-circuited by jolts, vibrations or rolling and pitching on ships on which they may be installed. Cl cannot be generated within the cell even if immersed in sea water. Gas explosions cannot be communicated from the inside of the cell or *vice versa*. The same amp.-hr. rating is developed regardless of the rate at which the battery is discharged. Standing idle in charged, semi-charged or discharged condition will not injure the plates. Z. SMILOVICI.

Battery zincs: some causes of defective service. R. JOB AND F. F. WHITE. *Proc.*

Am. Soc. Testing Materials 15, II, 112-8(1915).—Serviceability depends upon the phys. condition of the Zn. Volatilization of Hg is minimized by avoiding overheating, and by keeping the molds cold. After the addition of Hg, the bath should be carefully stirred to avoid segregation. Results of tests are given. W. H. BOYNTON.

The electrolytic coating of mirrors. J. J. DECLÈRE, A. L. E. GRÉSY AND G. PASCALIS. *Electrician* 76, 19(1915); cf. *C. A.* 9, 398.—The fine Ag film of a mirror is protected by a lacquer or coating of Cu to prevent injury. The difficulties of making adequate contact with the very thin (0.0005 mm.) film of Ag are avoided by a new method in which the flat mirror is placed in a large flat plating bath upon a set of wood cleats. Contact with the surface of the Ag is made by a number of contact combs made up of a large number of brass teeth tipped with Sn to prevent scratching. These are insulated from the bath except at the extreme points and are of adjustable length. The position of the combs is changed every 10 min. Current at about 5 v. and a density of 30 amps. per sq. m. is supplied. The whole operation takes about 20 min. The electrolyte, an ammoniacal soln. of Cu, is kept circulating through a filter by a turbine pump. This prevents the settling of impurities upon the Ag surface. The washing is done in the same vat after the plating soln. is drained off.

W. E. RUDER.

Aluminium electrolytic lighting arrester for continuous currents. C. C. GARRARD. *Electrician* 76, 11-3(1915); cf. *C. A.* 9, 3033.—Mascicke condensers, the Giles valve and other lightning arresters are described. The best form for continuous current is the Al electrolytic cell. Diagrams of connections and of the internal construction of these are given, together with the methods and connections for earthing.

W. E. RUDER.

Behavior of half watt lamp on filling with nitrogen, to which small quantities of methane and carbon monoxide have been added. L. HAMBURGER. *Chem. Weekblad* 12, 62-73(1915).—H. investigated the effect of CO and CH₄ (which often occur in N gas) upon W filaments of N-filled lamps. It was found that when CH₄ was present, the largest amount of W carbide was formed in the cooler parts of the W wire (i. e., near the supports). The combination of W and C causes an increase in the resistance of the wire, renders it brittle and lowers its m. p. Small quantities of CH₄ (as low as 0.14%) were very injurious; a quantity of 0.09% of CH₄, however, did not produce any bad effects. The decompn. of CH₄ into C and H gives rise to another reaction: $(CN)_2 \rightleftharpoons 2C + N_2$. This reaction takes place to a certain extent at temps. as high as 3000°. It was furthermore found that HCN is formed by the presence of H, resulting from the decompn. of CH₄. CO, when present in an amt. higher than 2%, renders the W wire brittle; small amts. of CO showed little effect.

J. T. FLOHIL.

The A. E. G. nitra lamp. K. MGY. *Elektrotechn. Z.* 36, 376-7(1915), illus.—M. describes the elec. and photometric characteristics of the improved gas-filled W lamps.

C. G. F.

Device for insuring continuous operation and increase of life of Moore tubes. F. MEYER. *Z. Beleuchtungsw.* 21, 104-5(1915); cf. *C. A.* 9, 3033.—A detailed account of the 2-valve system (see Ger. pat. No. 280,504).

C. G. F.

Million-volt transformer demonstrated at the Panama-Pacific Exposition. NEILL WILLSON. *Elec. Rev. West. Elec.* 67, 945(1915).—This is a 1000-kw., 60-cycle transformer. The million-v. winding is made up of 190 5000-v. coils equally spaced and wound with flat Al (0.008 in. 0.1 amp.) conductor insulated by 3 layers of paper.

W. E. RUDER.

Electric strength of insulating materials under mechanical pressure. F. KOCK. *Electrician* 76, 6-8(1915); see *C. A.* 9, 1277.

C. G. F.

Primary electric battery. G. A. LUTZ. U. S., 1,161,322, Nov. 23. Structural features.

Galvanic battery. M. L. KAPLAN. U. S., 1,160,999, Nov. 16. Dense MnO_2 is deposited on particles of graphite by applying Mn nitrate soln., drying and heating to 170° and after removal of H_2O -sol. materials from the coated particles they are pressed into shape to form depolarizers for cells of the Leclanché type.

Electric dry battery. C. F. BURGESS. U. S., 1,162,449, Nov. 30. A depolarizing mixt. is used which is formed of graphite, at least a large % of which is finer than 200-mesh, mixed with MnO_2 , NH_4Cl , ZnCl_2 and H_2O .

Dry battery. I. KORETZKY. U. S., 1,160,907, Nov. 16. The depolarizing mass of the battery is formed of "recovered manganese" (the Mn ppt. produced as a by-product in making chloride of lime), mixed with C, moistened with NH_4Cl or ZnCl_2 , NH_4Cl and H_2SO_4 soln.

Secondary electric battery. J. O. LUTHY. U. S., 1,161,398, Nov. 23. An electrolyte containing 1% of AgCl dissolved in H_2O 60-70, Na silicate 4 and H_2SO_4 25-35% is used, mixed with PbO , PbO_2 and pumice used on Pb grids. The AgCl gives longer life and more uniform action to the battery.

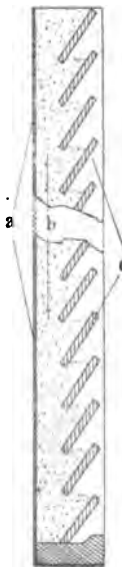
Storage-battery cell structure. P. BROWN. U. S., 1,160,491, Nov. 16.

Storage-battery grid. W. S. HUTCHINSON. U. S., 1,159,035, Nov. 2. Structural features.

Apparatus for circulating the electrolyte in a series of storage battery cells. W. L. BLISS. U. S., 1,160,133, Nov. 16.

Storage-battery electrodes. E. HANDLER. U. S., 1,158,491, Nov. 2. Structural features.

Storage-battery electrodes. H. S. HAWKINS, A. M. GREEN and I. W. GIBBINS. U. S., 1,159,021, Nov. 2. The electrodes are formed of alternating superposed disks of volcanic scoria or other porous material and Pb oxide, centrally perforated and mounted on a supporting rod.



Electrolysis of alkali metal or alkaline earth metal chlorides. A. CLEMM. U. S., 1,160,847, Nov. 16. A diaphragm is used between the anode and cathode compartments, formed of a body portion, *b*, of BaSO_4 or other pulverulent material capable of resisting the action of the cell liquors, supported on the cathode side by asbestos fabric, *a*, or other material resistant to alkalis and on the anode side by plates, *c*, formed of material resistant to Cl and HCl, *e. g.*, glass, ebonite or stoneware.

Electrolytic production of sodium alloys. E. A. ASHCROFT. U. S., 1,161,585, Nov. 23. Alloys of Na with heavier metals such as Pb are produced by electrolysis of molten NaOH, using a cathode of the molten heavy metal at a temp. of about 400° while using a high c. d. at the anode and maintaining the electrolyte and cathode in motion during electrolysis.

Electrolytic apparatus for producing alkali metal amides, etc. E. A. ASHCROFT. U. S., 1,159,154, Nov. 2.

Electrolytic detinning. H. GOLDSCHMIDT. U. S., 1,160,400-1, Nov. 16. Several batches of tin scrap are placed in a series of metal receptacles in an alk. soln., *e. g.*, NaOH and Na stannate, and an elec. current of high amperage is passed in parallel through each batch of scrap and the receptacles and alk. bath. The electrolyte is heated to $70-80^\circ$ and circulated.

Incandescent tungsten lamp. F. SKAUPY. U. S., 1,160,661, Nov. 16. A small amt. of charcoal (or other porous material) containing Cl or other halogen is placed in the lamp bulb and the volatilization of the halogen compd. during the operation of the lamp serves to prevent blackening of the bulb by W. The amt. of the compd. used is so small that a good vacuum is maintained in the lamp.

Tungsten filament incandescent lamps. F. SKAUPY. U. S., 1,159,111, Nov. 2. A small amt. of TiCl_3 or other Ti-halogen compd. is placed in the lamp. In operation it does not materially lessen the vacuum and restricts the obscuration of the light caused by deposition of W on the glass bulb. $3\text{KCl} \cdot \text{TiCl}_3$, PtCl_4 , $3\text{KF} \cdot \text{HF} \cdot \text{PbF}_4$ and $3\text{KF} \cdot \text{PbF}_4$ act similarly.

Arc-lamp electrodes. G. M. LITTLE. U. S., 1,159,511, Nov. 9. The electrodes are formed of TiO_2 35, WO_3 5, Fe_2O_3 60, Cr_2O_3 4.5, H_3BO_3 6 and NaF 1 part. A temporary binder such as starch, glucose, oil or glycerol may be used if the mixt. is shaped by forcing through dies. Cf. C. A. 9, 2488.

Arc lamp electrode. E. J. WATZL. U. S., 1,161,173, Nov. 23. Fused oxides of Ti, W and Ce, La, Yb, or other rare earth metals, combined chemically in mol. proportions by heating to 2500° , are used with about 6 times their wt. of the usual body material, to form luminous arcs of high c. p. and intense whiteness.

Arc lamp electrodes. C. FIELD. U. S., 1,158,997, Nov. 2. Double fluorides of K or Na and Ce or Zr are added to electrodes formed of a usual good conducting mixt. to increase the temp. of the arc and give greater candle power.

Electric resistance furnace. A. DOW. U. S., 1,161,634, Nov. 23. The furnace has a granular C resistor.

Electric resistance furnace for heating crucibles, etc. P. A. BOZCK. U. S., 1,158,971-2, Nov. 2.

Electric furnaces for melting metals, etc. J. M. LOHR and H. W. GILBERT. U. S., 1,162,178-9, Nov. 30. (These pats. are "dedicated to the public," rendering them open to use by anyone in the U. S. without payment of royalty.)

Electric furnace for the manufacture of aluminium nitride. G. COUTAGNE. U. S., 1,158,899, Nov. 2. See Brit., 12,057 (C. A. 9, 2841).

Smelting zinc ores and other materials in an electric furnace. E. S. BERGLUND. U. S., 1,160,244, Nov. 16. After permitting the operation of smelting to proceed with an ordinary charge for some time, a mixed charge containing more readily fusible slag-forming constituents (*e. g.*, fluorspar) in addition to the usual constituents of the charge is added before tapping off the material to render the slag more fluid.

Reducing iron or other metals from ores. J. W. BECKMAN. U. S., 1,160,822, Nov. 16. The ore, *e. g.*, Fe_2O_3 , is heated to about 2000° or higher in an elec. furnace to liquefy it and a reducing gas obtained from cracking petroleum oil is forced through the highly heated material together with sufficient air to maintain the reaction temp. of the mixt.

Acetic acid. C. HANSEN and A. WEINDEL. U. S., 1,159,376, Nov. 9. C_2H_2 is oxidized on a Pt anode in an electrolyte of 30% H_2SO_4 containing about 1-2% of a Hg salt. The temp. of the electrolyte is maintained at $30-40^\circ$ and the electrolyzing cell has a porous clay diaphragm and a cathode of Pb or Cu (also immersed in 30% H_2SO_4). Cf. C. A. 9, 1095.

Protectors against electric currents of high potential. C. F. FRANK. U. S., 1,159,205, Nov. 2. A packing of 40-80 mesh carborundum granules is used between the electrodes, which serves to give equal static and dynamic breakdown voltage.

Electrolytic clarification of beer and other liquids. J. E. BLOOM. U. S., 1,162,213, Nov. 30. A large variety of liquids is listed which may be purified, clarified and prepared for storage without pptn. or formation of turbidity by passing over finely divided corundum or crushed quartz while warm and simultaneously subjecting them to the action of an a. c. The liquids which may be thus treated include beer, malt exts., brandy, whiskey, vinegar, milk, mineral water, coffee exts., pharmaceutical exts., colloidal solns. of dyes, turpentine oil, chemically hydrogenated oils, honey and molasses.

Electrolytic treatment of grape juice and wines. J. E. BLOOM. U. S., 1,162,212, Nov. 30. Grape juice or wine is passed rapidly through a mass of warm adsorption material such as corundum, crushed garnet or quartz, while acted on by an elec. a. c. to free it from suspended colloids and yield a product which will not become turbid or form a ppt. when stored and which is substantially free from deleterious micro-organisms.

Electrolytic apparatus. SCHOTT & GEN. Ger., 283,136, Nov. 11, 1913. The app. has a liquid anode and the cathode and anode are in direct contact through the solvent.

Ultraviolet rays. J. VON KOWALSKI. Ger., 284,091, Apr. 16, 1913. Ni, W, or their alloys with each other or with other metals, especially the rare earths, are employed as electrodes, and the metal vapor appearing in the arc gives rise to the ultraviolet rays. Cf. C. A. 9, 2741.

Arc for the production of ultraviolet rays. J. VON KOWALSKI. Ger., 284,979, Feb. 17, 1914. Addition to 284,091 (*supra*). One of the electrodes consists of a material (metal or alloy) unlike that of the other, so that the N oxides forming on one electrode are neutralized.

Electrodeposition of metals. T. R. HARRIS. Brit., 17,133, July 20, 1914. A printing roller, hydraulic ram, or like body is rotated at a peripheral speed of 200 ft. per min. in a plating vat. A current d. of 250 amp. per sq. ft. is employed. Parallel with the roller on both sides are the limbs of 1 or more U-shaped tubes, each having a row of slots or closely arranged perforations, or a continuous slot, through which electrolyte is squirted on to the roller by means of a pump. Flexible connections may be provided to allow of adjustment of the tubes. Perforations in the tubes on opposite sides of the roller are staggered.

Preparing surfaces for plating. L. HELLER. Brit., 16,690, July 13, 1914. Glass, porcelain, earthenware, terra-cotta, etc., are painted with a mixt. of about 5 parts of linseed oil, 5 of oil of turpentine, 250 of burnt bone-black, 180 of resin, and 420 of pure washed graphite. These ingredients may be mixed in a color mill. The painted objects may be baked at 80°, cooled, and polished by a rapidly rotating fiber brush, and are then plated, as with Cu or Ni.

Electrolysis. BADISCHE. Brit., 17,763, July 27, 1914. In obtaining alkali metals from molten alkali hydroxides, evolution of H at the cathode is prevented by supplying fresh anhydrous alkali in place of that which has taken up H₂O at the anode. The alkali removed may be dehydrated and re-used.

Obtaining alkalies and chlorine. SIEMENS & HALSKE AKT.-GES. Brit., 17,089, July 18, 1914. The rate of flow of a soln. of an alkali metal halide downward through an horizontal diaphragm is regulated by maintaining the Cl in the anode compartment above the diaphragm at a reduced pressure, so that the hydrostatic pressure on the diaphragm is partly counteracted. A suction pump with an adjustable regulator is provided for this purpose.

Selenium cells. N. S. YAPOLSKY. Brit., 17,131, July 20, 1914. A Se cell is

made by immersing a mold, comprizing bridges, with linear teeth, into liquid or plastic Se under diminished pressure, and cooling the Se under increased pressure, after which the base of the mold uniting the bridges is removed either mechanically or chem.

Vacuum tubes. A. LEDERER. Brit., 17,036, July 17, 1914. A lamp for low elec. pressures contains a gas or mixt. of gases, such as Ne, He, A or Kr, and a small quantity of 1 or more alkali metals, not forming the electrodes, which may be of Al, Mg, or W. The alkali metal or an alloy may be placed in a small pocket communicating with the lamp, and heated to cause it to deposit within the lamp, preferably near the electrodes only, the pocket being then sealed off. The alkali metal or alloy may alternately be in liquid or gaseous form within the lamp; a mere trace is usually sufficient.

Separating suspended bodies from fluids. E. MÖLLER. Brit., 17,175, July 20, 1914. The elec. separation of suspended bodies from insulating fluids, especially air or other gases, is effected by charging the ionizing electrodes with electricity of that sign which allows of the use of a higher potential difference before disruptive or luminous discharges take place, so that a more intense charging of the suspended bodies may be effected. In the case of air, the ionizing electrodes are charged with negative electricity.

Double diaphragm for continuous electrolysis of a flowing electrolyte. BAYER & Co. Ger., 284,937, July 24, 1913. The diaphragms are so constructed that the slime particles pass through small openings, while the products of one electrode chamber are not allowed to diffuse over into the other chamber.

5. PHOTOGRAPHY.

LOUIS DERR.

Contributions of the chemist to the photographic industry. FRANCIS C. FRARY. *J. Ind. Eng. Chem.* 7, 938-9(1915).—A part of the symposium at the Seattle meeting of the Am. Chem. Soc. E. H.

Color-sensitive plates for spectrum photography in the infra-red, red, yellow and green. J. M. EDER. *Phot. Korr.* 52, 271-7(1915).—Transmission curves and photographs of the solar spectrum are given for plates sensitized with dicyanin, dicyanin A, pinachrome blue and pinachrome violet, pinacyanol, pinacyanol blue, pinachrome, orthochrome and pinaverdol. For infra-red, dicyanin and dicyanin A are best. From infra-red to beyond yellow, pinachrome blue is recommended, NH_4OH increasing the sensitiveness. For yellow and green in addition to blue and violet, pinaverdol is best. With these dyes the entire visible spectrum may be photographed without difficulty. The plates used were bathed 4 min. in a bath of 200 cc. water, 100 cc. alc., 6 cc. 1:1000 alc. soln. of the dye, then quickly dried in total darkness. L. DERR.

Reduction of sensitiveness by amidol. H. LÜPPO-CRAMER. *Phot. Korr.* 62, 76-81(1915).—Plates bathed in 0.02% acid amidol, washed, dried, exposed, and developed by NH_3 vapors, show a greatly reduced sensitiveness as compared with the untreated plates. This is considered proof that as a result of halogen absorption the pulverization of AgBr by light is much hindered. Photomicrographs show the grain of the original plates to be much larger than that of the treated plates. "Grainless" emulsions of the Lippmann type show an interesting diminution of deposit on the slightly illuminated portions of the plate and an increase of deposit on the more strongly illuminated areas. L. DERR.

Removal of photographic developing and fixing agents from films and prints. C. A. BRAUTLECHT. *J. Ind. Eng. Chem.* 7, 899(1915).—To avoid waste of time and

water, it is recommended that plates, films and prints, when removed from the fixing bath, be put into running water and transferred every 2-3 min. to clean trays of running water. After removal of the prints, the last wash water is tested in a white tray by adding a few drops of 5% AgNO_3 . Any visible yellowish brown coloration shows insufficient washing. L. DERR.

Solarization of silver chloride. H. LÜPPO-CRAMER. *Phot. Kor.* 62, 281-2 (1915).—Evidence of the fact has hitherto been conflicting. The author has, however, been able to prepare an emulsion which shows it well; the emulsion, however, is not suitable for practical uses, as the image is thin and veiled. L. DERR.

Photomechanical printing surfaces. E. ROSENBERG. *Brit.*, 26,140, Nov. 14, 1913. The sensitive colloid layer which is to form the printing surface is supported on a rigid absorbent mass such as a fire-clay plate. After exposure and development, the plate is immersed in a bath of glycerol and H_2O . The absorbent support serves as a moisture container and maintains the colloid layer in a suitably moist condition. The printing ink used contains a colloid tanning agent, such as alum or HgCl_2 . A screen image and the pictorial image may be produced upon the colloid layer as follows: The picture pellicle of the negative is stripped from its support, reversed, and transferred to the front side of a gelatin film, on the back of which a screen has been printed. This film is copied as a negative on the colloid layer.

Color photography. F. E. IVES. U. S., 1,160,288, Nov. 16. A multi-colored print is prepd., from a set of color-selection negatives, on gelatin-coated paper by color impressions from gelatin reliefs made from the different color-selection negatives.

Photographic or cinematographic film. L. GAUMONT. U. S., 1,159,924, Nov. 9. The film is formed mainly of viscose with a very thin coating of sensitized collodion. The thinness of the coating permits developing, washing and fixing to be carried on so rapidly that the viscose is not materially affected by the H_2O in the solns.

Photographic or moving picture films. W. A. BEATTY. U. S., 1,158,963, Nov. 2. Films formed of a mixt. of cellulose acetate and a condensation product of acetone and PhOH are coated with a condensation product of acetone and PhOH with CH_2O applied in alc. soln., to protect the film from sparks, etc.

Cinematograph picture films. J. E. THORNTON. *Brit.*, 16,899, July 16, 1914. Cinematograph picture films are made by the dichromated colloid process in monochrome or colors as follows: From an ordinary positive film having continuous tones, a printing film with broken tones is obtained by reproduction through a half-tone screen. From this screen printing film, a print is made on to a C or other dichromated colloid film. The film is printed right through to the base and developed from the front. To obtain color films, sep. screen printing films representing component colors may be made from sep. color negatives or from an autochrome or other screen negative, and the positive film is resensitized and printed successively from these printing films. In producing the screen printing film, the position of the screen may be altered for successive exposures, so that the dots of successive pictures may come in a different place on the screen, thereby avoiding any grainy appearance.

Color filters. H. HARTRIDGE. *Brit.*, 17,789, July 27, 1914. A safe-light for photographic purposes which has the characteristic visual properties of white light. A filter is used which transmits 2 or more spectral areas, each of which is photographically safe, while combined they give visually white light. A superposed combination of gelatin filters colored with malachite green and picric acid is one example of a filter

transmitting portions of the spectrum corresponding substantially to λ_{730} — λ_{685} in the red, and λ_{540} — λ_{515} in the green. Other examples are given, and in all cases it is necessary that light of substantially shorter wave length than λ_{580} shall be transmitted. In a modified form, two or more independent sources of colored light are used, and in a further modification, a filter with colored strips or a mosaic of color areas. For color-sensitive or panchromatic plates, additional absorption filters must be used to cut out injurious rays, unless the developer is dyed or the color sensitiveness of the plate is destroyed before developing.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

Occurrences in the reactions of gases with silver and lead. W. STAHL. *Chem. Ztg.* 39, 885-6(1915).—A brief summary of observed facts in regard to the behavior of solid and molten Ag and Pb in the presence of O, H, N, SO₂, CO₂, CO and hydrocarbons, and also of Ag with A and He. A short bibliography is given.

J. H. MOORE.

The supposed tin-sulfur compound, Sn₂S. F. FICHTER. *Basel. Chem. Ztg.* 39, 833(1915).—F. considers the substance described by G. Epprecht (*C. A.* 9, 2357) to be a mixt. of SnS and metallic Sn.

J. H. MOORE.

7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Report on testing chemical reagents. J. B. RATHER (Referee). *J. Assoc. Official Agr. Chem.* 1, 317-29(1915).—The purity and strength of crude NaOH, molybdic acid, com. citric acid, and ethyl ether have been studied in regard to their suitability for the detn. of N, phosphoric acid, insol. phosphoric acid, and ether ext., resp. (I). Four methods were used for the detn. of carbonate in crude NaOH. (1) Krauch-Merck, (2) Sutton, (3) Sutton, by pptn. as BaCl₂ and (4) the following modification by the referee: Dissolve 2 g. crude NaOH in H₂O and titrate with approx. 2 N HCl and phenolph. until the color fades. To another 2 g. portion add 0.5 cc. less of the 2 N acid, and titrate with 0.2 N acid until the color fades; read the buret, add 2 or 3 drops Me orange, and titrate until the color changes. The number of cc. 0.2 N acid required to change the Me orange $\times 1.06$ gives the % Na₂CO₃. All samples tested but 1 contained more than 90% NaOH. Methods (1) and (2) give discordant results both from duplicate detns. and by the 2 methods. Further study of method (4) and of the amt. of Na₂CO₃ which causes frothing in the N detns. is desirable before a limit is set. (II) Conditions affecting the detn. of N in NaOH. (A) Effect of the amt. of NaOH on the apparent N. Two methods were used: (1) Put 100 g. NaOH into a Kjeldahl flask with a little granulated Zn and distil into a receiver containing 5 cc. 0.2 N HCl. Titrate the excess acid with 0.1 N NH₄OH and cochineal. (2) Same as 1) except that 40 g. NaOH are used. Method (1) gives too high results as some of the NaOH is carried over mechanically. (B) Effect of the addition of H₂SO₄ on the apparent N. H₂SO₄ had no effect on the results when 40 g. NaOH were used and its use is therefore unnecessary. (C) Effect of redistn. of distillate on the apparent N. Differences in results were small and within the limits of error, but this point should be studied further. (III) Molybdic acid. (A) Methods for detn.: (1) Krauch-Merck, (2) referee's modification of (1). Dissolve 0.5 g. molybdic acid (H₂MoO₄)? in 50 cc. H₂O and 1 cc. NH₄OH, heat gently, filter if necessary, acidulate with 5 cc. HOAc, dil.

with 200 cc. H_2O , heat to boiling and add a filtered soln. of 1.5 g. lead acetate in 20 cc. H_2O . Boil several min., stirring constantly, allow to settle a minute or 2 and decant through a Gooch crucible. Wash by decantation 10 times, using 50 cc. boiling H_2O each time, allowing about a min. to settle. Transfer the ppt. to the gooch, ignite, cool and weigh the ignited ppt. as $PbMoO_4$. The factor 78.494 gives % MoO_3 . (3) Reference. A volumetric method was tried but not found suitable. Method (2) is much to be preferred over method (1), as it is much quicker (2 hrs. against 2 days). It is to be noted that "molybdic acid" in the official method probably means H_2MoO_4 (85%), but that nearly half of the coöperators seem to be using MoO_3 . (B) Phosphoric acid in molybdic acid. Total phosphoric acid, phosphoric acid in the official soln. and sulfates were detd. In only 2 cases was even a slight amt. of phosphoric acid found; hence it appears that errors from this source are insignificant. No sulfates were found, but the effect of the sulfates should be studied further. (IV) Citric acid. The samples of citric acid were tested for ash, for oxalic, tartaric, and sulfuric acids, and for sugars. It appears that the purity of the samples of citric acid is quite sufficient for fertilizer control work. The subject should be studied further. (V) Ethyl ether. Four samples were examd. for matter non-volatile at 100° . Evap. 100 cc. in a tared Pt dish to dryness over a steam bath. Dry at 100° to constant wt. The amt. of non-volatile matter may introduce errors as high as 1.5%. The method used, together with the question of the presence of alc. and H_2O and other possible impurities, should be studied further.

F. A. HARVEY.

The effect of ammonium chloride upon ferric and aluminium hydroxides during ignition. H. W. DAUDT. *J. Ind. Eng. Chem.* 7, 847(1915).—When $Fe(OH)_3$ and $Al(OH)_3$ are ignited in the presence of small amts. of NH_4Cl no loss occurs as a result of the formation and volatilization of the metallic chlorides. The washing of $Fe(OH)_3$ with a 1% soln. of NH_4Cl before ignition does not cause any loss, but when the soln. contains as high as 5% NH_4Cl a small loss occurs. The use of a 10% soln. causes a decided loss. $Al(OH)_3$ can be washed with a 5% soln. without loss of Al. D. describes in detail the manipulation, by means of which a rapid filtration and washing of $Al(OH)_3$ was obtained.

H. W. D.

The electrolytic assay of lead. E. A. LEWIS. *Metal Ind.* 13, 463(1915).—*Cartridge metal and rolled brasses:* Dissolve 5 g. in 40 cc. HNO_3 (1:1), boil off nitrous fumes, dil. to 150 cc. with warm H_2O , electrolyze with a current of 3 amp. for 25 mins., using a rotating electrode, wash off cover, and continue for 5 mins. more. Wash and dry anode as usual; if Pb is low 10 mins. drying at 200° suffices, and the factor is 0.866; with over 20% Pb the factor is 0.865. With brasses low in Pb, the soln. for electrolysis must not be above 40° ; with cartridge metals containing 0.03%, or less of Pb, dissolve 10 g. in 80 cc. HNO_3 (1:1), dil. to 200 cc. and electrolyze. *Gun metals:* Treat 5 g. with 30 cc. concd. HNO_3 and 15 cc. H_2O , digest as above, dil. with hot H_2O , let settle, filter off Sn ppt., and electrolyze as above. The Sn does not carry down Pb to any serious extent, but contains Sb, P, As, Fe and a little Cu. It is unnecessary to evap. the soln. to pastiness or dryness before filtering. *White metals:* When low in Sn, follow method for gun metal; with solders and rich Sn alloys filter off the Sn ppt. from the HNO_3 treatment and digest with $(NH_4)_2S$ soln.; filter off any PbS , digest the ppt. with 15 cc. concd. HNO_3 to form $PbSO_4$, add hot H_2O , boil, cool, det. the small amt. of Pb by electrolysis, and add to the Pb obtained on electrolyzing the first filtrate. *Spelter:* Treat 5 or 10 g., according to the Pb content, with 40 or 80 cc. HNO_3 (1:1), adding the acid cautiously, 1 or 2 cc. at a time; expel nitrous fumes, dil. to 150 or 200 cc., filter off Sn if present, and electrolyze; with very high grade spelter, the temp. must not exceed 40° . For more accurate work, treat 20 g. with a mixt. of 40 cc. concd. H_2SO_4 and 200 cc. H_2O , keeping the soln. cool during the process, until the bulk of the Zn is

dissolved, filter off the Pb and dissolve it in 15 cc. HNO_3 , dil. to 150 cc., filter off Sn, if present, add 5 cc. HNO_3 , and electrolyze. *Ores and residues:* Grind to pass through a 60-mesh sieve, sepg. fires and metallics in the case of residue. Digest 1 g. of a sulfide ore or a sulfate residue with 30 cc. concd. HNO_3 , until all the sulfide is converted into sulfate, boil off the nitrous fumes, add about 100 cc. of hot H_2O and heat until the PbSO_4 dissolves; then electrolyze with 3 amp. for 30 mins., without filtering off any residue. If very little residue is present, the anode can be weighed after drying at 200° in the usual way; with much residue, dissolve the deposit on the anode in HNO_3 (1:3), adding a little oxalic acid; dil., filter if necessary, add 10 cc. HNO_3 , dil. to 150 cc., electrolyze again, and weigh the PbO_2 . F. W. SMITHER.

Analysis of turbadium bronze. H. WILLIAMS. *Chem. News* 112, 175-6(1915).—Turbadium bronze contains approx. Cu 48, Zn 46.45, Sn 0.5, Pb 0.1, Fe 1.0, Al 0.2, Mn 1.75, and Ni 2.0%; it has a tensile strength of 35-42 tons per sq. in., and an elongation (on 2-in. test piece) of 14-20%. It is used for making solid propeller castings, not being appreciably corroded by sea-water. *Tin:* Heat 1 g. of the drillings with 20 cc. of HNO_3 (d. 1.2), evap. to about 10 cc., add 50 cc. of H_2O , let insol. matter settle, filter, wash with 5% HNO_3 , ignite in a porcelain crucible, cool, and weigh SnO_2 . *Copper:* Electrolyze filtrate and washings (not over 100 cc.) from the SnO_2 with a current of N. D.₁₀₀ = 1 amp. and 2.5 v., using Pt gauze electrodes with a rotating anode; wash, dry, and weigh as usual. *Lead:* Dissolve PbO_2 deposited on anode in a mixt. of 5 cc. concd. HNO_3 , 10 cc. H_2O , and 4 drops of alc., remove, and wash anode, add 3 cc. concd. H_2SO_4 , evap. to fumes, cool, add 30 cc. of H_2O , filter on a gooch, wash with 2% H_2SO_4 , remove filtrate, then wash with alc., dry, and weigh as PbSO_4 . *Iron and aluminium:* Evap. the soln. and washings from the Cu and Pb detns. to about 30 cc., add 5 g. of NH_4Cl , ppt. the hydroxides of Al, Fe, and Mn by the addition of 30 cc. of satd. Br water and 30 cc. concd. NH_4OH ; boil, let settle, filter, and wash. Dissolve ppt. (using beaker in which pptn. was made) in hot dil. HCl and H_2SO_4 , boil to expel SO_3 and oxidize Fe^{2+} with a few drops of HNO_3 ; sep. the Mn from the Al and Fe by the basic acetate process, ignite, and weigh the ppt. of $\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$; dissolve in 20 cc. concd. HCl, reduce with SnCl_2 , add HgCl_2 , and titrate with $\text{K}_2\text{Cr}_2\text{O}_7$ for Fe, obtaining Al by difference. *Manganese:* Treat separately the filtrates from the PbSO_4 and the basic acetate pptn. with Br water and NH_4OH , collect the ppts. on the same filter, wash with hot H_2O , ignite, and weigh as Mn_2O_4 . *Zinc:* Evap. the filtrate and washings from the first pptn. of Al, Fe, and Mn to about 150 cc., add AcOH till neutral to litmus paper, and then 1 cc. excess; add 4 g. of $(\text{NH}_4)_2\text{HPO}_4$ in usual manner, filter, redissolve the NH_4ZnPO_4 in dil. HCl and reppt., using 2 g. of precipitant, let settle, filter on gooch, wash with hot H_2O , ignite, and weigh as $\text{Zn}_2\text{P}_2\text{O}_7$. *Nickel:* Render the combined filtrates and washings from the Zn ppt. slightly alk. with NH_4OH , heat to 70° , and det. the Ni by the dimethylglyoxime method. The alloy usually contains 0.1% of impurities (Bi 0.03, As 0.05, O as $\text{Cu}_2\text{O} + \text{CuO}$ 0.02%), and the percentage of Zn may be obtained with sufficient accuracy by subtracting the sum of the other constituents from 99.9% (detg. the Ni in the presence of the Zn). W. gives notes on the various operations. F. W. SMITHER.

The determination of methyl alcohol by Rinck. G. FENDLER. *Z. Nahr.-Genussm.* 30, 228-30 (1915).—A criticism of Rinck's method (*C. A.* 9, 123). Rinck's method will give tests for MeOH in alc. which is free from MeOH.

HELEN N. ELLIOTT.

Modification of the Mohler reaction of benzoic acid (GROSSFELD) 12. Determination of phytosterol (WAGNER) 12.

8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

The solubility of calcite in water in contact with the atmosphere and its variation with temperature. R. C. WELLS. *J. Wash. Acad.* 5, 617-22(1915).—W. performed expts. designed especially to show the effect of temp. on the solubility of calcite. The method of working consisted in agitating the solns. under investigation by a current of outdoor air for long intervals. The Jena flasks employed were kept in a thermostat while air was being passed and for the expts. at 1° C. they were continuously immersed in a mixt. of ice and water in a refrigerator. The air used for stirring was filtered through cotton and washed with water. The Joplin calcite used had the following compn.: SiO_2 0.09, MnO 0.05, FeO 0.19, CaO 55.8, MgO none, CO_2 (diff.) 43.87%. The Ca content of the solns. was calcd. from the result of titrating about 50 cc. with 0.02 *N* NaHSO_4 , using methyl orange as indicator. Tables are given and a curve shown of the results obtained. The geochemical conclusion to be drawn from the results is that in solns. freely exposed to the atm., solid CaCO_3 is considerably more sol. at low temps. than at higher temps. Two applications of these data to results in nature are mentioned. The Mississippi River flows in a direction of rizing temp., and results of analysis show the dependence of the solubility of CaCO_3 on its temp. Another application may be found in the formation of marble from coral. J. H. BOWER.

Chemical composition of bornite. EDGAR T. WHERRY. U. S. Nat. Museum. *Science* 42, 570-1(1915).—Attention is called to certain points which it is thought were not sufficiently emphasized in the paper on this subject by Rogers (*C. A.* 9, 2858), and it is suggested "that the variability in the compn. of bornite (normally Cu_5FeS_4) is due to the presence of submicroscopic inclusions of one or more of the minerals often occurring as visible inclusions in it, namely, chalcocite, chalcopyrite and pyrite." L. W. RIGGS.

Notes on allophanite, fuchsite, and triphylite. EDGAR T. WHERRY. *Proc. U. S. Nat. Museum* 49, 463-7(1915).—It is recommended that the various colloidal hydrous Al silicates be all grouped into 3 species, the one with the ratio $\text{Al}_2\text{O}_3 : \text{SiO}_2$ from 1:1.5 to 1:0.25, being named allophanite. Stremme (*Doelter's Handb. Min. Chem.* 2, Pt. 2, 36(1914)) has shown that the evidence indicates such noncryst. clay minerals to be adsorption compds. of colloidal Al_2O_3 and SiO_2 with variable amts. of H_2O . A new occurrence of this mineral has been found near Salt Lake City, showing H 3, sp. gr. 1.88-1.90; isotropic (amorphous, colloidal) in large part, also showing confusedly anisotropic (metacoloidal) patches. The n varies with the H_2O content, from 1.465 with about 45% to 1.595 in the dehydrated material, being the average of the n s of the constituents in each case; this confirms Stremme's conclusion or at least indicates that no complete chem. combination is represented. Analysis of microscopically homogeneous, amorphous, material gave Al_2O_3 33.78, Fe_2O_3 1.08, SiO_2 21.70, CaO 2.04, MgO 0.45, H_2O below 100° 4.86, H_2O above 100° 35.82, sum 99.73. The name fuchsite is used to refer to the isomorphous series of which $\text{H}_2\text{K}(\text{AlSiO}_4)_2$ and $\text{H}_2\text{K}(\text{CrSiO}_4)_2$ are the end members, the first being usually present in excess over the second. Occurrences are reported from West Bradford, Chester Co. Pa., and the marble quarries of Colo., which contain 3.0 and 6.08% Cr_2O_3 , respectively. A new occurrence of triphylite has been discovered near Grafton, N. H. Analysis by J. E. Whitfield gave FeO 27.66, MnO 16.63, MgO 2.30, Li_2O 8.40, Na_2O 0.35, K_2O 0.00, P_2O_5 43.85, SiO_2 0.27, H_2O 0.41, sum 100.02. Sp. gr. 3.531; α 1.690, β 1.690, γ 1.695. This is close to the compns. of material from the old Grafton locality and from Norwich, Conn. In accordance with W.'s plans for simplifying mineralogical nomenclature this mineral is described as a triphylite containing 60% lithio-ferro-triphylite, 37%

lithio-mangano-triphyllite, and small amts. of several other members of the series.

L. W. RIGGS.

Lode deposits of the Allegheny district, California. H. G. FERGUSON. U. S. Geol. Survey, *Bull.* 580-I, 153-82(1915).—In the southwestern part of Sierra Co., Cal., Au is found in quartz veins associated with arsenopyrite. The milky whiteness of the quartz is due to reflection from the surfaces of innumerable cavities not greater than 0.01 mm. in diameter and usually much less. Some of these cavities contain liquid as well as gas. From the position of certain fragments of arsenopyrite, F. concludes that the quartz was formed after the arsenopyrite. After a period of crushing, Au and PbS were deposited. The Au is chiefly found near the arsenopyrite. The formation of the ore shoots therefore depended on at least two sets of conditions: (1) the formation of coarsely cryst. arsenopyrite, and (2) the accession of solns. bearing Au. (1) seems to have occurred where lenticular swellings in the original vein gave max. opportunity for circulation of the silica-bearing soln., from which the arsenopyrite must have crystd.

R. C. WELLS.

The disseminated copper ores of Bingham Canyon, Utah. J. J. BRESON. *Bull. Am. Inst. Mining Eng.* 1915, 2191-236.—The first part of this paper (to be read in February, 1916) deals with the country rock, its pegmatitic, pneumatolytic, and hydrothermal alterations; also the effect of magnetite on the deposition of the primary chalcopyrite and pyrite. The second part of the paper includes a detailed account of the processes of secondary enrichment which have been effective in producing the disseminated ores. Numerous plates are shown. The conclusions as to the formation of the important sulfides in the disseminated ores are as follows: Pyrite, chalcopyrite, and probably a minor amount of bornite are the primary Cu minerals. The primary sulfides do not occur in these ores as magmatic sulfides, but owe their present distribution to the magnetite, which was magmatic. Covellite is the most abundant secondary Cu mineral forming by a replacement of chalcopyrite in slightly acid to neutral solns. Chalcocite is the most important secondary Cu mineral formed under slightly acid to alk. conditions. Secondary chalcopyrite may be an intermediate mineral between pyrite and chalcocite; and bornite may be formed as an intermediate product between chalcopyrite and chalcocite. Secondary chalcopyrite and bornite may also be formed by the replacement of the Cu in chalcocite or covellite by the Fe of the FeSO_4 . The concn. of the FeSO_4 in the secondary solns. is probably an important factor in secondary enrichment.

J. H. BOWER.

Iron ore on Calambayanga Island, Mambulao, Carmarines. W. E. PRATT. *Philippine J. Sci.* 10A, 323-31(1915).—The ore body is irregular in shape. It consists of magnetite and hematite and carries fresh quartz and pyrite. The main portion is almost pure massive or granular hematite, soft and very porous. Av. ore carries 60% Fe and is free from objectionable impurities, being below the Bessemer P limit. The amt. of ore is undetermined, but it appears to exist in commercial quantities.

H. C. BERMAN.

Iron ore in Surigao Province. W. E. PRATT AND V. E. LEDNICKY. *Philippine J. Sci.* 10A, 335-46(1915).—The ore body is ferruginous clay and is composed of a series of hydrous Fe oxides related to limonite. The color at the surface is red-brown, beneath the ground yellowish brown. The ore is 20 m. thick and is soft and spongy or mealy. Analysis shows about 52.5% Fe in dried ore. Estimate is 275,000,000 metric tons good ore and 222,000,000 metric tons poor ore (in regard to the accessibility and nature of deposit). The ore is free from S and P, and gives promise of future importance.

H. C. BERMAN.

Recent alunite developments near Marysvale and Beaver, Utah. G. F. LOUGHLIN. U. S. Geol. Survey, *Bull.* 620-K, 237-70(1915).— K_2SO_4 is now being manufactured

from alunite. The deposits of alunite thus far found are veins cutting porphyry. In some places bands of quartz alternate with bands of alunite. Three varieties of alunite have been noted: coarsely crystalline, which is practically pure; fine-grained, which may be mixed with SiO_2 or kaolin and resembles kaolin; and laminated, the structure being due to shearing. L. describes various prospects and gives hints as to possible by-products in the utilization of alunite.

R. C. WELLS.

The phosphate deposits of Florida. G. C. MATSON. U. S. Geol. Survey, *Bull.* 604, 100 pp. (1915).—The geology of the deposits, analyses of the several kinds of phosphate, and discussions of their mode of origin are given.

R. C. WELLS.

A new phosphatic ore. B. DE ROLLIERE. *Chem. Trade J.* 57, 365 (1915).—R. claims the discovery in France of a considerable deposit of a new variety of ore extremely rich in P, the composition of which is given as: H_3PO_4 50.1, CaO 0.005, SiO_2 4.25, KOH none, Na_2CO_3 0.005, Fe none, free Al_2O_3 8.30, combined Al_2O_3 22.80, Mn none, F 4.15, combined H_2O 5.60, loss 4.79%.

J. H. BOWER.

Persistence of Philippine coal beds. W. E. PRATT. *Philippine J. Sci.* 10A, 289-99 (1915).—The beds are not of superior quality, black lignites and sub-bituminous coals predominating. These are subject to spontaneous combustion. The obstacle to successful exploitation is the discontinuity of the beds owing to faulting.

H. C. BERMAN.

Geologic reconnaissance of Mountain Province, Luzon, P. I. W. D. SMITH. *Philippine J. Sci.* 10A, 177-207 (1915).—A trip through northern Luzon is described. The geology and mineral deposits of the district are discussed, coal, clay, S, building stone, Au and Fe being found. Water power is available.

H. C. BERMAN.

Geologic reconnaissance in Caramoan Peninsula, Carmarines Province. W. E. PRATT. *Philippine J. Sci.* 10A, 303-19 (1915).—Small unimportant deposits of Au, Cu, Hg, coal, and clay were found.

H. C. BERMAN.

Petrographic analysis of the Bridger, Washakie, and other Eocene formations of the Rocky Mountains. ALBERT JOHANSEN. U. S. Geol. Survey. *Bull. Am. Mus. Nat. Hist.* 33, 209-22 (1914).—Many of the sediments were found to be composed of fragments of volcanic rocks, in part deposited directly as tuffs, and in part reworked by water. The general type seems to be that of dacite, or even quartz diorite, although the quartz may not have come from the same source as the feldspars and volcanic glass. Certain geologic correlations are made possible by such petrographic studies of the beds.

E. T. W.

Petroleum and residual bitumens in Leyte, P. I. (PRATT) 22. Petroleum in Cebu, P. I. (PRATT) 22. Evaporation of potash brines (HICKS) 18.

9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

The production of iron and steel in Canada during 1914. JOHN McLEISH. Canada Dept. of Mines, Mines Branch, *Bull.* 349, 35 pp. (1915).

E. J. C.

Casting from blast furnace. J. E. JOHNSON, JR. *Iron Age* 96, 1054 (1915).—An outline of J.'s method based on the action of O. "The process may be practiced by various means and mechanisms, desirably by using an ordinary type of plant and blowing Fe taken directly from a blast furnace in a Bessemer converter at a low temp., so that the Si is nearly all burned out before any of the C burns, and stopping the blow when the C flame appears. This impregnates the bath with O and by mixing other

Fe direct from the furnace with the white Fe so produced, Si is restored without removing all the O," i. e., the Fe is converted from white back to gray. The process is briefly discussed. Cf. C. A. 8, 897. .

F. W. SMITHER.

Atomizing fuel oil. R. A. BULL. *Iron Age* 96, 1049-50(1915).—B. reports the results of an investigation, by the Committee on Steel Foundry Standards of the American Foundrymen's Association, into the relative advantages and disadvantages of atomizing fuel oil with steam and with air in basic open-hearth steel furnaces to determine which of the 2 agents is preferable from every standpoint, including cost, time, quality of product, etc., both in basic and in acid practice. It is concluded that there would be a considerable advantage in employing superheated steam as an atomizing agent in basic open-hearth practice, with no loss in the quality of the product.

F. W. SMITHER.

The prevention of hydrolysis in cyanide solutions. H. M. LESLIE. *J. Chem. Met. Soc. S. Africa* 16, 36-49(1915).—An exptl. study reported in detail. It is shown that: (1) Simple cyanide solns. decompose by the hydrolysis of the soln.; (2) the percentage loss by this reaction is greater in a given time, the weaker the soln.; (3) increased temp. accelerates this decompn.; (4) the alkali formed as a product of the hydrolytic action has little or no protective action on the remaining cyanide, so that hydrolysis goes on until all the cyanide is destroyed; (5) the protection afforded by the addition of an excess of caustic alkali is by no means complete and is only of a very temporary nature. Expts. with open (present method) and "closed" systems are described at some length, showing conclusively the enormous saving which can be effected by the introduction of the closed system for the treatment of ores by cyanide.

F. W. SMITHER.

Precipitation with zinc-thread. J. A. CARPENTER. *Mining Sci. Press* 3, 888-91 (1915).—C. gives data on pptn. with Zn-thread at a Tonopah mill showing that this method, although second in efficiency to the use of Zn dust, gives excellent results when operated under favorable conditions. The results show that the high cyanide and alkali strength of the pregnant soln. is responsible for the high Zn consumption in Ag cyanide plants. A greater vol. of Zn-box capacity for a given tonnage of soln. does not increase Zn consumption, but rather tends to decrease it by allowing ample space for the care of the short Zn. Working with a mill-soln. of 3 lbs. KCN and 0.7 lb. protective NaOH, the av. consumption of Zn in lbs. per oz. of refined bullion extd. for 6 months was 0.0453 lb., or 0.66 oz. troy.

F. W. SMITHER.

Zinc in the cyanide mill. A. DORFMANN. *Eng. Mining J.* 100, 680(1915).—Owing to the high price of Zn, due to the European war, and to the fact that a great deal more Zn is used than is theoretically required for pptn. of Au and Ag contained in soln., D. carried out a series of expts., at the McIntyre-Porcupine Mill in the Porcupine Au district of Ontario, in an effort to reduce the Zn consumption. The results are given in tables under the captions: Exptl. data on Zn in cyanide solns., analysis of solns. used in expts., consumption of Zn in various depts. While the work does not point toward a remedy for the difficulties encountered, it does show what is actually taking place in the mill.

F. W. SMITHER.

Cyanide consumption on the Witwatersrand. H. A. WHITE. *J. Chem. Met. Soc. S. Africa* 16, 24-36(1915).—Based on the amt. of cyanide purchased and the total tons of ore milled, and assuming no great increase in the stocks on hand, the av. consumption of cyanide in 1914 was 0.40 lb. per ton of ore treated, while Zn figured at 0.32 lb. The present paper gives in much detail the results of an exptl. study to ascertain exactly where all this goes (5,000 tons NaCN) and what are the possibilities of effecting any significant saving.

F. W. SMITHER.

Notes on the treatment of antimonial gold ores from the Murchison range. H. R. ADAM. *J. Chem. Met. Soc. S. Africa* 15, 322-7(1915).—The "reef," located in N. E. Transvaal, has been traced for over 40 miles. Satisfactory methods of treatment of the ore have not been found. The ores are classed as: (1) Partly oxidized (Sb over 2%); (2) partly oxidized (Sb under 2%); (3) sulfides (Sb over 2%); (4) sulfides (Sb under 2%). *Class 1.* Cyaniding extracts but 50% of the Au, with high cyanide consumption, a difficulty increased by use of CaO or alkali. Careful roasting, followed by cyanide, was good in lab. tests, but failed in practice. The ore can be worked for Sb. *Class 2.* Plate amalgamation, followed by concn. and cyaniding, gave an extn. of 70 to 80% Au. Pan amalgamation gives too much slime. *Class 3.* In general, the higher the Sb, the lower the Au. Various methods have been proposed. Mixing with charcoal, and roasting at below 400° to volatilize Sb₂O₃, worked fairly well in removing much Sb, but the residues were incompletely extd. by KCN. Strong HCl will dissolve the Sb₂S₃, which is precipitable on diln. Mixing with MgCl₂ and treating with superheated steam promised well, but the material frits too soon for good removal of Sb. The usual concn. method is unsatisfactory, because crushing stibnite gives too much slime. A detailed account is given of expts. on concn. by acid flotation. Much Sb goes into the froth; Au values go into the settled portion. *Class 4.* By concg., then grinding and cyaniding, extn. of 80% of the Au may be attained. F. J. Pooler suggested for Class 3 mixing with NaCl and driving off SbCl₃ by volatilization. H. Meyer mentioned the ore of the Cam and Motor mine in Rhodesia which is an arsenical pyrite contg. some Sb. Treatment is crushing in ball mills, roasting (mechanically), fine grinding with KCN and vacuum filtration; 75% extn. was attained (lab. expts. showed 85%). E. WALLER.

Zinc oxide from lead blast furnace slag. H. B. PULSIFER. *Met. Chem. Eng.* 13, 783-5(1915).—Zn is being recovered from a 150,000 ton Pb-refinery slag-dump in South Chicago by means of a remodeled Pb blast furnace, 46 X 156 in. at the tuyères, having a capacity of 65 tons daily. The slag carrying 12% Zn, charged with additional lime and coke, yields besides 7% Zn as fume, a ton of Ag-bearing Pb and speiss per day. The furnace is run with hot top on 12-oz. blast. The plant yields a considerable profit in spite of the low efficiencies of Zn recovery and fuel consumption.

H. L. OLIN.

Smelting at Panulcillo, Chile. ANON. *Eng. Mining J.* 100, 787-9(1915).—An account of the smelting operations of the Central Chili Copper Co. at Panulcillo in the province of Coquimbo. Besides the ore (sulfide) of its Panulcillo mine, the company smelts custom ores (carbonates and oxides), for which a bedding system is provided. About 7000 tons of ore are smelted per month with an av. slag analysis of SiO₂ 40.9, Fe 15.6, CaO 12.3, Al₂O₃ 22.8, MgO 1.1, Cu 0.43%. German coke was previously used; at present English coke is used. F. W. SMITHER.

Monometer tinning furnace. ANON. *Electrician* 76 (suppl.) 56-8(1915).—An account of a new process recently introduced by the Monometer Mfg. Co. (Ltd.), Birmingham, Eng. The special features comprize a complete enclosure of the melting pots, means for preventing oxidation of the molten metal, a self-acting heat controller for holding the metal at the correct fluidity, heating by low-pressure gas with intense heat and without fans, blowers, or compressors, special guiding, devices for threading the wire onto the rollers and for elimination of fumes. This process is cheaper and more efficient than other methods in use, and an enormous saving in residue is effected. Diagrams of the furnace are given. I. C. MATTHEWS.

Analysis of Turbadium bronze (WILLIAMS) 7. Electrical applications of aluminium (RICHARDS) 4.

Flotation apparatus for sulfide ores. L. G. ROWAND. U. S., 1,159,713, Nov. 9.

Apparatus for leaching ores. P. A. ROBBINS. U. S., 1,160,200, Nov. 16.

Apparatus for amalgamating ores. V. I. ZACHERT and P. A. BRANGIER. U. S., 1,160,485, Nov. 16.

Smelting ores. J. H. KLEPINGER, M. W. KREJCÍ and C. R. KUZELL. U. S., 1,160,621. Nov. 16. Oxides of Zn, Cu, Pb, or other oxide ore, flux and fuel are introduced into a reduction chamber while finely divided (in the form of a spray or dust) and the fuel ignited so that each particle of ore is entirely surrounded by reducing gas; the fused particles which settle are led to a settling chamber while kept under agitation and the metal and slag are allowed to separate.

Furnace for desulfurizing or calcining ore, etc. F. MEYER. U. S., 1,162,634, Nov. 30.

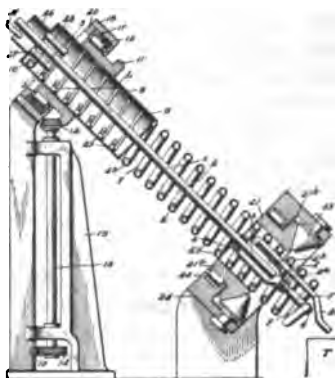
Furnaces for roasting ores. U. WEDGE. U. S., 1,162,532-3-4, Nov. 30.

Furnace for roasting ores. U. WEDGE. U. S., 1,159,141, Nov. 2.

Cyanide extraction of ores. H. M. LESLIE. U. S., 1,158,513-4, Nov. 2. The pat. relates to the method of handling the soln. and circulating it in a closed system.

Apparatus for agitating ore pulp with cyanide solutions. H. R. CONKLIN. U. S., 1,160,848, Nov. 16.

Precipitating metals from cyanide solutions. H. R. CONKLIN. U. S., 1,160,849-50, Nov. 16. A solid pptg. material, such as Zn or Al balls 29, is introduced into the upper end of the pipe 1 and passes through it to the lower turn of the worm pipe 7 and by slow rotation of the latter is carried to the upper end of the pipe 7 and discharged onto the rib 9 in the chamber 8 and finally is fed back into the pipe 1 by the short spiral pipe 10. Soln. to be pptd. is supplied continuously through the pipe N and passes through the conduits 26, 28, 8, 7 and 25 into the tank T. The balls are gradually dissolved and their residual particles are carried with the soln.



Sulfatizing of organic compounds or ores of copper and other metals. H. B. HOVLAND and G. B. FRANKFORTER. U. S., 1,159,032, Nov. 2. Ores are sulfatized by treatment with O and SO₂ under pressure while subjected to the action of an elec. arc. Org. compds., e. g., alc., may also be sulfatized with O and SO₂ under pressure. The elec. arc hastens the process by generation of N oxides.

Sulfatizing ores. H. B. HOVLAND and G. B. FRANKFORTER. U. S., 1,159,033, Nov. 2. The ore in the form of a pulp is treated with O and SO₂ under pressure at ordinary atm. temp. The reaction may be hastened by subjecting the materials to the action of N oxides (produced by action of an elec. arc) or by NaCl.

Obtaining copper or other metals from ores. H. B. HOVLAND. U. S., 1,159,942, Nov. 9. Ores of Cu or other oxidized ores are treated with H₂SO₄ to dissolve the metal and the soln. obtained is treated with CaS and Fe₂(SO₄)₃ to ppt. the metal as sulfide.

Extracting copper from ores and gangs. E. ERDOS. U. S., 1,162,044, Nov. 30. The disintegrated roasted material is treated with a soln. of Al₂(SO₄)₃ which is regenerated by the addition of H₂SO₄ after the formation of basic Cu and Al salts. On concg. the soln. CuSO₄·5H₂O crystallizes and CuSO₄·Al₂(SO₄)₃·14H₂O is held in soln.

Obtaining iron, gold, silver and other metals from ores and smelter residues. A. ESTELLE. U. S., 1,162,150, Nov. 30. The material is leached with HCl, Fe is deposited electrolytically from the ferrous soln. thus formed, using insol. anodes, and the insol. sulfides of other metals remaining in the leaching app. are treated with solvents or otherwise recovered. The H_2S from the leaching is washed with ferric soln. from the electrolysis and the acid soln. formed after sepn. from S is used in the leaching.

Removing cadmium from zinc ore. G. RIGG. U. S., 1,161,885, Nov. 30. Roasted or naturally oxidized Zn ore is heated to $700-850^\circ$ and treated with a reducing gas flame in which the reducing gas is largely in excess, additional air being admitted intermittently only as necessary to maintain the temp. until the Cd is driven off from the ore.

Removing cadmium from zinc ore. G. RIGG. U. S., 1,161,886, Nov. 30. A layer of Zn ore containing Cd, either roasted or naturally oxidized, is covered with a layer of fuel which is ignited and air is passed downward through the fuel and ore in an amt. regulated so as to maintain the temp. above the point of volatilization of Cd but below the volatilization temp. of Zn at the zone of exit of the gases from the charge.

Detinning tin-scrap. H. FOERSTERLING and H. PHILIPP. U. S., 1,160,590, Nov. 16. The Sn on the scrap is alloyed with Na by treatment with molten Na in a countercurrent process until an alloy containing about 50% of Sn is obtained.

Producing aluminium from its silicates. G. MËLLEN. U. S., 1,160,431, Nov. 16. Clay is fused with Na_2SO_4 and H_2SO_4 , the product lixiviated and filtered and NaF soln. added to the filtrate of Na_2SO_4 and $Al_2(SO_4)_3$ soln. The Na_2SO_4 remaining in the soln. is filtered off and crystd. for further use in the process and the AlF_3 pptd. is fused with NaCl and the fused mixt. is electrolyzed to obtain metallic Al. The exhausted electrolyte is reused to form fresh AlF_3 .

Alloy for casting or stamping. C. R. DENTON. U. S., 1,162,226, Nov. 30. The alloy is formed of Cu 86, Ni 15, V 1, spelter 12, Sn 7 and Al 1 part. It is resistant to sea water and to most acids.

Alloy for magnet cores, etc. R. H. PATCH. U. S., 1,162,186, Nov. 30. Fe 60-70% (preferably 65%), Co 30-40% (preferably 34.5%) and Mn 0.2-2% (preferably 0.25%) are used. The alloy has a very great magnetic permeability.

An alloy for bullets. F. C. FRARY and S. N. TEMPLE. U. S., 1,158,671, Nov. 2. Pb is combined with about 2% of Ca and a small amt. of Cu as a hardening agent. The Ca serves to harden the alloy more than an equal amt. of Sb and gives a tougher and less brittle metal.

Alloy for bullets. F. C. FRARY and S. N. TEMPLE. U. S., 1,158,672, Nov. 2. Pb is combined with about 2% of a mixt. of Ca and Ba or Sr and Mg or other mixts. of alk. earth metals and with a small amt. of Cu as an additional hardening agent.

Alloy for cast bullets, type, etc. F. C. FRARY and S. N. TEMPLE. U. S., 1,158,673, Nov. 2. Pb is combined with 2-2.8% of Sr and 0.2-0.8% Cu.

Alloy for cast bullets, type, etc. F. C. FRARY and S. N. TEMPLE. U. S., 1,158,674, Nov. 2. Pb is combined with 3-6% of Ba and 0-0.25% Cu. The Cu, if used, reduces the hardness slightly but gives a finer texture to the alloy.

Alloy for cast bullets, etc. F. C. FRARY and S. N. TEMPLE. U. S., 1,158,675, Nov. 2. Pb is alloyed with Mg 0.5% and Cu 0.25-0.5%.

Uniting copper and tungsten. W. D. COOLIDGE. U. S., 1,162,339, Nov. 30. After being degasified the Cu is cast while molten and heated just sufficiently to make it flow readily against wrought W to which it is to be united, *in vacuo*.

Uniting copper with tungsten. W. D. COOLIDGE. U. S., 1,162,340, Nov. 30. W and Cu are heated together *in vacuo* to a temp. of about 1400° and the Cu is allowed to solidify in contact with the W *in vacuo*.

Solder for aluminium. J. CAYOCCA. U. S., 1,161,612, Nov. 23. Sn, Pb and Al, in the proportions of 64:16:5, resp., are used in making the solder.

Composition for cleaning metals to be soldered. V. LOGRASSO. U. S., 1,160,731, Nov. 16. ZnCl_2 4 oz., borax and H_3BO_3 1 teaspoonful each are dissolved in H_2O 1 gal.

Melting aluminium and its alloys. G. MELLEN. U. S., 1,160,430, Nov. 16. Al or its alloys are melted in a chamber from which the air has been first partially exhausted and the residual O then removed by displacement with a gas chemically inert to the Al.

Forming a protective coating on iron or steel. J. H. MADDY and B. H. SCHUBERT. U. S., 1,161,944, Nov. 30. Powdered Pb, Zn, Sn, Sb or alloy of low m. p., is mixed with HgCl_2 and sufficient liquid ZnCl_2 soln. to make a readily flowing mixt. which is then applied to the articles to be coated and heated on them to fuse the metal in the coating mixt.

Galvanizing iron or steel pipes. U. S. ARMSTRONG. U. S., 1,159,820, Nov. 9. After pickling the pipe in an acid bath, its inner surface is coated with varnish, Japan or similar partially combustible material which is resistant to water and acids, the pipe is again subjected to an acid cleaning bath and then is passed through a bath of molten coating metal to coat its outer surface and partly consume the coating on its inner surface.

Coating iron and steel sheets with lead or lead alloys. R. HAZELTINE. U. S., 1,161,475, Nov. 23. The sheets are passed through the molten coating metal and then through an overlying layer of palm oil. Within the latter are placed brass, bronze or Ni rolls which remove the surplus coating metal from the sheets.

Gold- and platinum-coated tungsten dental pins, etc. W. D. COOLIDGE. U. S., 1,162,342, Nov. 30. An alloy of Au and Pt is used to form a firmly adherent coating on ductile W (or Mo).

Concentrating ores. MINERALS SEPARATION, LTD. Brit., 17,327, July 21, 1914. In a froth-flotation process for concg. ores containing colloidal gang slimes, there is added at some stage of the process a small quantity of an electrolyte which either has a low dissociation const., such as a weak organic acid, or is a salt of such an acid, e. g., argol. The treatment may be combined with any of the known flotation processes. Cf. C. A. 9, 52.

Metallurgical furnace. NEW METALS-PROCESS CO. Brit., 17,322, July 21, 1914. A furnace for the reduction of metals, as Fe, Cu, Zn, or Pb from ores, comprises a relatively low reducing chamber, having an aperture at its lower end for the discharge of unconsumed fuel, metal, etc., in a solid state, to which fuel and ores are fed from a preheater heated by the combustion with air of gases withdrawn from the reducing chamber.

Metallurgical furnace. NEW METALS-PROCESS CO. Brit., 17,323, July 21, 1914. A furnace for the reduction of metal from ores, such as oxides or carbonates, includes a preheater, preferably in the form of an inclined rotary drum, which slowly feeds ore with excess of fuel to a comparatively low wide reducing chamber having a top opening for high bituminous fuel, and tuyères arranged to deliver air at a relatively short distance from the outlet to the preheater.

Metallurgical furnace. NEW METALS-PROCESS CO. Brit., 17,324, July 21, 1914. A furnace for the reduction of metal from ores, such as ferro-Mn, and other metals, and alloys such as ferro-Mn,

the ore, together with a large excess of coke or other solid fuel, passes through an inclined rotary preheating cylinder to a reducing chamber of the kind described in 17,323 (cf. preceding pat.). The air supply through the tuyères is controlled so as to produce a temp. of about 3500° F. in the reaction zone when reducing Fe ores, and the reduced metal in globular form, together with the unburnt C, sinks into a cooling chamber. The tuyère which is directed vertically downwards passes through an elbow connecting the pre-heater and reducer, and is cooled by H₂O circulation. The product is discharged into pits by a reciprocating plate having apertures. Bituminous fuel is charged into the furnace through an inlet. The reaction gases escape to a chimney through the pre-heating chamber, and any combustible components are consumed by air supplied through a tuyère. The unburnt C is sepd. from the metal and again used in the furnace. The upper part of the reducer is domed and provided with poke-holes. In the case of a complex ore, metals such as Cu and Pb may be extd. separately; otherwise, an alloy is produced.

Extracting metals. NEW METALS-PROCESS CO. Brit., 17,325, July 21, 1914. In distg. metals from the ores, a charge containing lump fuel in great excess is subjected to the action of a downdraught, without the formation of a slag, and the unconsumed solid fuel is sepd. from the gang, and any non-volatile metal, and used again.

Steel. A. HETHEY. Brit., 17,285, July 21, 1914. In dephosphorizing steel in a basic open-hearth or elec. furnace, Mn is added to the bath prior to addition of ore, and also from time to time during the process, for the purpose of preventing the soln. of oxide in the metal. The product may be carbonized by adding coke or coal after the removal of the slag, or molten Fe may be poured through the slag; ferro-silicon containing over 25% of Si may be added in the ladle. After dephosphorization, the slag may be solidified by the addition of lime or dolomite to prevent oxidation, and to allow the temp. to be raised before pouring.

Chromium-nickel steels. COMPAGNIE DES FORGES ET ACIERIES DE LA MARINE ET D'HOMECOURT. Brit., 16,687, July 13, 1914. Ti is added to the Cr-Ni steels described in 25,742, 1907 (C. A. 3, 775), just before pouring, in order to refine the metal and to bring the critical points closer together. It is added in the form of a 20-25% alloy, and in the proportion of 0.15-0.3%.

Copper alloy. C. R. DENTON. Brit., 17,157, July 20, 1914. A Cu alloy contains also Ni, V, Zn, Sn, and Al. The Ni and V are melted with the Cu, and fluxes are stirred into the mass. Zn is then added, and the temp. raised to 2000° F., whereupon the Sn and Al are added in succession.

Priming for bronze coatings on iron or sheet metal. A. KRUTZ. Ger., 285,060 Apr. 18, 1914. The article is provided first with a coating of minium, then with a layer consisting of 0.25 kg. gilder's size dissolved in 1 liter H₂O, 25 g. dextrin flour boiled with 55 g. H₂O, 2.55 g. K₂CrO₄ dissolved in 255 g. H₂O. These materials are mixed and stirred with the admixt. of china clay, whereupon the surfaces are polished coated with the size, bronzed and polished.

Zinc furnace receivers. METALLWERKE UNTERWESER AKT.-GES. Ger., 284,597 Oct. 11, 1913. The receiver is shaped up from a cylindrical tube.

Reducing and purifying zinciferous flue dust. TROLLHÄTTANS ELEKTROTHERMISKA AKTIEBOLAG. Ger., 284,866, May 10, 1914. The gases from elec. Zn furnace are conducted over a reducing layer of coal. The speed of the flowing gases is reduced by a suitable relative adjustment of the sizes of the coal compartment and the gas canals, so that entrained dust can deposit on the coal.

Transportation and working of flue dust. H. GLITZ. Ger., 284,850, June 10, 1913.

Pulverizing refuse slag. VESUVIO, ART.-GES. FÜR DEN BAU VON MÜLLVERBRENNUNGSANLAGEN. Ger., 284,336, Jan. 5, 1913.

Mold for cast iron and steel. F. SCHRUFF. Ger., 283,342, Dec. 30, 1913. Addition to 250,914.

Welding copper. C. CANZLER and R. SAMERSREUTER. Ger., 284,840, Oct. 1, 1912. Cu wire containing P, to which Ag is added, is used.

10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

Synthesis of α -tetronic acid. LEONORE KLETZ AND ARTHUR LAPWORTH. Manchester. *J. Chem. Soc.* 107, 1254-65(1915).— $\text{CH}_2\text{BrCH}_2\text{CHAcCO}_2\text{Et}$, prepd. by Freer and Perkins' method (*Ibid* 51, 838(1887)) in cold H_2SO_4 , when gradually treated with an equimol. amt. of $\text{O}_2\text{S(OH)ONO}$, the mixt. poured on ice and extd. with CHCl_3 , yielded an oil (A) from which *ethyl syn-oximino- γ -bromobutyrate*, $\text{CH}_2\text{BrCH}_2\text{C}(\text{NOH})\text{CO}_2\text{Et}$, needles from light petroleum, m. 49-50°, was isolated. When 25% aq. KOH was gradually added to (A) until the temp. remained const., the soln. acidified with HCl and extd. with a large vol. of AcOEt , the filtered exts. united and neutralized with 20% KOH (phenolph. indicator), the aq. soln. acidified and extd. with AcOEt or AcEt , and the exts. dried and evapd., *syn- α -oximinobutyrolactone* (B), $\text{CH}_2\text{CH}_2\text{O.CO.C}(\text{NOH})$, flat prisms from Et_2O or light petroleum, m. 107° (decompn.),

was obtained. (B) is acid to litmus, forms sol. Cu, Fe'', Hg', Ca, Ba, Sr, Na and K salts, but forms an insol. ppt. with $(\text{AcO})_2\text{Pb}$. (B) was not readily hydrolyzed and none of the available methods for the elimination of the NOH group led to the formation of compds. having well defined ketonic properties. 20 g. of crude $\text{BrCH}_2\text{CH}_2\text{CH}(\text{CO}_2\text{H})_2$, prepared by Carpenter and Perkins' method (cf. *Ibid* 75, 924(1899)), in 17 cc. H_2O , when treated with 6.5 g. of NaNO_2 in satd. aq. soln., gave an 80% yield of *anti- α -oximinobutyrolactone* (C), needles from AcOEt , m. 192° (decompn.), which, unlike (B), reduces Fehling soln. in the cold. When carefully heated with Br, (C) in H_2O or $\text{C}_6\text{H}_5\text{N}$ formed a *bromonitroso compound*, $\text{CH}_2\text{CH}_2\text{O.CO.CBrNO}$, brilliant blue

liquid which readily loses Br on treatment with org. solvents or hot H_2O . On reduction with Sn and ice-cold HCl, (C) formed $\text{CH}_2\text{CH}_2\text{O.CO.CHNH}_2$, m. 194°, identified

by conversion into the Bz deriv., m. 141°, and the free NH_2 acid, m. 185-6° (cf. Fischer,

Ber. 40, 110(1907)). *α -Telronic acid* (D), $\text{OC.O.CH}_2\text{CH}(\text{COH})$ or $\text{OC.O.CH}_2\text{CH}_2\text{CO}$ [possibly identical with Böttinger's " *α -ketobutyrolactone*," *Ann.* 260, 345(1890)], was best prepd. by the following method: 15 g. of Na_2SO_3 were gradually added to 5 g. (C) suspended in warm H_2O , the soln. heated on the H_2O bath, acidified with HCl and evapd. under diminished pressure. The viscous residue after repeated extn. with AcOEt , evapn. of the ext. *in vacuo*, and extn. of the residue with Et_2O , yielded a mixt. containing a small amt. of (D) which was sepd. by means of repeated crystn. from Et_2O . (D), needles or prisms from AcOEt , m. 111° (gradual decompn.); *phenylhydrazine* (E), yellow needles, m. 223-4°. When condensed with HONH_2HCl , (D) is converted into (C). (D) in H_2O is acid to litmus, reduces AgNO_3 in the cold, and gives a deep reddish violet color with FeCl_3 , thus differing from most α -ketonic acids and substituted α -ketolactones. (E) was much more readily obtained by the interaction of C, and PhNHNH_2 in AcOH , or from $\text{BrCH}_2\text{CH}_2\text{CH}(\text{CO}_2\text{Na})_2$ and PhN:NCl . (D) was also obtained, in very poor yield, by the action of hot mineral acids on (C), by the

interaction of $O_3S(OH)ONO$ and (C) in HCO_2H , or by the action of $FeSO_4$ and HCl on (C). The action of HNO_3 on various monoalkylmalonic acids was also investigated. The interaction of $PhCH_2CH(CO_2H)_2$ and $NaNO_2$ gave rise to $PhCH_2C(:NOH)CO_2Na$ (yielding the free acid, m. 155° ; cf. Erlenmeyer, ref. not given) or $PhCH_2CN$ (obtained from the above Na salt by the loss of $NaHCO_3$). When ethyl-, methyl- or allylmalonic acid was treated with HNO_3 under similar conditions, the reaction proceeded imperfectly, yielding large amts. of the unchanged acid together with nitriles formed by the withdrawal of $NaHCO_3$ from the expected oximino acids. The above method of prep. oximino acids is therefore not generally applicable.

LOUIS E. WISE.

Non-aromatic diazonium salts. IV. Thiazole-2-diazonium salts. GILBERT T. MORGAN AND GENEVIEVE V. MORROW. Roy. Coll. Sci., Ireland, Dublin. *J. Chem. Soc.* 107, 1291-6(1915).—M. and M. have detd. the best conditions for the diazotization of 2-aminothiazole (A) prepd. by Traumann's method (cf. *Ann.* 249, 35(1888)). (A) was very readily diazotized in 20% H_2SO_4 by means of N aq. $NaNO_2$ and the diazo compd. isolated as the *chloroaurate* (B), $[S.CH:CHN:C.N_2]AuCl_4$, yellow crystals, m.

122° (decompn.), stable at ordinary temp. and hydrolyzed by H_2O . An attempted diazotization of (A) in cold dil. HCl led to the formation of brown amorphous products [thiazolediazohydroxide(?); cf. Nef, *Ann.* 265, 110(1891)]. Diazotization of (A) in $HClO_4$ by means of $EtNO_2$ proceeded smoothly but formed an extremely explosive diazonium perchlorate. In HNO_3 the diazotization of (A) proved unsatisfactory, owing to the insolubility of the nitrate of (A). Solns. of thiazolediazonium salts when added to β -naphthol in $EtOH$ formed *thiasoleazo- β -naphthol*(?), brownish red plates from C_6H_6 , which partly dissolved in aq. $NaOH$, leaving a Cu-red flaky residue, m. 105° . The $NaOH$ soln. upon acidification yielded a pale red substance, m. 126° . Both of these fractions gave an intense purple color with H_2SO_4 . *Thiasoleazo- β -naphthylamine*, amorphous bluish red compd., m. $135-40^\circ$, gives an orange color with concd. H_2SO_4 and a magenta color on diln. CH_3Ac , reacting with thiodiazonium nitrate in the presence of $(NH_4)_2CO_3$ formed *thiasole-2-azoacetylaceton*, $S.CH:CH.N:CN:NCAc$:

CMeOH.

LOUIS E. WISE.

Action of alkalis on dextrose and levulose. CHARLES W. R. POWELL. Univ. Sidney. *J. Chem. Soc.* 107, 1335-46(1915).—A study of the combination between the sugars and alkalis in aq. solns., and the velocity of the ensuing decompn. The formation of a compd. in a soln. containing dextrose (or levulose) and $NaOH$ (or KOH) was detected by the following method: changes in conductivity produced by gradually increasing the concn. of the sugar in the alk. soln. were carefully noted. As the relative amt. of sugar was increased, the conductivity fell until a point was reached where the decrease suddenly became less marked. This change occurred when the soln. contained equimol. amts. of the sugar and $NaOH$ (or KOH). Dextrose and levulose therefore unite with $NaOH$ or KOH to form compds. containing the substances in equimol. proportions. These compds. are largely hydrolyzed by H_2O , the degree of hydrolysis being of the same order of magnitude in the case of dextrose and levulose. The velocity of decompn. of the 2 sugars by alkalis was detd. by noting the gradual vol. changes in delicate dilatometers. The velocity consts. for the reaction between the sugars and $NaOH$ were calcd. from the equation: $k = 2.3 / t \cdot \log[a/(a-x)]$, where a is the initial concn. of sugar and x is the amt. decompd. in the time t (dilatometer scale readings being taken at the beginning and at the end of the reaction). The results have been tabulated. The reaction under the influence of alkalis were shown to be due to the rapid conversion of the sugar under the influence of alkalis at a slower rate.

to form the salts of various acids. The velocity coeff. for the decompn. of dextrose depends very little on the concn. of free dextrose, but largely on the concn. of HO ion, to which, however, it is not exactly proportional. Excess of alkali acting upon dextrose or levulose at 50° causes the decompn. of about 50% of the sugar.

LOUIS E. WISE.

Formation of heterocyclic compounds from cyanoacetamide and hydroxymethylene ketones. I. HEMENDRA K. SEN-GUPTA. Royal Coll. Sci., London. *J. Chem. Soc.* 1915, 1347-67 (1915).—The paper deals mainly with the condensation of hydroxymethylene cycloketones with $\text{NCCH}_2\text{CONH}_2$ (A), which led to the formation of quinoline derivs. (A) in H_2O when treated with an equimol. amt. of freshly prepd. $\text{CH}_2\text{CH}_2\text{CH}_2\text{CO.C}(\text{:CHOH}).\text{CH}_2$ (B), in the presence of a small amt. of

piperidine or Et_3NH , sufficient alc. added to effect soln. and the mixt. allowed to stand overnight, yielded 2 products: 3-cyano-9-hydroxyoctahydro-2-quinolone (C),

$\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{C}(\text{OH}).\text{C}:\text{CH}.\text{CH}(\text{CN}).\text{CO}.\text{NH}$, does not m. 290°; and 3-cyano-octahydro-2-quinolone (D), $\text{CH}_2(\text{CH}_2)_3\text{C}:\text{N}.\text{CO}$, prisms, m. 249°, sepd. by repeated

crystn. from AcOH. (C) was also prepd. in purer form, though in very poor yield, by treating (B) with $\text{NCCH}_2\text{CO}_2\text{Et}$ in the presence of NH_3 in abs. alc., or from the amide of (B) and $\text{NCCH}_2\text{CO}_2\text{Et}$ in alc. in the presence of Et_3NH or piperidine. (C) when heated in glacial AcOH at 200-10° for several hrs. was converted into (D). The 9-methyl ether of (C), long needles, m. 247°, hydrolyzed by H_2SO_4 to an acid m. 200-2°. (D) was also formed by condensing the acetate of (B) with (A) in the presence of EtONa . Hot 80% H_2SO_4 hydrolyzes both (C) and (D), giving rise to hexahydro-2-quinoline-3-carboxylic acid (E), needles from AcOH, m. 266-7° (decompn.). When heated with fuming HCl at 120-30°, (C) and (D) yield (E). If the hydrolysis is carried out at 150-60°, CO_2 is evolved in either case and hexahydro-2-quinolone,

$\text{CH}:\text{C}(\text{CH}_2)_4\text{C}:\text{N}.\text{CO}.\text{CH}_2$ (F), m. 202-4°, is obtained. (F) was also formed by

heating (E). When treated with PCl_5 , (F) yields 2-chlorotetrahydroquinoline, oil, and when heated at low red heat with Zn dust in a current of H, (F) gives rise to quinoline, identified by means of its picrate and methiodide. The condensation of 3-methylhydroxymethylenecyclohexanone (G) and (A) gave rise to 3-cyano-9-hydroxy-7-methyloctahydro-2-quinolone, m. 272° (decompn.), and 3-cyano-7-methylhexahydro-2-quinolone, m. 255-6°, the latter being formed from the former by heating at 200-10° in a sealed tube. Both compds. on hydrolysis give rise to 7-methylhexahydro-2-quinolone-3-carboxylic acid (H), needles, m. 259° with the evolution of CO_2 and formation of 7-methylhexahydro-2-quinolone, needles, m. 192-3°. The condensation of $\text{NCCH}_2\text{CO}_2\text{Et}$ with (G) gave rise to ethyl α -cyano- β -[2-keto-4-methylcyclohexylidene]propionate, $\text{CH}_2\text{CHMe}.\text{CH}_2\text{CO.C}[\text{:CHCH}(\text{CN})\text{CO}_2\text{Et}].\text{CH}_2$, m. 184-5° (accidentally sepd. in

the pure state in an attempt to form the semicarbazone), exceedingly difficult to purify, giving a red coloration with FeCl_3 , and hydrolyzed to (H) when heated with H_2SO_4 or with alc. KOH. Its hydraside m. 263-5°. 4-Methylhydroxymethylenecyclohexanone, m. 108-9°, when acted upon by (A) formed 3-cyano-6-methylhexahydro-2-quinolone, m. 229°. The corresponding 3-cyano-9-hydroxy-6-methyloctahydroquinolone, does not m. 290°, was formed by heating (A) with (G) in abs. alc. NH_3 as the condensing agent. Both quinolones on hydrolysis give rise to hexahydro-2-quinolone-3-carboxylic acid, m. 284° with evolution of CO_2 . The condensation of 6-methylhexahydro-2-quinolone, m. 205-6°.

The condensation of 2-methylhydroxymethylenecyclohexanone and (A) gave rise to 3-cyano-8-methylhexahydro-2-quinolone, prisms, m. 242°, yielding on hydrolysis the corresponding acid, m. 260-1° with elimination of CO₂ and the formation of 8-methylhexahydro-2-quinolone, m. 142°. Hydroxymethylenementhone, when condensed with (A), formed 3-cyano-5-methyl-8-isopropylhexahydro-2-quinolone,

$\text{CH}:\text{C}(\text{CHMe}.\text{CH}_2.\text{CH}_2.\text{CH}(\text{CHMe}_2).\text{C}:\text{N}.\text{CO}.\text{CHCN})$, thin prisms, m. 227-8° (de-

compn.), yielding the corresponding acid, soft plates, m. 182-4°, on hydrolysis. (A) and EtCOCMe:CHOH formed 3-cyano-5-methyl-6-ethyl-2,3-dihydro-2-pyridone, N:CEt.CMe:CH.CH(CN).CO, m. 230-1°, yielding the corresponding acid, m. 287-8°,

which evolves CO₂ and forms the corresponding hydroxypyridine derivative, prisms, m. 110°, resolidifying, and rem. 138-9° (m. 141° after dehydration). The condensation of NCCH₂CO₂Et and EtOCH:CACCO₂Et in the presence of NH₃ led to 6-hydroxy- α -picoline, m. 212-3° (obtained by a similar reaction by Errera, Ber. 33, 2969(1900)). Condensation between ethoxymethyleneacetylacetone and (A) could not be effected in the presence of piperidine or Et₃NH, hence the Na salt of (A) was used in the reaction, and the resulting product pptd. by adding HCl to the reaction mixt. This compound, C₁₂H₁₄O₂N₂, m. 229-30°, formed a methyl ether, plates, m. 170°; an ethyl ether, fine needles, m. 110°; and a corresponding acid, C₁₂H₁₄O₂N, m. 242-3°. Condensation of the Na salt of (A) and dibenzylidenecyclohexanone formed a compound, C₂₂H₂₂O₂N₂, prisms, m. 262-3° (decompn.), insol. in acids and alkalies and giving no color with FeCl₃, which when hydrolyzed with HCl formed a compound, C₂₂H₂₂ON, needles, m. 248-9°, insol. in aq. acids or alkalies, giving a deep color with FeCl₃. This type of condensation with benzylidene ketone derivs. is apparently general. PhCH:CHAc and (A) reacting normally gave rise to a compound, C₁₃H₁₄O₂N₂, m. 257-8°, excepting when the reaction was carried out in alc. in the presence of Et₃NH. Under these conditions was formed a compound, C₁₃H₁₄O₂N₂, needles, m. 276° (decompn.), yielding a methyl ether, needles, m. 146°. The disappearance of the 2 H atoms in the formation of this product has not been satisfactorily accounted for. The condensation of (A) and acetylcyclohexanone was readily effected in the presence of Et₃NH, the resulting compound, C₁₁H₁₂ON₂, needles, m. 290°, yielding on hydrolysis at 150-60° with HCl a derivative, C₁₀H₁₂ON, m. 235°. The structure of these compds. has not been definitely determined.

LOUIS E. WISE.

Complex metallic amines. I. *cis*-Sulfonyldiacetatodiethylenediaminecobaltic salts. THOMAS S. PRICE AND SIDNEY A. BRAZIER. Municipal Tech. School, Birmingham. J. Chem. Soc. 107, 1367-76(1915); cf. C. A. 9, 566.—The interaction of carbonatodiethylenediaminocobaltic bromide (A), Ag₂O and S(CH₂CO₂H)₂ lead to the formation, not of the expected hydrogen thiodiacetate, but of the double salt of cobalt thiodiacetate and ethylenediamine thiodiacetate, S(CH₂CO₂)₂Co.S(CH₂CO₂H)₂C₂H₄(NH₂)₂.2H₂O, which could be directly prepd. from CoCO₃, C₂H₄(NH₂)₂, and S(CH₂CO₂H)₂, and which, when treated with AgNO₃, gave a quant. yield of S(CH₂CO₂Ag)₂. The following *cis*-sulfonyldiacetatodiethylenediaminecobaltic salts are described (R = [SO₂(CH₂CO₂)₂-Co.en₂]): bromide (B), RBr.2H₂O, dull rose-red microscopic plates, from (A) and SO₂-(CH₂CO₂H)₂; RCO₂CH₂SO₂CH₂CO₂H, previously described; iodide, RI, rose-red microcrystals, from (B) and KI; chloride, RCl.H₂O, rose-red platelets, from (B) and freshly prepared AgCl, undergoing decompn. when heated for 3 hrs. at 115°; nitrate, RNO₂.2H₂O, clusters of pale red microprisms, from (B) and AgNO₃; thiocyanate, RSCN, brick-red microcrystals, from (B) and KSCN; dithionate, R₂S₂O₆, from (B) and Na₂S₂O₆, small rose-red leaflets; chloroplatinate, R₂PtCl₆, pale brown microcrystals; chloroaurate, RAuCl₄.H₂O, burnt sienna microcrystals, after air drying. Oxalatodiethylenediamine-

cobaltic bromide was prepd. by a method similar to that used in the prepn. of (B). The properties of the salt corresponded with those described by Werner and Vilmos (*Z. anorg. Chem.* 21, 153(1899)).

LOUIS E. WISE.

New halogen derivative of camphor. I. α' -Chlorocamphor. Isomerism, static and dynamic. THOMAS M. LOWRY AND VICTOR STEELE. Guy's Hosp., London. *J. Chem. Soc.* 107, 1382-96(1915); cf. *C. A.* 9, 2893.—A more detailed description of the synthesis and properties of α' -chlorocamphor (A). A kg. of α -chlorocamphor (B) in 1 l. of boiling 96% alc. (freshly distd. after boiling with KOH) was treated with 75 cc. of 0.1 N NaOEt, the boiling continued for 0.5 min. and the soln. acidified with aq. HCl, and rapidly cooled in ice H_2O . The less sol. residual (B) sepd. after the mixt. was cooled to -18° ; the mother liquor after evapg. nearly to dryness, yielded (A), which after recrystn. to const. $[\alpha]_{441}$ finally yielded a product m. 117° free from (B). The $[\alpha]_{25}^\circ$ in 95% alc., 5 g. per 100 cc., were as follows (wave lengths of the sources of monochromatic light being given in parentheses): (6708) 23° ; (5893) 35° ; (5780) 38° ; (5461) 47° ; (4358) 129° . The $[\alpha]$ previously reported were of a sample of (A) which had been crystd. only to const. m. p. L. and S. have since shown that as much as 10% of (B) may contaminate (A) without altering its m. p. A satd. alc. soln. of (A) when treated with a drop of EtONa in alc. undergoes rapid isomeric change, evolving heat and yielding (B). Mutarotation in alk. soln. of (A) was similar to that observed by Kipping in the case of (B), each substance being converted by alkalis into the same mixt. of isomerides in equil. (A) when brominated gives rise to the same isomorphous mixt., m. $55-8^\circ$, as that formed by (B) on bromination. Judging from the $[\alpha]_D^{21}$ in $CHCl_3$, 52.2-52.6°, both components of this mixt., which consists of α -chloro- α' -bromo- and α' -chloro- α -bromocamphor, are formed in equal amts., a fact which serves as a confirmation of Lapworth's theory according to which the replacement of H by halogen in keto compds. is preceded by the addition of the halogen to an enolic isomer of the ketone (cf. *Ibid* 85, 30(1904). Nitration of (A) yielded only α' -chloro- α -nitrocamphor, m. 132° . A study of the relationship between (A) and (B), which is in many ways analogous to that existing between the ketonic and the enolic components of acetoacetic ester, has led L. and S. to urge that the words "tautomeric" and "desmotropic" be used in the sense of the original definitions, *tautomerism* covering such cases as the 1,2- and 1,6-dibromobenzenes, *desmotropy* referring to all cases in which there is a rearrangement of the bonds consequent upon the displacement of a mobile H atom, and *dynamic isomerism* including all cases in which isomerism passes from a static to a dynamic condition.

LOUIS E. WISE.

Metallic derivatives and constitution of guanidine. HANS KRALL. M. A. O. Coll., Aligarh, India and Trinity Coll., Dublin. *J. Chem. Soc.* 107, 1396-1405(1915).—Of the 3 possible tautomeric forms of guanidine, the one usually written, $HN:C(NH_2)_2$, has not been established. HNO_2 , even when an excess of the strong acid is present, liberates N corresponding to only 1 NH_2 group, and reacts very slowly. The dihydrochloride of guanidine could not be prepd. The other possible tautomeric forms, $H_2NC:N.NH_2$ (A) and $HN:C.NH.NH_2$ (B), corresponding to the constitutions sug-

gested for carbamide by E. A. Werner (*Ibid* 103, 1013(1913)) are probably present in guanidine solns. in the form of an equil. mixt. The constitutions (A) and (B) are in strict accordance with the relation of guanidine to cyanamide, and serve to explain its hydrolysis and the formation of its metallic and Me derivs., as well as its behavior when forming salts. The hydrochloride yielded no trace of NH_3 when solid residue (from the alc. soln.) evolved NH_3 , soln. was treated with 1 equiv. of EtOK and

distd. At no point in the distn. was the brisk evolution of NH_3 noted, gradual decompn. taking place with the formation of K cyanamide. When the expt. was repeated with 2 equivs. of EtOK , only traces of NH_3 were liberated below 160° . Hydrolysis of guanidine with H_2O led to the formation of NH_3 , CO_2 , and small amts. of melamine. No urea was formed. The interaction of concd. solns. of guanidine and Ag nitrates led to the formation of the *double salt*, $\text{CH}_5\text{N}_3\cdot\text{HNO}_3\cdot 2\text{AgNO}_3$, needles. When the above in H_2O was rendered alk. a flocculent ppt. formed, which varied in color from white through yellow to grey, depending on the proportions used. A *monosilver derivative*, $\text{HN}:\text{C.NAg.NH}_2$ (C), colorless granules, not exploding when struck, but decomposing

with a mild explosion when strongly heated, was formed by treating a soln. of guanidine nitrate with 5 equivs. of NaOH and 1 equiv. of AgNO_3 . When 2 equivs. of AgNO_3 were added to guanidine solns. containing an excess of alkali, a very explosive black *disilver derivative*, $\text{Ag}_2\text{N}:\text{C.NAg.NH}_2$, was formed. When an excess of alkali is avoided,

guanidine solns. and AgNO_3 yield a yellow substance (D), identical with a compd. prepd. by Thiele (*Ann.* 302, 334) and believed by him to be $\text{CH}_5\text{N}_3\text{Ag}_2\cdot\text{H}_2\text{O}$. (D) does not contain H_2O , is stable, and is apparently an equimol. mixt. of (C) and a non-explosive *disilver derivative*, $\text{Ag}_2\text{N}:\text{C}:\text{N.NH}_2$ (derived from (A)). This hypothesis is

in harmony with Schenck's observations (*C. A.* 4, 1475) that (D) yields a mixt. of the mono- and dimethylguanidines on alkylation. When treated with HCl , (D) forms guanidine hydrochloride and AgCl . Dil. aq. solns. of guanidine and Cu salts, when treated with alkali formed a green *monocopper derivative*, $\text{Cu}:\text{N}:\text{C}:\text{N.NH}_2$.

A blue *copper salt*, $\text{C}_2\text{H}_5\text{N}_3\text{ClCu}(\text{?})$, was formed when 20 g. of guanidine hydrochloride in 50 cc. H_2O were treated with 25 g. KOH in 50 cc. H_2O and 13 g. CuCl_2 in 100 cc. H_2O added. This compd., when hydrolyzed, yielded $\text{Cu}(\text{OH})_2$, guanidine, and guanidine hydrochloride.

LOUIS E. WISE.

Phenylsuccinic acid series. II. Some derivatives of the optically active diphenylsuccinic acids. HENRY WREN AND CHARLES J. STILL. Belfast. *J. Chem. Soc.* 107, 1449-59(1915); cf. *C. A.* 9, 2223.—Pure *d*-diphenylsuccinic acid (A) yields a *barium salt*, well defined prisms containing 5 mols. of H_2O , 4 of which are lost at $100-5^\circ$, the 5th being expelled at $200-1^\circ$. The anhydrous salt dissolves in 330 parts H_2O at 7° . (A) and the *l*-isomer (B) react with MeOH and H_2SO_4 , yielding, resp., the *d*-ester, platelets m. $165-6^\circ$, $[\alpha]_D^{18.3}$ (acetone) 341.9° , $[\alpha]_D^{15.8}$ (CHCl_3) $376-8^\circ$, and the *l*-ester, platelets, m. $165-6^\circ$, $[\alpha]_D^{15.8}$ (acetone), -342.1° , $[\alpha]_D^{14.2}$ (AcOEt) -365.3° , $[\alpha]_D^{16.3}$ (CCl_4) -431.8° . *Methyl dl*-diphenylsuccinate, rhombic platelets, m. $173.5-4.0^\circ$; *methyl meso*-diphenylsuccinate, fine needles, m. $218.5-9.5^\circ$. Esterification of (A) and (B) with EtOH proceeded less rapidly than with MeOH . *Ethyl l*-diphenylsuccinate, rectangular plates, m. $104-5^\circ$, $[\alpha]_D^{16.4}$ (acetone) -279.7° . *Ethyl d*-diphenylsuccinate (C), plates, m. $104-5^\circ$, $[\alpha]_D^{18}$ (acetone) 279.4° . ($[\alpha]_D$ in other solvents are given.) During the purification of (C) by treatment with Na_2CO_3 (to remove unchanged acid) the *ethyl sodium d*-diphenylsuccinate, pearly leaflets, containing 4 H_2O , was isolated. A similar salt obtained from the *l*-acid, after decompn. with aq. H_2SO_4 and extn. with Et_2O , yielded *ethyl hydrogen l*-diphenylsuccinate, cryst. powder, m. $113.5-4.5^\circ$, readily electrified when gently rubbed, $[\alpha]_D^{16.5}$ (acetone) 328.7° . ($[\alpha]_D$ in other solvents are given.) (A) was not appreciably racemized by treatment with hot aq. KOH , but very appreciable racemization occurs upon hydrolysis of the optically active esters with alc. KOH . AcCl acting upon (B) at 30° gave rise to *l*-diphenylsuccinic anhydride (D), oblique prisms, m. $105.5-6.5^\circ$, $[\alpha]_D^{17.4}$ (C_6H_6) -278.7° ; the corresponding *d*-anhydride (E), prisms, m. $105.5-6.5^\circ$, $[\alpha]_D^{18.6}$ (C_6H_6) 286.2° . The latter was also ob-

tained by the action of SOCl_2 on (A). When treated with hot H_2O , (D) and (E) pass into (B) and (A), resp., the active acids, however, containing about 8% of inactive material from which a small amt. of the corresponding *meso*-acid could be isolated after fractional crystn. of Ba salts. The action of cold EtOH on (B) appears to be complex, a mixt. of ethyl hydrogen esters ($[\alpha]_D -260^\circ$ in EtOH) being probably formed, although no pure substance could be isolated.

LOUIS E. WISE.

Volatile oil of *Cymbopogon sennaarensis*, Chiov. OSWALD DIGBY ROBERTS. Imp. Inst., London. *J. Chem. Soc.* 107, 1465-70 (1915).—"Mahareb" grass when distd. with steam yielded 1.2% of a pale yellow oil, possessing an odor of pennyroyal, $d_{15}^{20} 0.9422$, $\alpha_D^{23} 29^\circ 38'$; acid no., 4.2; ester value before acetylation, 14.5; after acetylation, 62.1. The approx. compn. of this oil was as follows: Terpenes [including *d*-limonene (identified by conversion to the tetrabromide, m. $103-4^\circ$), and probably pinene], 13%; ketones [chiefly or entirely Δ' -menthenone (A), $d_{15} 0.9387$, $\alpha_D^{25} 1^\circ 44'$, b. $235-7^\circ$ (cf. Wallach and Meister, *Ann.* 362, 272 (1908); Schimmel's Reports, Oct., 1910, p. 97)] 45%; a *sesquiterpene alcohol*, $\text{C}_{15}\text{H}_{26}\text{O}$ (B), $b_{11} 170-3^\circ$, $d_{15}^{16} 0.9544$, $\alpha_D^{24} 10^\circ 48'$, 25%; an undetd. alc. with rose-like odor, 3%; unidentified phenol, yielding a benzoate, m. $70-2^\circ$, 0.2%; acids (probably AcOH, octoic, decoic, both in the free state and as esters and palmitic as an ester) 2%. The residue probably consisted of sesquiterpenes, 11.8%. The α - and β -semicarbazones and the oxime and oxamino-oxime of (A) were prepd., and agreed in properties with those given in Schimmel's Reports. The *bisnitroso derivative* of (A), microcrystals, m. $96-7^\circ$ (decompn.). The decompn. of (A) by means of neutral KMnO_4 lead to the formation of α -hydroxy- α -methyl- α' -isopropyladipic acid, diosphenol, m. 82° , and an unidentified acid, m. $126-7^\circ$. (A), when reduced with Na and EtOH formed, menthol. When distd. under reduced pressure, over P_2O_5 and finally over Na, (B) yielded a practically odorless sesquiterpene b. $150-5^\circ$, $d_{15}^{16} 0.9114$, $\alpha_D^{23} 24^\circ 24'$.

LOUIS E. WISE.

Polymorphic phthalyl-halogen-substituted-phenyl- and -tolylhydrazides. FREDERICK D. CHATTAWAY AND ERNEST VONDERWAHL. Oxford. *J. Chem. Soc.* 107, 1503-9 (1915).—The compds. listed were prepd. in order to det. the effect of halogen substituents upon the cryst. structure of phthalylphenyl- and phthalyltolylhydrazides, and to note whether any of the halogen compds. could be readily obtained in polymorphic forms. All of the compds. were readily formed by dissolving $\text{C}_6\text{H}_4(\text{CO})_2\text{O}$ and equiv. amts. of the corresponding hydrazine in alc., evapg. to dryness and heating at 100° , and crystg. from suitable solvents. *Phthalyl-o-chlorophenylhydrazide*, $\text{C}_6\text{H}_4(\text{CO})_2\text{N} \cdot \text{NHC}_6\text{H}_4\text{Cl}$, clusters of compact pale yellow plates, m. 221° ; *m*-isomer, pale yellow, slender, hair-like prisms, m. 180° ; *phthalyl-o-bromophenylhydrazide*, clusters of compact pale yellow plates, m. 212° ; *m*-isomer, pale yellow, hair-like prisms, m. 208° ; *o*-iodophenylhydrazide, crystals in 2 polymorphic forms, almost colorless clusters of hair-like needles, and bright yellow, compact rhombic plates, m. $144-5^\circ$; *m*-isomer, long, very slender prisms, m. 232° ; *p*-isomer, bright yellow prisms, m. 193.5° ; *2,6-dibromophenylhydrazide*, crystg. in 2 polymorphic forms, pale yellow microprisms, m. 203° , which when suspended in PhMe at room temp. are converted into large transparent, colorless, 6-sided, rhombic plates, showing signs of m. 190° and transformed at this temp. into the yellow variety, m. 203° ; *3,5-isomer*, faintly yellow, long, hair-like prisms, m. 268° ; *3,4-isomer*, small, pale yellow needles, m. 200° ; *2,4-isomer*, pale yellow, hair-like prisms, m. 224° . *2,4-Dichlorophenylhydrazide*, pale yellow, hair-like prisms, m. 206° ; *2-chloro-4-bromophenylhydrazide*, very pale yellow, hair-like prisms, m. 210° ; *4-chloro-2-bromophenylhydrazide*, practically indistinguishable from its isomer, m. 211° . *2,4,6-Br_3C_6H_2NHNH_2* was prepared by adding *2,4,6-Br_3C_6H_2NH_2* to a mixt. of its own wt. of H_2SO_4 and 7 times its wt. of AcOH, diazotizing at $3-5^\circ$, and reducing the mixt. with a slight excess of SnCl_2 . The *hydrochloride* of the hydrazine forms colorless plates; the free base, white needles,

m. 146° (cf. Neufeld, *Ann.* 248, 96(1888)). The other halogen-substituted phenylhydrazines used in the prepn. of the following compds. were synthesized by very similar methods: *Phthalyl-2,4,6-tribromophenylhydrazide*, pale yellow, compact prisms, m. 295°; *2,4,6-trichlorophenylhydrazide*, stout, nearly colorless prisms, m. 191°; *2,6-dichloro-4-bromophenylhydrazide*, pale yellow, compact rhombic plates, m. 188°; *2,4-dichloro-6-bromo isomer*, pale yellow, short, stout prisms, terminated by pyramids, m. 193°; *4-chloro-2,6-dibromophenylhydrazide*, compact, pale yellow prisms, m. 217°; *6-chloro-2,4-dibromo isomer*, pale yellow, compact, irregular plates, m. 195°; *phthalyl-3,5-dibromo-tolylhydrazide*, 3,5,6-Br₃[C₆H₄(CO)₂NNH]C₆H₂Me, long, colorless, slender prisms, m. 236°; *p-isomer*, crystg. in 2 polymorphic modifications, pale yellow needles, which when left in AcOH at ordinary temp. change into pale yellow, compact crystals (apparently short, stout prisms), m. 196°.

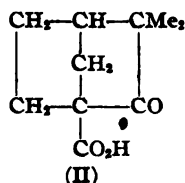
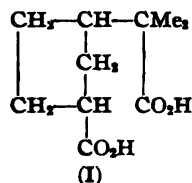
LOUIS E. WISE.

Optical rotatory power of derivatives of succinic acid in aqueous solutions of inorganic salts. III. GEORGE W. CLOUGH. Birkbeck Coll., London. *J. Chem. Soc.* 197, 1509-19(1915).—Since it has been shown that inorg. salts exercise a very marked influence on the $[\alpha]_D$ of various HO derivs. of (CH₃CO₂H)₂ (cf. Stubbs, *C. A.* 6, 956; Clough, *C. A.* 8, 1569; 9, 2622), C. has undertaken the study of the effect of various salts on the $[\alpha]$ of aspartic acid (A) and of asparagine (B). The influence of these salts appears to be analogous to that of the same salts on the $[\alpha]$ of malic and tartaric acids in H₂O. The $[\alpha]_D$, $[\alpha]_{Hg}$ green, and $[\alpha]_{Hg}$ violet of (A) and (B) at various temps. were detd. A change in sign in the case of the $[\alpha]$ of (A) at elevated temps. was noted. NaCl and BaCl₂ increased the $[\alpha]$ of (A), the latter salt having the greater effect. The enhancing effect of varying concns. of aq. HCl on the $[\alpha]$ of (A) and the *l*-rotation caused by the addition of different strengths of NaOH to (A) solns., together with the salt effects, have been recorded in tabular form. (A) in H₂O shows an anomalous rotatory dispersion. The influence of NaOH, KNO₃, KI, KBr, KCl, NaCl, NH₄Cl, BaCl₂, BaBr₂ and HCl on the $[\alpha]$ of (B) was also detd. The Ba salts cause a greater alteration in $[\alpha]$ than do the K salts which in turn possess greater influence than do the Na salts. The rotation-temp. curves of (A) in H₂O, in *N* HCl, and in *N* NaOH have been drawn and compared with those of Et hydrogen aspartate and EtNa aspartate. The 2 latter were drawn from the data given by Piutti and Magli, *Gazz. chim. ital.* 36, [II], 738(1906), and the comparison made since these compds. are *d*-rotatory at lower and *l*-rotatory at higher temps. Their rotation-temp. curves show marked similarity to those of (A). C., after a critical review of the literature on the subject of salt effects upon rotation, concludes that the changes in the $[\alpha]$ of the NH₂ and HO derivs. of (CH₃CO₂H)₂ are not due to a phys. alteration in the mol., as suggested by previous investigators, but "are to be ascribed to a more decidedly chem. character, probably a combination of the compds. in soln."

LOUIS E. WISE.

Constitution determinations in the camphene series. VI. Isomerism of methylcamphenilol and camphene hydrate. OSSIAN ASCHAN. Univ. Helsingfor. *Ann.* 410, 222-39(1915); cf. *C. A.* 7, 3478.—Methylcamphenilol and camphene hydrate are geometrical isomers. The same camphene hydrate is obtained by the action of Ca(OH)₂ upon (1) the product of the addition of HCl to camphene and (2) and (3) the chloride obtained by the action of PCl₅ upon borneol and isoborneol. Ac₂O gives an *acetate*, C₁₅H₁₇OAc, b₁₆ 103-5°, d₁₆¹⁵ 0.9852. Upon sapon. a mixt. of camphene hydrate and isoborneol was obtained. *Phenylurethan*, m. 89°. Methylcamphenilol was prepd. by adding the ketone to the MeMgI soln., and by adding the MeMgI to the ketone. The 2 products showed about the same m. p., 96°, but differed in optical activity, the 1st being $[\alpha]_D^{18.6}$ 16.6°, the 2nd $[\alpha]_D^{21}$ 12.7°. 10 g. of the alc. dissolve in 1.5 g. petr. ether. *Phenylurethan*, m. 126°. The alc. loses H₂O when heated 2 hrs. with 20%

H_2SO_4 . The camphene shows about half the rotation of the original material. Acetate, prepd. by warming the mixt. 26 hrs. at 100° , b_{11} $100-2^\circ$, d_4^{18} 1.003, $[\alpha]_D^{18}$ 18.9° . The sapon. requires 20-24 hrs., and gives pure methylcamphenilol. This is only slightly decompd. by boiling AcOH, while camphene hydrate is nearly completely changed into camphene. The following method serves to distinguish the 4 alcs.: The sample is dissolved in 0.5 cc. AcOH, 0.05 cc. 50% H_2SO_4 added, the mixt. boiled 10 sec., and then cooled to 10° . Borneol crystals out at once. Isoborneol: the liquid becomes turbid when cooled to 0° but clears up when warmed to 18° . Methylcamphenilol: the test does not become turbid upon cooling. Camphene hydrate: the sample becomes turbid while heating and forms a noticeable layer upon cooling. VII. The camphenonic acids and their optically active components. *Ibid* 240-56.—*dl*-Camphenonic acid is best prepd. by boiling 50 g. *dl*-camphenonic acid with 72 g. Ac_2O 6 hrs. and then distg. in a stream of CO_2 at ordinary pressure. The acid dists. undecompd. at $310-312^\circ$. Yield, 37.5 g. 100 g. H_2O dissolves 0.921 g. acid. The acid is resistant to boiling alk. KMnO_4 and to a boiling mixt. of concd. and fuming HNO_3 . This indicates that the CO group is between 2 tertiary C atoms. *Oxime*, crystals from C_6H_6 with C_6H_6 of crystn., m. 173° . Heated with 2.1 equivs. of Na in alc. 5 hrs. at $180-200^\circ$ in a tube, it gives a camphenonic acid, m. $134-5^\circ$. Since camphenonic acid is (I), camphenonic acid must be (II). *Ethyl ester*, liquid. It does not



react with BzH . *Amide*, 4-sided plates or leaflets, m. $184-5^\circ$. Reduced with Na and EtOH, the acid gives *dl*-camphenolic acid, $\text{C}_9\text{H}_{14}(\text{OH})\text{CO}_2\text{H}$, isolated as the Na salt, monoclinic crystals, m. $99-100^\circ$. *d*-Camphenonic acid is obtained as a by-product in the prepn. of the *dl*-acid and is purified by crystn. from C_6H_6 and then from H_2O . It is also prepd. from *d*-camphenonic acid. Long needles, with 1 mol. H_2O , m. 70° ; 100 g. H_2O dissolved 1.117 g. at 19° ; $[\alpha]_D^{20}$ 79.1° . *Amide*, plates, m. $152.5-4^\circ$, $[\alpha]_D^{20}$ 56.6° . Heated with KOH this gives *d*-camphenonic acid. *l*-Camphenonic acid, needles, with 1 mol. H_2O , m. 70° , anhydrous, m. $105-6^\circ$; 100 g. H_2O dissolves 1.112 g. at 19° ; $[\alpha]_D^{20}$ -79.2° . *Amide*, m. $152.5-4^\circ$, $[\alpha]_D^{20}$ -58.3° . The *dl*-acid and amide were synthesized from the components.

C. J. WEST.

Reactions in energy-rich solvents. I. The direct replacement of the sulfo group by chlorine. HANS MEYER. Univ. Prag. *Monatsh.* 36, 719-22(1915).— SOCl_2 , acting upon aromatic SO_3H acids, their salts, chlorides, or anhydrides for several hrs. at $160-200^\circ$, forms the chlorinated hydrocarbon. Thus, *p*- $\text{ClC}_6\text{H}_4\text{SO}_3\text{H}$ heated 7 hrs. with SOCl_2 at 180° gave *p*- $\text{C}_6\text{H}_4\text{Cl}_2$. PhSO_3Na gave PhCl . The anthraquinone- α - and β -sulfonic acids gave the corresponding chloroanthraquinones, but these proved difficult of purification. II. A direct replacement of the nitro group by chlorine and a new method of chlorination. *Ibid* 723-30.— SOCl_2 is capable of replacing the NO_2 group by Cl. Thus $\text{HO}_3\text{SC}_6\text{H}_3(\text{NO}_2)\text{Cl}$, heated with SOCl_2 10 hrs. at $160-80^\circ$, gave 1,2,4- $\text{C}_6\text{H}_3\text{Cl}_3$. *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{Cl}$ gave *C}_6\text{H}_4\text{Cl}_2. The formation of PhCl from PhNO_2 was quant. when the reaction was carried out for 10 hrs. at $190-200^\circ$. With *m*- $\text{O}_2\text{N}-\text{C}_6\text{H}_4\text{SO}_3\text{H}$, besides *m*- $\text{C}_6\text{H}_4\text{Cl}_2$, two substances were obtained, depending upon the time; a substance, needles, m. 82° or 96° , contains Cl and N (9 hrs. at $180-200^\circ$) or a substance, m. $165-75^\circ$, N-free but rich in Cl (13 hrs.). 1,5-Dinitroanthraquinone gave the *di*-Cl deriv. *o*- $\text{O}_2\text{NC}_6\text{H}_4\text{OMe}$ gave *o*- $\text{ClC}_6\text{H}_4\text{OMe}$, some $\text{Cl}_2\text{C}_6\text{H}_3\text{OH}$ and some*

α -ClC₆H₄OH. These facts indicate that SOCl₂ may be used as a chlorinating agent. Thus C₁₀H₈ gave 1,4-Cl₂C₁₀H₆, identified by oxidation to the corresponding ketone. (PhN:), gave a mixt. of the 2,2'- and the 4,4'-Cl₂ derivs. By the use of suitable conditions (higher temp. or use of a solvent) the side chain may be chlorinated. The reaction may be used to obtain the ClC₆H₄CO₂H which are otherwise hard to prep. The *m*-series do not react as smoothly as do the others. C. J. WEST.

Symmetrical triaminopyridine. HANS MEYER AND ERICH RITTER V. BECK. Univ. Prag. *Monatsh.* 36, 731-49(1915); cf. C. A. 8, 1575.— α, α' -Dichloroisonicotinic acid (A) is best prepd. by the action of POCl₃ upon citrazinic acid in a bomb tube at 200° for 4 hrs. *Methyl ester*, small needles, m. 82°. If a slight excess of N₂H₄·H₂O reacts upon the ester for a few min., α -hydrazo- α' -chloropyridine- γ -carboxylic acid hydrazide results, small needles, m. 226°. If the ester is dissolved in EtOH and treated with N₂H₄·H₂O, α, α' -dichloroisonicotinic acid hydrazide is formed, white needles, m. 184°. A soln. of 5 g. of the hydrazide in 400 cc. H₂O and 30 cc. of 2 N HCl, treated with 3.5 g. NaNO₂, gave the *azide*, m. 89°. The *urethan* results by heating the azide with 20 parts abs. alc. for 2 hrs., needles, m. 132°. α, α' -Dichloro- γ -aminopyridine (B), prepd. by saponifying the urethan with dil. alc. KOH by boiling 3 hrs., needles, m. 176°, sublimes undecompd.; it shows a slight carbylamine reaction, and does not reduce Fehling soln. nor Ag₂O·NH₄OH. When (A) is heated with an excess of NH₄OH for 8 hrs. at 200° in an autoclave, α -amino- α' -chloropyridine- γ -carboxylic acid results, small yellow needles, m. with decompn. If the heating is carried out at 210° after the addition of a little Cu bronze, α, α' -diaminopyridine- γ -carboxylic acid is formed, yellow powder, which does not m. The acid is obtained as colorless needles when the amide is sapond. with KOH. *Methyl ester*, needles, m. 173°. *Hydrochloride*, greenish yellow needles, m. 208° (decompn.). *Amide*, leaflets and stars, m. 256°. *Hydrazide*, needles, m. 260° (decompn.). *Methyl ester dibenzoate*, small needles, m. 312°. With N₂H₄·H₂O this gives the above hydrazide (sapon. of the Bz groups). *Di-*p*-toluenesulfamino- γ -aminopyridine*, prepd. by heating 1 g. (B) with 1.3 g. MeC₆H₄SO₂NH₂ and 0.7 g. Na₂CO₃, together with a little Cu bronze, for 4 hrs. at 180-90°, small needles from dil. alc., does not m. 360°. Upon sapon. with concd. H₂SO₄ for 2 hrs. at 100°, it gives α, γ, α' -triaminopyridine, white needles, m. 185°, sublimes undecompd., is hygroscopic, shows a slight carbylamine reaction, does not reduce Fehling soln., reduces NH₄OH-Ag₂O when heated, and gives an aq. soln. which reacts strongly alkaline. PtCl₄ gives a reddish yellow chloroplatinate, which quickly decomps. in the air.

C. J. WEST.

Substituted benzoylbenzoic acids. ALICE HOFMANN. Univ. Prag. *Monatsh.* 36, 805-24(1915).—*p*-Dichlorobenzoyldichlorobenzoic acid, prepd. by treating a mixt. of 25 g. 3,6-Cl₂C₆H₃(CO)₂O and 250 g. C₆H₄Cl₂, heated to 200°, with 50 g. AlCl₃ and heating 2 hrs., removing the C₆H₄Cl₂ with steam, and extg. with Na₂CO₃, needles from dil. AcOH, m. 205-7°, easily sol. in hot AcOH, alc. and acetone. The *sodium salt* is insol. in an excess of concd. Na₂CO₃. Heated 0.5 hr. with concd. H₂SO₄ at 140° and a few min. at 180°, the acid gives tetrachloroanthraquinone, m. 342° (Schilling, C. A. 7, 2555); a part of the acid was decompd. into C₆H₄Cl₂ and Cl₂C₆H₃CO₂H. *Methyl ester*, prepd. through the chloride, fine needles, m. 145-8°. This pseudo-ester is changed into the *normal methyl ester* by boiling 1 g. with 15 cc. MeOH and 1 cc. concd. H₂SO₄ for 6 hrs., m. 172°. This is also obtained directly from the acid, MeOH and H₂SO₄. Both esters give a colorless soln. with concd. H₂SO₄. *Pentachlorobenzoylbenzoic acid*, prepd. by the action of 25 g. tetrachlorophthalic anhydride, 400 g. PhCl and 50 g. AlCl₃ by boiling 3 hrs., white flakes, m. 165°. The *pseudo ester* did not cryst. The *normal methyl ester* formed an amorphous mass. Heated with concd. H₂SO₄ the acid gave *pentachloroanthraquinone*, m. 192°. *Hexachlorobenzoylbenzoic acid*, from 25 g.

anhydride, 400 g. $C_6H_4Cl_2$ and 50 g. $AlCl_3$, small, hard crystals, m. $238-9^\circ$. The *pseudo methyl ester*, yellowish powder, m. $180-2^\circ$. Normal ester, amorphous. With concd. H_2SO_4 the acid gives *hexachloroanthraquinone*, short yellowish needles which easily sublime as pale citron-yellow needles, m. 298° . *Nitrobenzoyltetrachlorobenzoic acid*, from 20 g. anhydride, 300 cc. $PhNO_2$ and 40 g. $AlCl_3$, m. $242-5^\circ$. It could not be changed into the corresponding anthraquinone. The *pseudo methyl ester* is amorphous. The anhydride does not condense with $O_2NC_6H_3Cl_2$ or $o-CIC_2H_4NO_2$. *Tetrabromobenzoylbenzoic acid*, from 25 g. tetrabromophthalic anhydride, 400 g. $PhBr$ and 50 g. $AlCl_3$, m. $230-2^\circ$; yield, 40 g. Normal methyl ester, glistening plates, m. $108-11^\circ$. *Tetrabromoanthraquinone*, by heating the above acid a very short time with fuming H_2SO_4 (13% SO_3), fine, orange-red, cm.-long needles, m. $200-2^\circ$ (sealed capillary). The Br deriv. is not as resistant to H_2SO_4 as is the Cl deriv. *Pentabromobenzoylbenzoic acid*, m. $228-30^\circ$. Normal methyl ester, m. unsharply above 100° . Pseudo-ester, amorphous, m. $178-83^\circ$. *Pentabromoanthraquinone*, m. $230-40^\circ$ (very poor yield). *Hexabromobenzoylbenzoic acid*, m. $218-9^\circ$. *Hexabromoanthraquinone*, m. $280-5^\circ$. *Tetrabromobenzoyldichlorobenzoic acid*, m. $240-5^\circ$. *Tetraiodobenzoylbenzoic acid*, small yellow crystals, m. $230-1^\circ$.
C. J. WEST.

Chlorination experiments with antimony pentachloride. KARL STEINER. Univ. Prag. *Monatsh.* 36, 825-9 (1915); cf. C. A. 9, 1761.— $SbCl_5$ reacting with Ph_2CO gives *perchlorobenzophenone*, $CO(C_6Cl_5)_2$, needles, m. 318° , and $Cl_3C_6CO_2H$, m. 201° . Benzil gave principally Cl_3C_6H . 1,2-Naphthoquinone and $SbCl_5$ give a small amt. of tetrachlorophthalic acid and probably perchloronaphthoquinone (*Gmelin* 7, 66). $BzOH$ gave a mixt. of products, including some perchlorobenzene. $C_6H_4(CO_2H)_2$ gave a mixt. of Cl derivs. of $BzOH$ and Cl_3C_6 , besides a small amt. of tetrachlorophthalic acid. $BzC_6H_4CO_2H$ gave the same products as $C_6H_4(CO)_2C_6H_4$: perchlorobenzoylbenzoic acid, 1,2,3,5,6,7,8-heptachloroanthraquinone and slight amts. of tetrachlorophthalic acid and Cl_3C_6 . $C_6H_4(CO)_2C_6H_4$ and $SbCl_5$, dild. with an equal vol. of CCl_4 , gave principally 1,4,5,8-tetrachloroanthraquinone.
C. J. WEST.

Cerebronic acid. PERCY BRIGL. Univ. Tübingen. *Z. physiol. Chem.* 95, 161-94 (1915).—This is an attempt to establish the normal constitution of cerebronic acid. *n*-Pentacosane is prepd. in order to compare with the hydrocarbon from cerebronic acid, but the latter could not be prepd. (cf. Levene and West, C. A. 7, 2379). *Ethyl cetylmalonate* (A), b_{14} $238-40^\circ$, m. 22° . *Cetyloctylmalonic acid*, from 19.2 g. (A), 12 g. C_2H_5I and 1.15 g. Na in 70 cc. alc., needles, m. 68° . *Cetyloctylacetic acid*, white powder, m. 52° . Attempts were made to split off CO_2 from this product but no definite product could be obtained. The acid was then changed into the *cetyloctylbromoacetamide*, m. $49-51^\circ$, clears 54° . 6 g. of this product, heated with 1.5 g. Na in 30 cc. abs. alc., for 10 min., gave *cetyl octyl ketone* (*9-pentacosanone*), powder, m. 66° . *Semicarbazone*, m. $39-41^\circ$. When the ketone was changed into the chloride and reduced with HI and red P, *pentacosane* was obtained as white leaflets, m. $55.5-56^\circ$. *Docosyl iodide*, m. $48.5-50^\circ$. *Docosylmalonic acid*, m. 126° . *Tetracosanic acid*, m. 85° . *Behenyl chloride*, m. 40° (Meyer gives $73-75^\circ$; C. A. 7, 3597). *α -Ketotricosylic ethylamide*, $Me(CH_2)_{20}COCONHEt$, prepd. by warming 4 g. $C_{22}H_{44}COCl$ and 1 g. $EtNC$ at 70° and then 100° for 0.5 hr., and decomp. with dil. acetone, m. $91-2^\circ$. Yield, 30%. *Phenylhydrazones*, m. $96-8^\circ$. *α -Hydroxytricosylic ethylamide*, by reduction of the keto acid with $Al-Hg$ in Et_2O , m. $113-5^\circ$. *α -Ketopentacosylic ethylamide*, m. $94-95.5^\circ$. *α -Hydroxypentacosylic ethylamide*, m. $115-7^\circ$. Sapond. with acid, *α -hydroxypentacosylic acid* is obtained, m. $102-4^\circ$. Attempts to racemize the natural cerebronic acid gave a product m. $97-100^\circ$ instead of 84° as given by Levene. B. therefore decides to call the low melting acid *neuro acid*, while the higher melting cerebronic acid, m. $100-1^\circ$, is *n*-hydroxypentacosylic acid.
C. J. WEST.

Nuclein metabolism. III. High molecular, crystalline decomposition products of yeast nucleic acid. S. J. THANNHAUSER AND G. DORFMÜLLER. München. *Z. physiol. Chem.* 95, 259-62(1915); cf. *C. A.* 8, 3580.—The triphosphonucleic acid, $C_{22}H_{41}O_{22}N_{15}P_3$, earlier obtained by the digestion of yeast nucleic acid with human duodenal juice, has now been obtained by hydrolysis with NH_3 under very little pressure. 50 g. acid in 40 cc. 25% NH_3 and 210 cc. H_2O were heated 1.75 hrs. at 120-25° in an autoclave. The soln. was poured into 800 cc. alc., the grayish white ppt. filtered off, taken up in cold H_2O and the acid pptd. from the hot soln. by hot $Pb(OAc)_2$. The ppt. is decompd. by H_2S , the filtrate concd. at 30° to 40 cc., and alc. added as long as a ppt. forms. The ppt. was again taken up in H_2O , the soln. concd. to 30 cc. and poured into 400 cc. of 96% alc. Yield, 2-3 g. 2 g. in 25 cc. H_2O were treated with 4 g. brucine in 8 cc. b. alc., giving 2 g. *brucine salt*, which was purified through the Ag salt, m. 205°. From the mother liquors, as above, a second *brucine salt* was obtained, m. 182-3°, containing C 58.3, H 5.89, N 7.6, P 2.98%. C. J. WEST.

β -Methylanthracene and β -anthraquinonecarboxylic acid. I. OTTO FISCHER AND KURT REINKOBER. Univ. Erlangen. *J. prakt. Chem.* 92, 49-54(1915).—When β -methylanthracene (a) is subjected to the action of Cl in various solvents, mixts. of halogen derivs. are invariably obtained in every case; in 100 parts dry CS_2 satd. cold with Cl, a mixt. of *penta-* and *hexachloromethylanthracene* seps., light yellow prisms from 70% alc., m. 191°; satd. in $CHCl_3$ with Cl, the product, which is chiefly the *hexachloro derivative*, seps. in needles from AcOH, shows a blue fluorescence in soln. and m. (not sharply) 193°; treated with Cl in 20-30 parts CS_2 until no more HCl is evolved, the product, needles from AcOH, m. 220°, analyzes for a mixt. of *hepta-* and *deca-chloro derivatives*; suspended in C_6H_6 and treated with Cl until the soln. is clear, it gives a cryst. product with a Cl content lying between that of the *mono-* and *dichloro derivatives*. Better results are obtained with Br. *meso-Dibromo- β -methylanthracene* (b), [cf. Fischer, *Ber.* 7, 1196(1874); Liebermann, *Ann.* 212, 35(1882)] dissolves in Br with the evolution of HBr and the formation of *pentabromo- β -methylanthracene*, light yellow prisms, m. 300° (decompn.). (b) is slowly converted by CrO_3 in AcOH into β -anthraquinonecarboxylic acid (c), but toward reducing agents is very stable; it is thus recovered unaltered after passing HI into the boiling AcOH soln. for 2 hrs. (a) is likewise stable under the same treatment, but is reduced by Na in boiling AmOH to *meso-dihydro- β -methylanthracene*, needles from 70% alc. It m. 51°, is volatile with steam and becomes brown in the light and air. (a) is very resistant to the action of HNO_3 . Thus to produce a satisfactory yield of β -methylanthraquinone from (a), 1 part (a) must be boiled with 2 parts HNO_3 , d. 1.48, for 6 hrs.; practically no CO_2H acid or NO_2 compd. are formed under these conditions. To convert (a) into (c), it is necessary to heat with 3 parts HNO_3 , d. 1.5, and 2 parts H_2O at 170° for 8-10 hrs. under pressure [cf. Liebermann, *Ber.* 17, 888(1884)]. *Ammonium salt* of (c), needles from dil. NH_4OH , which revert to the free acid and NH_3 at 100-110°; *sodium salt*, $C_{14}H_7O_4Na \cdot H_2O$, prisms from H_2O ; *barium salt*, $C_{14}H_7O_4Ba \cdot 3H_2O$, cryst. ppt.; *pyridine salt*, $C_{17}H_{11}O_4N$, loses C_4H_4N at 100°; *quinoline salt*, $C_{24}H_{18}O_4N$, needles.

NORMAN A. SHEPARD.

The behavior of *p*-dimethylamino-*o*-benzoylbenzoic acid and related substances toward nitrous acid. OTTO FISCHER AND HANS LOEWZ. *J. prakt. Chem.* 92, 54-60 (1915).—When *p*-dimethylamino-*o*-benzoylbenzoic acid, $HO_2CC_6H_4COC_6H_4NMe_2$ (a), *p*-dimethylamino-*o*-benzylbenzoic acid, $HO_2CC_6H_4CH_2C_6H_4NMe_2$ (b), and *p*-dimethylanilino-phthalide, $O.CO.C_6H_4.CHC_6H_4NMe_2$ (c), are treated with HNO_2 , the products

are not NO (cf. Limpricht, *Ann.* 300, 228(1898)), but NO_2 compds. 30 g. (a) in 150 g. dil. HCl treated ice cold with 7.7 g. $NaNO_2$ in 50 g. H_2O , filtered from the (a)-HCl

which seps., allowed to stand 6 hrs. in ice water and neutralized with Na_2CO_3 , gives *mononitrodimethylaminobenzoylbenzoic acid*, pointed yellow prisms from Et_2O , m. 164° , which does not give the Liebermann NO reaction and is identical with the NO_2 compd. obtained by L. from (a) with H_2SO_4 and HNO_3 (cf. *Ann.* 307, 308). (b), previously prepd. by L. from (a) in NH_4OH with Zn dust and by Haller and Guyot (cf. *Compt. rend.* 126, 125) by reduction of (a) with Zn in dil. NaOH , is obtained more smoothly by reduction with Zn in acid soln., using 10 g. (a) in 200–300 g. glacial AcOH , 1 cc. fuming H_2SO_4 (30% SO_3) and an excess of Zn dust; yield, about 9 g. 2 g. (b) in 15 g. 40% HCl and 180 g. H_2O treated ice-cold with 1.5 g. NaNO_2 in 20 g. H_2O , gives 0.5 g. of a hydrochloride which dissociates in H_2O , giving a product sepg. in small orange-yellow prisms from C_6H_6 , m. about 180° . This product was not isolated by L. under the same conditions. The mother liquor from this hydrochloride, on neutralization with Na_2CO_3 , seps. 1.5 g. *nitrodimethylaminobenzoylbenzoic acid*, long, pointed prisms from dild. MeOH , m. $133-4^\circ$, which was erroneously described by L. as the NO compd. (c) (cf. Haller and Guyot, *Bull. soc. chim.* [3] 19, 830) is obtained in 70% yield on reduction of (a) in dil. NaOH with Na-Hg, neutralizing from time to time with AcOH ; reduced according to L.'s directions, a mixt. of *nitrodimethylanilinophthalide* (not the NO deriv.), orange-red leaves, m. 157° , sol. in HCl and pptd. by Na_2CO_3 or NH_3 , and *nitrosomonomethylanilinophthalide*, light yellow needles from MeOH , m. 175° , is obtained.

NORMAN A. SHEPARD.

The action of *p*-nitroso bases on hydrazines. OTTO FISCHER AND W. JOHANNES. *J. prakt. Chem.* 92, 60–73 (1915).—When 3 mols. $\text{EtNHC}_6\text{H}_4\text{NO} \cdot \text{HCl}$ (a) is treated in H_2O at 0° with 2 mols. $\text{PhNHNH}_2 \cdot \text{AcOH}$ (b) and allowed to stand 2 hrs., *p*-ethylaminodiazooxyaminobenzene (c) seps. in yellow leaves; pptd. from warm alc. by H_2O at $30-40^\circ$, or from C_6H_6 by petr. ether, it explodes $122-3^\circ$; boiled with dil. acids or alkalis, it decomps. into N, PhOH , $\text{EtNHC}_6\text{H}_4\text{NO}$ and a resin; dissolved in cold CHCl_3 , (a) seps. [cf. Fischer and Wacker, *Ber.* 21, 2609 (1888); 22, 622 (1889)]; the picrate of (c) seps. in small, yellow prisms. (c), and the similar substances described below, may be repre-


 sented by two structures, $\text{R}_2\text{NC}_6\text{H}_4\text{N}(\text{:O})\text{:NNRPh}$ and $\text{R}_2\text{NC}_6\text{H}_4\text{N} \cdot \text{N} \cdot \text{NRPh}$, of which the latter is preferred, for some of these substances are volatile without decompn., which would hardly be expected were a pentavalent N present. *p*-Ethylaminodiazooxymethylaminobenzene (d) is formed when (a) is treated with $\text{PhNMeNH}_2 \cdot \text{AcOH}$ (e); bright yellow needles from alc., m. 97° , which explode when heated rapidly. Substituted products of this type are more stable than (c); (d) does not react with CHCl_3 , though dil. H_2SO_4 decomps. it with the evolution of N. In exactly the same manner the following were obtained: *p*-methylaminodiazooxymethylaminobenzene, from *p*- $\text{MeNH} \cdot \text{C}_6\text{H}_4\text{NO} \cdot \text{HCl}$ (f) and (e), yellow prisms from luke-warm dil. alc., m. $98-100^\circ$; *p*-dimethylaminodiazooxyphenylaminobenzene, from $\text{Me}_2\text{NC}_6\text{H}_4\text{NO} \cdot \text{HCl}$ (g) and $\text{Ph}_2\text{N} \cdot \text{NH}_2$ (h) in dil. AcOH , yellow needles from alc., m. 150° (decompn.); *p*-methylaminodiazooxyphenylaminobenzene from (f) and (h), yellow needles, m. 167° ; *p*-dimethylaminodiazooxyamino-*p*-bromobenzene, from (g) and *p*- $\text{BrC}_6\text{H}_4\text{NHNH}_2$ in dil. AcOH , yellow prisms, m. 128° (decompn.), which decomp. on boiling with dil. H_2SO_4 into N, PhBr , $\text{Me}_2\text{NC}_6\text{H}_4\text{NH}_2$ and a resin; *p*-dimethylaminodiazooxy- α -aminonaphthalene, from (g) and $\alpha\text{-C}_{10}\text{H}_7\text{NHNH}_2$, greenish yellow, unstable, decomp. on the filter in spite of cooling; *p*-dimethylaminodiazooxy- β -aminonaphthalene, yellow needles exploding on heating. *p*-Dimethylaminodiazooxymethylaminobenzene (i), previously prepd. by F. and J., forms neither a stable hydrochloride nor hydrobromide, but gives a stable picrate, small yellow prisms, and a quaternary salt with MeI , clusters of yellow needles from abs. alc., m. 147° ; when (i) in glacial AcOH is reduced at 0° with Zn dust, it decomp. chiefly into *p*- $\text{Me}_2\text{NC}_6\text{H}_4\text{NH}_2$ and PhNMeNH_2 , with a little NH_3 and MeNHPH .

Diazooxymethylaminobenzene (cf. *Ber.* 22, 622) forms a *picrate*, yellow needles, de-

comp. 114°. *p*-Dimethylaminodiazooxyurea, $p\text{-Me}_2\text{NC}_6\text{H}_4\text{N}-\text{N}(\text{O})\text{NHCONH}_2$, is obtained from $\text{Me}_2\text{NC}_6\text{H}_4\text{NO}$ and $\text{NH}_2\text{CONHNH}_2$ (j) in AcOH; groups of yellow-green needles from glacial AcOH or $\text{C}_6\text{H}_5\text{N}$, which explode 181°. From $p\text{-NH}_2\text{C}_6\text{H}_4\text{NO}$ and (j), under the same conditions, *p*-aminodiazooxyurea, yellow needles, m. 220° (decompn.), is formed.

NORMAN A. SHEPARD.

A misleading report on formose. OSCAR LOEW. *J. prakt. Chem.* 92, 133-5 (1915).—The 11th edition of Richter's "Chemie der Kohlenstoffverbindungen" ascribes the synthesis of the first sugar-like substance to Butlerow, who prepd. "methylenitan" in 1861; it further states that "in an analogous manner," Loew obtained formose from $(\text{CH}_2\text{O})_6$ and $\text{Ca}(\text{OH})_2$. L. objects to this statement, pointing out that B.'s methylenitan was a mixt. of transformation products of formose and actually contained only 20% or less of real sugars, since it was prepared from $(\text{CH}_2\text{O})_6$ and boiling $\text{Ca}(\text{OH})_2$. Furthermore, L.'s conditions were not "analogous" to B.'s, for L. worked with 3-4% aq. CH_2O at room temp. and whereas B.'s product was a brown smeary syrup with a burned odor and bitter taste, and analyzed very poorly, L.'s product was colorless, sweet, and analyzed exactly for $\text{C}_n\text{H}_{2n}\text{O}_n$ (cf. *J. prakt. Chem.* 33, 342(1886)). L. also objects to the statement that he used MgO in the prepn. of the fermentable methose, for he actually employed $\text{MgSO}_4 + \text{PbO}$, and MgO, even at 100°, is not a condensing agent. L. claims the distinction of having been the first investigator to show that really sugar-like substances can be obtained from CH_2O , and introduces very interesting excerpts from letters of congratulation received from Nencki, E. von Meyer, R. Maly and E. Schulze at the time of the prepn. of formose to prove his point.

NORMAN A. SHEPARD.

Alleged existence of an optically active benzaldehyde. G. BRÉDIG AND M. MINARFF. Karlsruhe. *Chem. Ztg.* 39, 73.—The so-called optically active PhCHO , which Erlenmeyer (cf. *Chem. Ztg.* 1911, 1095) thought to have obtained by boiling BzH (a) in alc. with $[\text{CH}(\text{OH})\text{CO}_2\text{H}]_2$ (b) is a mixt. of ordinary (a) with a small amt. of a compd. of (a) + (b), to which compd. the optical activity is due. This impurity can be sapond. by boiling with dil. H_2SO_4 , which leaves the oil entirely inactive; or the ordinary BzH , which constitutes approx. 90% of the oil, can be sepd. as the bisulfite addition product, leaving an active residue of (a) + (b) ($\alpha_D -40$). N. A. S.

The velocity of nitration of benzene and of some of its derivatives. J. P. WIBAUT. Amsterdam. *Rec. trav. chim.* 34, 241-58(1915).—In studies on substitution in the C_6H_6 ring Holleman attributed great importance to the velocity of substitution and to the influence that substituents already present exercise on this velocity and the ideas put forward by him have been of great value. But the actual knowledge of this velocity is small in amt. Martinsen (*Z. physik. Chem.* 50, 385(1905); also *C. A.* 1, 2763) detd. the velocity of nitration in concd. H_2SO_4 and found that in this medium it is often very great. W. wished to det. the relative velocity of nitration of PhMe and PhCl . Since it seemed improbable that a solvent could be found in which this nitration would take place slowly an indirect method was used. If one adds to an equimol. mixt. of PhMe and of PhCl a small amt. Δx of HNO_3 , Δx_1 nitrotoluenes and Δx_2 nitrochlorotoluenes are formed. Although all of the HNO_3 is not consumed, Δx_1 and Δx_2 ought to be in direct ratio to the velocity of nitration of PhMe and PhCl , and thus $\Delta x_1/\Delta x_2 = k_1/k_2$, where k_1 and k_2 are the corresponding consts. When additional amts. of HNO_3 are added the calcn. becomes difficult since the mol. concns. of PhMe and PhCl are no longer equal. So that by varying the amt. of HNO_3 used with an equimol. mixt. values for the amt. of nitrotoluenes and nitrochlorobenzenes which have no sim-

ple relationship to each other are obtained. But as the amt. of HNO_3 is decreased the values obtained will correspond more and more closely to k_1/k_2 . The amt. of HNO_3 was varied and added drop by drop to an equimol. mixt., the temp. was kept at 0° and the mixt. was strongly agitated. The mixt. was then treated with $\text{Fe} + \text{H}_2\text{SO}_4$ in aq. suspension in order to reduce the NO_2 to NH_3 , then treated with excess of H_2SO_4 and the unchanged PhMe and PhCl distd. off, the liquid was made alk. and distd. with steam, the distillate was satd. with NaCl and extd. with Et_2O in order to obtain the mixt. of toluidines and chloroanilines. By detg. the Cl in the mixt. the mol. ratio of the 2 types of compds. could be detd. but ratios found were discordant, owing perhaps to the fact that 2 liquid layers are formed during the nitration. Other nitrations were therefore done in Ac_2O and C_6H_6 was used instead of PhMe . An equimol. mixt. of $\text{C}_6\text{H}_6 + \text{PhCl}$ was dild. with Ac_2O and insufficient HNO_3 dild. with Ac_2O was added and the mixt. allowed to stand at room temp. for some days. The results seem to indicate that C_6H_6 is nitrated 17 times as fast as PhCl , but this was later found to be wrong. The mixts. of C_6H_6 and PhX were nitrated at 25° , but the PhMe at 0° . A weighed amt. of the compd. to be nitrated was placed in a small flask with 50–75 cc. Ac_2O . The weighed amt. of HNO_3 was added to 50 cc. Ac_2O with cooling. After standing in the thermostat some time the latter mixt. was poured into the former, and after some mins. in the thermostat the first sample was removed and this was taken as the beginning of the expt. From time to time 10 cc. were removed and added to 50 cc. NaOH soln. (d. 1.24) and converted into $\text{NaNO}_3 + \text{NaOAc}$, the liquid was extd. with C_6H_6 in order to remove PhNO_2 (which could be reduced to PhNH_2 and give NH_3 by hydrolysis), the liquid was placed in a 600 cc. Erlenmeyer, 30 cc. more NaOH added, then 3 g. Devarda's alloy and boiled under a condenser arranged to catch the evolved NH_3 in 0.2 N H_2SO_4 . The error may amt. to 1–2% of the HNO_3 used. The concn. of the reacting substances was $\approx 0.5 N$ for the C_6H_6 or deriv. and $\approx 0.75 N$ for the HNO_3 . The exptl. data are given in tables where t is the time, c the concn. of the HNO_3 , and k the velocity const. calcd. from the bimol. formula. In one expt. with C_6H_6 the values of t , c and k , resp., are 0, 0.7174 N , —; 44 mins., 0.6837, 0.0025; 102, 0.6505, 0.0023; 221, 0.5879, 0.0023; 347, 0.5331, 0.0024; 433, 0.4972, 0.0026; 558, 0.4336, 0.0032; av. for k , 0.00255. The mean results obtained for k were as follows: C_6H_6 at 25° , 0.0025; PhCl at 25° , 0.0020; PhBr at 25° , 0.0013; PhMe at 0° , 0.0080.

Theoretical considerations. Although the expts. described above are very incomplete from the point of view of a dynamic study of nitration, nevertheless some very interesting conclusions can be drawn about substitution in the C_6H_5 ring. The relative decreasing order of velocity of substitution is $\text{PhMe} > \text{C}_6\text{H}_6 > \text{PhCl} > \text{PhBr}$ for the introduction of a 2nd substituent. In considering the introduction of a 3rd substituent in a disubstituted benzene Holleman (*Die Einführung*, etc., p. 460) has indicated 2 factors that det. this relative velocity: (1) in the introduction of C in $\text{C}_6\text{H}_4\text{AB}$ the 1st factor is the ratio of the velocity with which the introduction of C in PhA and PhB takes place and the 2nd is the proportion in which $\text{C}_6\text{H}_4\text{AC}$ and $\text{C}_6\text{H}_4\text{BC}$ are formed in each case. From exptl. facts he deduced that the order of decreasing velocity for groups directing to p -o-positions is $\text{OH} > \text{NH}_2 > \text{I} > \text{Cl} > \text{Br} > \text{CH}_3$ and for groups directing to the m -position is $\text{CO}_2\text{H} > \text{SO}_3\text{H} > \text{NO}_2$. W. has shown (*C. A.* 8, 1268) that the velocity of nitration caused by Cl is to the velocity of nitration caused by Me as 1:1.475. Holleman (*C. A.* 9, 2384) calcd. the velocity of nitration of dihalogenbenzenes $\text{Cl}:\text{Br} = 1:0.88$ and $\text{Cl}:\text{I} = 1:1.84$. But these relations were deduced for the cases in which both groups are present in the same ring. The influence of groups on the total velocity of introduction of a 2nd substituent does not follow these ratios. For if it did the velocity of nitration of PhCl would be 1.5 times greater than that of PhMe which was not found above. From the expts. of Martinsen (*C. A.* 1, 2763) and Klemenc (*C. A.* 8, 1105) it is further argued that the influence of groups on the

total velocity of substitution is not bound by a direct proportion to the influence that 2 groups simultaneously present exercise on the relative velocity with which the H atoms of the ring react. The rule of Holleman, which consists in the possibility of systematizing in a rational and general manner the phenomena of the introduction of a 3rd substituent and of prophesying unknown cases, does not lose its value as a result of this work. In comparing the results of Martinsen with those of W. the great influence of the medium on the velocity of nitration is evident. In H_2SO_4 the velocity of nitration is much greater than in Ac_2O . M. found for k_{25}^0 in PhNO_2 1.5, $o\text{-ClC}_6\text{H}_4\text{NO}_2$ 7.15, p - 0.18, m - 0.39; for nitrotoluenes $k_{25}^0 = \infty$, 4,6-dinitro- m -xylene, $k = 0.004$, 2,4-dinitromesitylene, $k = 6.65$. He deduced from a comparison of the chloronitrobenzenes with PhNO_2 that the role of Cl is sometimes accelerating, sometimes retarding, depending on the position of the Cl in the ring. In comparing $(\text{NO}_2)_2\text{C}_6\text{H}_2\text{Me}$ derivs. with the nitrotoluenes the accelerating effect of Me is strikingly evident. Thus it seems that the influence of substituents on the total velocity of nitration is nearly the same whether there is only 1 substituent in the C_6H_5 ring or whether several are simultaneously present. W. expects to continue these expts. E. J. WITZEMANN.

The types of substitution. Remarks on the subject of the preceding communication of J. P. Wibaut. A. F. HOLLEMAN. Univ. Amsterdam. *Rec. trav. chim.* 34, 259-60(1915).—Wibaut showed (cf. preceding abstr.) that the velocity of substitution in PhMe is greater than in PhCl and in the latter less than in C_6H_6 , which confirms the results of v. d. Linden (*Verslag. Akad. Wetenschappen* 745(1911)) and of Olivier (*C. A.* 9, 442) and which necessitates a slight change in the hypothesis of H. and Böeseken (*Die directe Einführung*, etc., p. 475(1909)). H. and B. suggested that substituents causing the substitution to p,o -positions have such an action on the conjugated system of double bonds 1, 2, 3, 4 that the replacement of H atoms 2 and 4 is accelerated, while the double bond 5,6, not being in direct relation with X, does not have any influence. The results obtained by W. show that the introduction of a substituent may modify considerably the total velocity with which the remaining 5 H atoms are able to be substituted, but nothing opposes the idea that there remains notwithstanding a great difference between the velocity with which H atoms 2 and 4 are substituted compared with 3. With this modification the hypothesis may be retained unchanged. Although the simultaneous presence of 2 groups in the ring modifies the total velocities of substitution the ratio in which the isomers are formed under the influence of each of the groups must remain practically unchanged, since the relative amts. of the isomers $\text{C}_6\text{H}_3\text{ABC}$ that are formed when one introduces C in $\text{C}_6\text{H}_4\text{AB}$ may be calcd. on the basis of the relative amts. of the isomers formed by introducing C in Ph A and Ph B .

E. J. WITZEMANN.

The nitration of chloroethylbenzene, $\text{C}_6\text{H}_5\text{CH}_2\text{CH}_2\text{Cl}$. A. F. HOLLEMAN. Univ. Amsterdam. *Rec. trav. chim.* 34, 261-4(1915).—H. (*C. A.* 8, 1268) in nitrating PhMe and its Cl derivs. showed that in nitrating PhCH_2Cl at $20\text{--}30^\circ$, 40.9% of the o -isomer was formed. v. Braun (*C. A.* 6, 2605; 8, 123) found that in nitrating $\text{PhCH}_2\text{CH}_2\text{Cl}$ the $p\text{-NO}_2\text{C}_6\text{H}_4\text{CH}_2\text{CH}_2\text{Cl}$ (a) was formed exclusively. H. doubted this result because (1) the oily nitration product sepd. on cooling $25\text{--}30^\circ$ of (a), m. 49° , but the rest remained liquid. (2) v. B. considered that this liquid part is essentially pure (a) but contains a small amt. of impurity and hence does not cryst. Now the numerous binary and ternary f. p. curves show that small amts. of impurity cause small lowerings in the f. p., while here there is a lowering of at least 30° . (3) v. B.'s results with the liquid part show that some (a) was present but do not show that it was nearly pure (a). (4) v. B. worked at -15° and H. nitrated PhCH_2Cl at $20\text{--}30^\circ$ but this difference in temp. is not sufficient to account for so large a difference in the result especially since a difference of 90° in the temp. of nitration of PhMe does not change the % of the o -deriv.

(55.6% at -30° and 57.5% at 60°). v. B. sent 10 g. of the liquid residue from the crystn. of (a) to H. ($n = 1.5529$ at 52.5° , Cl 19.2%, calcd. 19.1% for (a)). This was dissolved in 30 g. glacial AcOH, 2 g. anhydrous AcONa was added and the mixt. boiled for some time (some tarring took place). The product was oxidized with KMnO_4 in acid soln., which gave some $p\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ and probably a little of the *o*-acid. H. repeated v. B.'s nitration and oxidized the product with KMnO_4 in alk. soln. since the $o\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ is more stable than in acid soln. 13 g. of the product in 0.5 l. $\text{H}_2\text{O} + 42$ cc. 10% KOH were boiled and 39.5 g. KMnO_4 in soln. was slowly added, the MnO_2 was filtered off, washed 3 times with 0.5 l. H_2O and the entire filtrate cond. to 1 l. The soln. was extd. with Et_2O to remove tar and acidified. 7 g. (a) were pptd. and filtered off. The filtrate was extd. with Et_2O which gave a residue of 3 g. This was converted into the Ba salt and the method of sepn. previously described (*l. c.*) was used. 1 g. of $o\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ m. 146° , identical with the same compd. obtained from other sources, was sepd. It is probable that the original nitration product contains about 30% of the *o*-deriv. Some crystals resembling $m\text{-O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ were sepd. which gives support to the idea that some $m\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{Cl}$ is also present in the nitration product.

E. J. WITZEMANN.

Nitration of *p*-bromotoluene. A. F. HOLLEMAN. Univ. Amsterdam. *Rec. trav. chim.* 34, 283-8 (1915).—The nitration of $p\text{-BrC}_6\text{H}_4\text{Me}$ studied by Wroblewsky (*Ann.* 168, 176 (1873)) and Huebner and Roos (*Ber.* 6, 799 (1873)) has been repeated in order to det. if the 2 isomers 1,2,4- (a) and 1,3,4- $\text{MeC}_6\text{H}_3(\text{NO}_2)\text{Br}$ (b) are formed in the calcd. amts. The data necessary are (1) the quant. ratio of the nitrotoluenes formed in the nitration of PhMe ; (2) the ratio of isomeric bromonitrobenzenes formed in the nitration of PhBr ; (3) the ratio of velocities of substitution that Br and Me cause, which is calcd. from the ratio of $\text{Cl}:\text{Me} = 1.475$ and $\text{Br}:\text{Cl} = 0.88$ as $\text{Br}:\text{Me} = 1.3$. From these data the calcd. ratio of (a):(b) = 52.4%. The nitration of $p\text{-BrC}_6\text{H}_4\text{Me}$ cannot be executed sharply. A small amt. of accessory product is formed which renders the analysis difficult so that the results are only approx. *p*-Toluidine was dissolved in 20 times its wt. of concd. H_2SO_4 and nitrated according to Noeltling and Collin (*Ber.* 17, 263 (1884)) and the NO_2 deriv. diazotized according to Erdmann (*Ann.* 272, 145 (1893)) gave (a) m. 45.5° , almost white, $n_{40} = 1.5750$; heated 24 hrs. at 110° with 0.33 *N* MeONa it liberated a little Br, but 24 hrs. at 170° with satd. $\text{NH}_3\text{-EtOH}$ was almost without effect. *p*-Acetotoluidide nitrated according to Gattermann (*Ber.* 18, 1483 (1885)) gave a NO_2 deriv. which was sapond. and gave a nitro-*p*-toluidine, m. 114° . This diazotized according to Erdmann gave impure (b) which crystd. from MeOH and distd. *in vacuo* gave pure (b), m. 33° , $n_{40} = 1.5682$; heated with MeONa as above, the Br is completely removed. $\text{NH}_3\text{-EtOH}$ leaves a part unchanged. The f. p. curve of (a) + (b) drops from 43.6° to below 15.8° at 36.3 mol. % (a) and rises to 31.0° at 100 mol. % (b). A series of nitrations was carried out without obtaining an entirely clean result, but the following facts were always observed: (1) a little Br is eliminated from the ring; (2) a nitrophenol-like substance is always formed which gives intensely red salts with alkalis and which can be removed by agitating the C_6H_6 soln. of the nitration product with alkalis; (3) a small amt. of a product having a higher Br content than (a) or (b) is formed. 20 cc. HNO_3 (d. 1.52) cooled with ice and treated with 2 portions of 10 g. of $p\text{-BrC}_6\text{H}_4\text{Me}$ were poured on ice (5 min. required). The product was dissolved in C_6H_6 , washed free from acid, and agitated some hrs. with very dil. KOH, washed again with H_2O , dried with Na_2SO_4 , the C_6H_6 distd. off and the residue distd. *in vacuo*; almost no tar is formed in successful expts. Crystals of (a) sep. The f. p. was 20.2° , which corresponds to 56.3% (a) and 43.7% (b). The eutectic point was found at 5.3° instead of 9.5° on adding a known amt. of (b), showing that a 3rd compd. is present. On heating a mixt. of (a) + (b) with MeONa 24 hrs. at 110° 103.7% of

the amt. of Br corresponding to the (b) used was found, due to the decompn. of some of (a). Treating the product of nitration in the same way 41.5% (b) were found, which agrees well with the % of (b) found from the f. p. The results for the isomers (a) and (b) coincide approx. with the calcd. values.

E. J. WITZEMANN.

The polymerization of isoprene under the influence of an aluminium-mercury couple. J. BÖRSEKEN AND J. NOORDUIJN. Delft. *Rec. trav. chim.* 34, 265-71 (1915). —Expts. on the condensation of C_6H_6 and its derivs. with C_6H_6 in the presence of an Al-Hg couple (C. A. 8, 1270) showed that the initial reaction is an addition of C_6H_6 at the double bond: $-C:C- + C_6H_6 \rightarrow -CPhCH-$. The polymerization of C_2H_4 does not take place under these conditions. A mixt. of $C_2H_4 + HCl$ gas passed over $AlCl_3$ at 50° gives a satd. condensation product free from Cl. $PhCH:CH_2$ in a C_6H_6 soln. of the catalyzer combines only with itself: thus the Ph group in C_2H_4 favors polymerization. Since this polymerization is probably due to the presence of adjoining systems of unsatd. bonds it was thought that isoprene ought also to polymerize in C_6H_6 under the influence of a catalyzer. 2 kinds of condensation products were obtained: (1) sol. in C_6H_6 , Et_2O , $CHCl_3$, etc., is a mixt. of polymers of isoprene of high mol. wt. since a 5% soln. in C_6H_6 did not elevate the b. p.; very little viscous; cannot be vulcanized (2) more insol. products with otherwise similar properties. These products are much more satd. than caoutchouc. In the method of Harries and Gottlob (C. A. 5, 3583) of prepg. isoprene by passing vapors of carvene along a Pt wire heated dull red with the electric current, after some days the wire becomes coated with C and the reaction slows up, showing that the Pt acts partly as a catalyzer and that it is poisoned by the C. The Hg-Al catalyzer was prepd. by pouring 0.2 g. powdered Al into a dry C_6H_6 soln. of 3 g. $HgCl_2$ and warming gently; a dark brown liquid was formed. After cooling 10 g. isoprene in 40 cc. C_6H_6 were added and the mixt. warmed 0.5 hr. on the H_2O bath. After standing 24 hrs. the amorphous powder sepd. was filtered off. The filtrate was washed, dried, and fractionated, leaving a nearly white resin, the odor of isoprene was absent; while warm it could be drawn into threads, but on cooling it turned into a hard, easily powdered mass. When carried out in a H_2 atm. the same result was obtained. The powdered material was placed in a desiccator over P_2O_5 until const. in wt. This showed C:H as 5:8.1 on analysis and may be an impure polyisoprene. The polymer adsorbed some Al, Hg and Cl as was shown by special tests. By detg. the I absorption it was found that the unsatn. is diminished $\frac{1}{4}$. An amorphous yellow Br deriv., $(C_6H_6)_4Br_2$, was obtained by brominating in CCl_4 soln. Attempts to hydrogenate the product by Willstätter's method with active Pt in ligroin soln. failed. The viscosity detns. are described.

E. J. WITZEMANN.

The influence of some polyhydroxylated substances on the electrical conductivity of boric acid. J. BÖRSEKEN with J. D. RUYS AND K. BRACKMANN. Delft. *Rec. trav. chim.* 34, 272-8 (1915). —1,2- $C_{10}H_8(OH)_2$ was obtained from 150 g. β -naphthol through α,β - $C_{10}H_8(NO)OH$, reduced to α,β - $C_{10}H_8(NH_2)OH$, oxidized to 134 g. β -naphthoquinone (Lagodzinsky, Hardine, *Ber.* 27, 3075 (1893)), reduced with SO_2 (*Z. angew. Chem.* 1897, 24) and recrystd. from aq. SO_2 . The conductivity was detd. as in preceding papers (C. A. 6, 623; 9, 1766) in $\frac{1}{4}$ and $\frac{1}{32}$ (satd.) M solns. of (a) to which 0.5 M solns. of H_3BO_3 were added. (a) exercises a marked positive action ($k = 84.6$ and 112.2 instead of 32.0 and 47.1 as calcd.) comparable to that of o - $C_6H_4(OH)_2$. 3,4- $(HO)_2C_6H_3CO_2H$ was recrystd. several times from conductivity H_2O and conductivity detns. were made in $\frac{1}{32}$, $\frac{1}{16}$ and $\frac{1}{8}$ M concns. in the presence and absence of 0.5 M H_3BO_3 . The excess conductivity for the mixts. was 68.7, 64.9 and 119.3, resp. Gallic acid in the same concns. showed an excess conductivity for the mixt. of 41.1, 83.2, 181.6, resp. The influence of the 2 preceding is positive and of the same order as o - $C_6H_4(OH)_2$ and pyrogallol. It is not probable that CO_2H *m*- or *p*- to OH groups plays any important role. It

may be that the complex formed between the OH's and the H_3BO_3 is similar to that of the phenols named. 3,5-Dinitropyrocatechol (*b*) (Nietski and Moll, *Ber.* 26, 2183 (1893)) is so little sol. that only a $1/300$ *M* soln. could be obtained. This soln. mixed with $1/64$, $1/32$, $1/16$, $1/8$, $1/4$, $1/2$ *M* H_3BO_3 solns. showed an excess conductivity of 16.3, 26.2, 45.1, 76.8, 116.4, 122.3, resp. 4-Nitroresorcinol (*c*) in $1/128$ and $1/256$ *M* soln. showed a feeble negative influence mixed with $1/64$ to $1/2$ *M* solns. of H_3BO_3 . The contrast between *o*- and *m*- $C_6H_4(OH)_2$ in their influence on the conductivity of H_3BO_3 is not changed in principle but is increased by the introduction of NO_2 groups. The results show that the positive influence of the NO_2 group on the acidity of the phenol group as observed in *o*- and *p*- $O_2NC_6H_4OH$ disappears when 2 OH groups are present simultaneously in these positions. 1,2,4- $C_6H_3(OH)_3$ (*d*) was prepd. from quinone (Thiele, *Ber.* 31, 1248 (1898)). The aq. solns. are unstable and were mixed with the H_3BO_3 each in $1/2$ *M* soln. and the conductivity detd. at once. The mixt. showed a depression in the conductivity even though 2 OH's were *o*- to each other. This seems to be an exception to the rule that *o*-(HO) $_2$ derivs. of the aromatic series increase the conductivity of H_3BO_3 . The conductivity of (*d*) itself is about 20 times as great as that of pyrogallol or phloroglucinol.

E. J. WITZEMANN.

The influence of some polyphenols on the electric conductivity of phosphoric acid. J. BÖSEKEN AND K. BRACKMANN. Delft. *Rec. trav. chim.* 34, 279-82 (1915).— H_3PO_4 in having 3 OH groups bound to P is similar to H_3BO_3 . B. and B. have therefore investigated the influence of some polyphenols on the conductivity of H_3PO_4 to see if its effects are similar, *i. e.*, the pyrocatechol and pyrogallol ought to increase its conductivity, while *m*- and *p*- $C_6H_4(OH)_2$ ought to diminish it. It was found, however, that all four, as well as phloroglucinol, diminish the conductivity without any marked difference in behavior. The *o*-phenols do not form complex acids stronger than the components. The detns. were made in the same way as in the case of H_3BO_3 (cf. preceding abstr.) at 25°. The phenols were recrystd. from C_6H_6 or H_2O until the conductivity no longer changed. The phenols in soln. of 1, $1/2$, $1/4$, $1/8$, $1/16$, $1/32$, $1/64$ mol. % were mixed with H_3PO_4 solns. of $1/8$, $1/4$, $1/8$, $1/16$, $1/32$, $1/64$ mol. %. In all cases the mixt. showed a lower conductivity than the value calcd. additively from the conductivity of unmixed solns. The diminution is greatest in $1/2$ mol. % H_3PO_4 solns. Pyrogallol has the most feeble action; it seems possible that 2 influences counteract each other: (1) A small increase in the H ions which will be strongest in the case of pyrogallol, (2) the formation of complex mols. with a conductivity lower than that of the components. The detn. of the abs. H ion concn. will answer the question. E. J. W.

The action of oxalyl chloride with some amides. TH. FIGER. Univ. Leyden. *Rec. trav. chim.* 34, 289-325 (1915).—Bornwater (*C. A.* 6, 2743) studied the action of (COCl) $_2$ on AcNH $_2$, ClCH $_2$ CONH $_2$ and BzNH $_2$, and found that in boiling C_6H_6 they gave carbonyl derivs., while substituted amines like AcNHEt and BzNHPh give oxalic derivs. Similarly treated NH $_2$ CO $_2$ Et gives CO(NHCO $_2$ Et) $_2$, while its Me deriv. gives (CONMeCO $_2$ Et) $_2$. NH $_2$ CONMe $_2$ gives the CO deriv., while (MeNH) $_2$ CO gives the cyclic oxalic deriv. (MeNHCO) $_2$ also gives the cyclic oxalic deriv. Moll v. Charante (*C. A.* 7, 1704) obtained the oxalyl deriv. with PhSO $_2$ NH $_2$, while Franchimont (*Kon. Acad. Wet.* 22, 285) obtained EtSO $_2$ NHMe with EtSO $_2$ NH $_2$. Me $_2$ CHCONH $_2$, however, decomps. partly in H $_2$ O into a nitrile in forming the oxalic deriv. But in working in Et $_2$ O soln. B. found that CO(NH $_2$) $_2$ + (COCl) $_2$ give parabamic acid, *i. e.*, a cyclic oxalic deriv. and another cyclic product, oxalyldiureide. Stollé (*C. A.* 8, 708) obtained diphenyloxamic chloride and tetraphenyloxamide from Ph $_2$ NH + (COCl) $_2$, depending on whether 1 or 2 mols. of Ph $_2$ NH were used. B. always used excess of the amine in order to obtain the oxalic derivs. and it seemed if only 1 mol. of amine was used with 1 mol. (COCl) $_2$, the chlorides like that found by S. would be obtained unless they underwent

intramol. rearrangement. Some examples of the latter are cited from Polpmer's data (C. A. 9, 1785). The expts. of B. were continued with PrNH_2 and $\text{PhCH}_2\text{CONH}_2$, partly to det. whether Ph in place of Me has a different effect. As substituted amides AcNHPh , PrNHPh and $\text{PhCH}_2\text{CONHPh}$ were used for the same reason. Moreover, PhNHCO_2Et , $\text{CO}(\text{NHPh})_2$ and $(\text{CONHPh})_2$ were used in place of the corresponding Me derivs. used by B. As homologs of PhNHCO_2Et F. has studied $\text{PhNHCH}_2\text{CO}_2\text{Et}$, and $\text{H}_2\text{NCHPh}_2\text{CO}_2\text{Me}$ (Meyeringh, *Rec. trav. chim.* 32, 152.) $\text{H}_2\text{NCONHPh}$, $(\text{CH}_2\text{NHCO}_2\text{Et})_2$ and $(\text{CH}_2\text{NHAc})_2$ were also used. Com. PrNH_2 was recrystd. in dry C_6H_6 instead of the usual CHCl_3 and was obtained as shining, nonhygroscopic leaves, m. $79-80^\circ$; 2 mols. boiled under a reflux condenser with 1 mol. $(\text{COCl})_2$ in dry C_6H_6 for 6 hrs. gave much HCl and sepd. a slightly brown compd. on cooling. This boiled with EtOH became white and was recrystd. from PhNO_2 as mica-like scales of *oxalyldi[propionamide]*, $(\text{CONHPr})_2$ (a), m. 216° (decompn.); yield 10%. 0.050 g. was boiled 0.30 hr. with 10% KOH under a reflux condenser, acidified with AcOH , treated with CaCl_2 soln. to ppt. CaC_2O_4 . (a) does not give the biuret reaction. EtCN was also formed which shows that $(\text{COCl})_2$ has a dehydrating action on PrNH_2 as was found by F. (l. c.) in the case of isobutyramide. The mother liquor on evapn. gave a yellow tar from which some (a) was sepd. in EtOH soln. and some unchanged PrNH_2 from petr. ether soln. 1 mol. $(\text{COCl})_2$ + 2 mol. $\text{PhCH}_2\text{CONH}_2$ (b) treated as with (a) sepd. a yellow powder which on crystn. from EtOH was found to be unchanged (b). The filtrate was evapd. and the residue recrystd. from boiling H_2O + EtOH , from which *carbonyldi[phenylacetamide]* (c), $\text{CO}(\text{NHCOCH}_2\text{Ph})_2$, sepd. as silvery plates, m. $114-6^\circ$, did not give $\text{H}_2\text{C}_2\text{O}_4$ on hydrolysis; it was noted that the introduction of 2 Ph groups in $\text{CO}(\text{NHAc})_2$ lowers the m. p. 2 mols. PhNHAc + 1 mol. $(\text{COCl})_2$ treated similarly seps. a little of a red compd.; the filtrate gives a brown viscous syrup on evapn., which crystd. from abs. EtOH , gave *oxalyldi[acetanilide]*, $(\text{CONPhAc})_2$ (d), colorless needles, m. $208-9^\circ$, gives $\text{H}_2\text{C}_2\text{O}_4$ on hydrolysis; a small amt. of a yellow product, m. $190-208^\circ$, was also formed. 2 mols. PhNH_2 + 1 mol. PrCl in dry Et_2O gave PhNHPr which was sepd. from PhNH_2Cl with H_2O . 2 mols. PhNHPr + 1 mol. $(\text{COCl})_2$ treated as in (a) sepd. a small amt. of a brown compd. and on evapn. gave a brown syrup which crystd. from EtOH gave impure *oxalyldi[propionanilide]* and unchanged PhNHPr . When 1 mol. PhNHPr + 1 mol. $(\text{COCl})_2$ were similarly treated *1-phenyl-3-methyl-2,4,5-triketotetrahydropyrrole* (e), MeHC.CO.CO.NPh.CO , or propionylisatin is formed.

Since the product gives $\text{H}_2\text{C}_2\text{O}_4$ on hydrolysis it is thought to be (e). The EtOH mother liquors give a little of an unidentified tetraketopyrrolidine deriv. 2 mols. $\text{PhCH}_2\text{CONH}_2$ + 1 mol. $(\text{COCl})_2$ similarly treated gave HCl and a yellow solid which recrystd. from AcOEt as yellow prisms, $\text{C}_{16}\text{H}_{11}\text{NO}_2$ (f), m. 235° , softens $215-20^\circ$, mol. wt. by Landsberger's b. p. method 260 (calcd. 265). Another compd., m. $114-6^\circ$, was sepd. which was thought to be unchanged $\text{PhCH}_2\text{CONH}_2$, m. 117° . (f) was either *1,3-diphenyl-2,4,5-triketotetrahydropyrrole* (*oxalphenylacetic anil*), PhHC.CO.CO.NPh.CO , or

phenylacetylisatin; the color indicated a deriv. of isatin; on hydrolysis it gave $\text{H}_2\text{C}_2\text{O}_4$, which is not given by isatin, and it did not give a blue color with concd. H_2SO_4 as isatin derivs. do, so that the former constitution is accepted. 1 mol. $\text{PhCH}_2\text{CONH}_2$ + 1 mol. $(\text{COCl})_2$ gave the same compd. Com. PhNHCO_2Et (g) was purified by distg., dissolving in abs. EtOH and pptg. with excess of H_2O by which (g) was sepd. as a turbid liquid, which was inoculated, crystd., powdered, and dried *in vacuo*; it m. $51-2^\circ$. 2 mols. (g) + 1 mol. $(\text{COCl})_2$ treated as for (f) gave HCl ; after agitating with H_2O unchanged (g) sepd. overnight. The mother liquor gave $\text{H}_2\text{C}_2\text{O}_4$. In a 2nd expt. H_2O was not added and the mixt. solidified in 4-5 days. Dissolved in petr. ether fine needles, m. $139-40^\circ$, sepd.; the H_2O soln. colors Congo paper blue; hydrolysis with KOH

gives $\text{H}_2\text{C}_2\text{O}_4$. In another expt. in which most of the C_6H_6 was 1st distd. off *N*-carbethoxyphenyloxamic acid (*h*), $\text{EtO}_2\text{CNPhCOCO}_2\text{H}$, was obtained, m. $140-1^\circ$. (*h*) is formed by the action of moisture on the $\text{EtO}_2\text{CNPhCOCOCl}$ first formed. 1 mol. $\text{CO}(\text{NHPh})_2$ + 1 mol. $(\text{COCl})_2$ give *diphenylparabanic acid*, PhN.CO.CO.NPh.CO ,

woolly needles, m. $206-7^\circ$. $(\text{CONHPh})_2$ does not react with $(\text{COCl})_2$; with KOH it hydrolyzes slowly. 1 mol. $(\text{COCl})_2$ + 4 mols. PhNHMe in dry Et_2O gave a powder of PhNHMe.HCl + $(\text{CONMePh})_2$ from which the latter was sepd. with H_2O ; it m. $111-1.5^\circ$; hydrolysis with KOH is much more difficult than for $(\text{CONHPh})_2$; the compd. described by Norton and Livermore (*Ber.* 20, 2273), b. $249-51^\circ$, is not $(\text{CONMePh})_2$. 2 mols. $\text{CO}(\text{NHPh})_2$ + 1 mol. $(\text{COCl})_2$ treated as for (*h*) gave *oxalyldi[phenylureide]*, $(\text{CONHCONHPh})_2$, silky needles, m. $238-40^\circ$, gives NH_3 + $\text{H}_2\text{C}_2\text{O}_4$ on hydrolysis with KOH, does not give the biuret test. The EtOH mother liquors also gave some *phenylparabanic acid*, PhN.CO.CO.NH.CO , shining scales, m. 208° . By treating

1 mol. $(\text{COCl})_2$ with 2 mols. $\text{H}_2\text{NCHPhCO}_2\text{Me}$, Meyeringh (*J. prakt. Chem.* 32, 20) obtained 2 isomeric compds., methyl oxalyldi[α -phenyl- α -aminoacetate], which F. has prepd. and subjected to the action of liquid NH_3 . 5 g. of the isomer (m. 168°) treated for 2 days in a pressure flask with liquid NH_3 at $8-12^\circ$ gave on evapg. the NH_3 a white product sol. in PhNO_2 from which *oxalyldi-[\alpha-phenyl- α -aminoacetamide]* (*i*), $(\text{CONHCHPhCONH})_2$, seps. as woolly, colorless crystals, m. 297° (browns 275°), insol. in H_2O but gives the biuret reaction. The isomer (m. $196-7^\circ$) gives similarly the isomer of (*i*), m. 282° (browns 245°), gives a biuret reaction; boiled with AcBr the compds. were recovered unchanged so that the compds. comparable to the peptides containing the oxalyl group could not be obtained in this way. 2 mols. $\text{PhNHCH}_2\text{CO}_2\text{Et}$ + 1 mol. $(\text{COCl})_2$ treated as for (*f*) sepd. colorless needles of *ethyl oxalyldi[phenylglycocolate]* + *benzene* (*j*), $(\text{CONPhCH}_2\text{CO}_2\text{Et})_2$, C_6H_6 , m. $105-6^\circ$; 4 g. (*j*) were distd. with excess of H_2O ; a thick, oily liquid free from the odor of C_6H_6 remained in the flask, and when crystd. from petr. ether gave (*j*) free from C_6H_6 as needle clusters, m. $87-8^\circ$. (*j*) treated with KOH for 0.5 hr. gives only a trace of $\text{H}_2\text{C}_2\text{O}_4$; prolonged heating gives more $\text{H}_2\text{C}_2\text{O}_4$. In attempting to prep. the diamide corresponding to (*j*) by treating with liquid NH_3 (*j*) was decompd. into phenylglycinamide and oxamide, and since the latter was recovered quant. the fact that it was an $\text{H}_2\text{C}_2\text{O}_4$ deriv. was proved. Since the rupture of the oxalyl group in (*j*) proceeds with difficulty it seemed possible that treating (*j*) carefully with dil. KOH would give oxalyldi[phenylglycocol] (*k*), $(\text{CONPhCH}_2\text{CO}_2\text{H})_2$. Heating 4 g. (*j*) in 25 cc. 10% KOH on the H_2O bath, cooling and adding excess of dil. H_2SO_4 sepd. (*k*) as an oil which crystd. in shining needles, m. $217-9^\circ$; titrations with NaOH (litmus indicator) showed it to be dibasic. 1 mol. ethylenedicarbamate in C_6H_6 soln. sepd. on cooling *2,3-diketo-1,4-N-dicarbomethoxypiperazine*, $\text{MeO}_2\text{CN.CO.CO.N}(\text{CO}_2\text{Me}).\text{CH}_2.\text{CH}_2$, brilliant crystals, m. 167° (softens 158°),

gives $\text{H}_2\text{C}_2\text{O}_4$ on hydrolysis with KOH; treated with liquid NH_3 at room temp. it gives a ppt. which recrystd. from boiling PhNO_2 gives oxamide and a compd. $\text{C}_7\text{H}_{12}\text{N}_4\text{O}_2$ which may be $\text{H}_2\text{NCONHCH}_2\text{CH}_2\text{NH}(\text{CO}_2\text{Me})\text{COCONH}_2$. 1 mol. diacetylene-diamine + 1 mol. $(\text{COCl})_2$ boiled with dry C_6H_6 gives a white insol. product which washed with boiling abs. EtOH and crystd. from AcOH gave *diacetyleneoxamide*, $\text{AcN.CO.CO.NAc.CH}_2\text{CH}_2$, as silvery leaves, m. $204-5^\circ$. F. in his summary discusses

the biuret reaction given by oxamide and certain oxalic derivs. According to Schiff (*Ann.* 229, 236) 2 CONH_2 groups or 1 CONH_2 and 1 CONHX group are necessary for this reaction, while with 2 CONHX groups it does not take place. F. has listed derivs. of oxamide prepared by himself, by M. (*l. c.*), by B. (*l. c.*) and G. (*l. c.*) and shows that

the biuret reaction occurs with *sym*-dialkyloxamides having the group (CONHalk), only when the amide function appears again in the alkyls as CONH₂ or as CONHX.

E. J. WITZEMANN.

Some derivatives of mesoxalic acid. D. J. VAN PROOYK. Univ. Leyden. *Rec. trav. chim.* 34, 326-49 (1915).—Since the discovery of easy methods of preparing esters of mesoxalic acid (*Ber.* 26, 3000; 27, 1782; *Am. Chem. J.* 35, 477; *Rec. trav. chim.* 29, 113) these and other derivs. of mesoxalic acid have been the object of many researches. Some have used the anhydrous esters of oxomalonic esters, others have used their hydrates, the esters of (HO)₂C(CO₂H)₂. v. P. has made some attempts with (HO)₂C(CO₂Et)₂ to prepare derivs. comparable to peptides containing the mesoxalyl groups but obtained no clear results. Equimol. amts. of (HO)₂C(CO₂Et)₂ (a) + urea were dissolved on the H₂O bath in sufficient abs. EtOH; on cooling there sepd. in a few days, fine, transparent needles, m. 132°, of what was thought to be the addition product, diethyl ureotartrate (b). Curtiss (*C. A.* 5, 1738) obtained the same compd. from CO(CO₂Et)₂ + urea. (a) was heated on the H₂O bath for some time with a 2nd mol. of urea in a little EtOH; the syrup obtained on evapg. the EtOH crystd. slowly as impure small needles, m. 98-100°, which are probably *monoethylureotartrate uride*, NH₂CONHCO(OH)C(NHCONH₂)CO₂Et; 1 OEt in (b) is replaced by urea. NH₂CONHPh, NH₂CONPh₂, CO(NHPh)₂, and NH₂CONMe₂ do not react with (a) in abs. EtOH nor in C₆H₆ or xylene. Attempts to make (a) react with NH₂CO₂H gave no result. Convinced that the H₂O in (a) does not hinder the reactions of the CO group sufficiently v. P. sought an addition product stable toward NH₃, alkalies and amines but from which the CO group or its hydrate could be easily obtained. The acetal could not be obtained by heating with EtOH 5 hrs. in a sealed tube at 100°. CBr₃(CO₂Me)₂ (Willstätter, *Ber.* 35, 1376) treated with a MeOH soln. of MeONa did not give the acetal. CBr₃(CO₂Et)₂ (b_m 152-5°) (96 g. in 30 cc. EtOH) was added drop by drop to 13.8 g. Na in 225 cc. alc., filtered and distd. and 0.75 l. Et₂O added to the residue, filtered, dried with Na₂SO₄, distilled and fractionated *in vacuo*, gave a liquid from which hexagonal colorless plates, m. 43°, of the acetal sepd.; av. yield, 13%. This compd. was used for the following expts.: (b) heated 15 min. on the H₂O bath with Ba(OH)₂ seps. *barium diethylmalonate*, C₇H₁₀O₄Ba.0.5H₂O, as a white, cryst. powder. A suspension of the Ba salt treated with the calcd. amt. of AgNO₃ soln. in the cold gave the dark insol. *silver salt*, C₇H₁₀O₄Ag₂, which was dissolved in NH₄OH and reprecip. as a white powder with HNO₃. The Ba salt agitated with the calcd. amt. of 10% H₂SO₄ gave on filtering and extg. with Et₂O an ext. which, crystd. from C₆H₆, gave small needles of *diethyloxymalonic acid*, m. 160° (decompn.). Attempts to prep. the chloride with POCl₃ and SOCl₂ failed. Treating (b) with aq. NH₃ or with liquid NH₃ gives *diethoxymalondiamide* (c), C₇H₁₄O₄N₂. (b) agitated with double the required amt. of 25% NH₃-H₂O for 24 hrs. dissolved completely and after some days deposited crystals of (c), m. 203-5°. (b) treated for 24 hrs. with liquid NH₃ in the sealed tube gave a residue on evapg. the NH₃ which gave crystals from EtOH identical with the preceding. The 1st method gives almost solely the diamide, the 2nd nearly 1/2 of *monoethyl diethoxymalonnate monoamide* (d), C₈H₁₇O₄N, shining needles, m. 94-5°; treated with NH₃ it gives (c). The monoamide is easily sol. in Et₂O and C₆H₆ in which (c) is insol. (c) boiled in C₆H₆ and AcCl for 6 hrs. did not react. Finally a large excess of AcCl was used and a little Ac₂O was added, HCl was evolved, the soln. was evapd. and *diethoxymalondiacetylamide* (e), C₁₁H₁₈O₆N₂, was crystd. from EtOH, fine needles, m. 125-6°. The same compd. was obtained by boiling (c) with Ac₂O for 3 hrs., or with AcBr and a little C₆H₆, while CH₃BrCOBr did not react. (d) remained intact when boiled 3 hrs. with Ac₂O + AcCl. (e) treated with liquid NH₃ in a sealed tube for 48 hrs. gave (c) + AcNH₂. Equimol. amts. of (c) boiled with (COCl)₂ in C₆H₆ for 6 hrs.

gave HCl and on evapg. the C_6H_5 a syrup which, dissolved in H_2O , sepd. *diethoxybarbituric acid* (f), $C_8H_{12}O_6N_2$, as fine, colorless needles, m. 165° . By dissolving (f) in concd. HNO_3 and evapg. nearly to dryness on the H_2O bath it gave on crystg. from boiling H_2O alloxan hydrate. (f) was also obtained by treating 24.8 g. (b) in 100 cc. abs. EtOH with 6.9 g. Na and 9 g. urea in 200 cc. abs. EtOH in the sealed tube at $100-10^\circ$ for 6 hrs. v. P. found that boiling trihydroxydihydromethyluracil (Osten, *Ann.* 343, 143) and trihydroxydihydrodimethyluracil (Henkel, *C. A.* 5, 876) with abs. EtOH gave the corresponding acetals, but the latter treated with alloxan or its hydrate did not give (f) as was hoped. (f) gives a *silver compound*, $C_8H_{10}O_4N_2Ag_2$, by substituting 2 H atoms bound to N. Anhydrous $MeNH_2$ acting on (b) in a sealed tube 2 days at room temp. seps. *dimalondimethylamide*, $C_8H_{12}O_4N_2$, as large crystals, m. 170° . Na was finely divided by agitation in boiling xylene, the xylene was removed and the Na treated with an Et_2O soln. of urethan which gave Na urethan + H, after which (b) was added and the mixt. heated $\frac{1}{2}$ hr. A solid sepd. which was filtered off and washed with Et_2O to remove unchanged (b). The residue was treated with weak H_2SO_4 until acid in reaction in which it dissolves. This extd. with Et_2O gave on evapg. and recrystn. *diethoxymalondicarboxyethylamide*, $C_{12}H_{22}O_8N_2$, white, irregular crystals, m. 114° ; treated with liquid NH_3 2 days at room temp. it gives (c), m. $204-5^\circ$, and NH_3CO_2Et , m. 51° . Attempts to obtain derivs. of (b) with derivs. of glycine and $m-NH_2C_6H_4CO_2H$ failed. A 2nd substance of which v. P. prepd. derivs. was $(PhO)_2C(CO_2Et)_2$ (g) (Conrad and Brückner, *Ber.* 24, 3004), yellow sirup, b_m 240° . Treated with liquid NH_3 for 3 days at room temp. a solid seps. which recrystd. from C_6H_6 as white flocks of *monoethyl diphenoxymalonate monoamide*, $C_{17}H_{17}O_4N$, m. $196-7^\circ$. (g) heated with liquid NH_3 2.5 hrs. at 72° in a sealed tube gave a brown residue on evapg. which dissolved in hot H_2O , sepd. *diphenoxymalondiamide*, $C_{18}H_{14}O_4N_2$, fine, white needles m. 269° , which was sepd. with some difficulty from the monoamide which is also formed in variable amts. Attempts to obtain the barbituric acid derivs. with $(COCl)_2$ failed. A mixt. of (g) with urea + $NaOEt$ in abs. EtOH heated in a sealed tube at 100° for 4 hrs. solidified gradually; this ppt., washed with a little EtOH, dissolved in H_2O , pptd. a white powder with HCl, which, dissolved in NaOH and repptd. with HCl, gave *sym-bis-[carboxydiphenoxymalonyl]urea*, $CO[NHCOC(OPh)_2CO_2H]_2$. The constitution was verified in part by the acid titration. Heated at its m. p. it loses 2 mols. CO_2 .

E. J. WITZEMANN.

Ephedrine and related compounds. AUGUST EDERHARD. Univ. Marburg. *Arch. Pharm.* 253, 62-91 (1915).—The object of the investigation was to ascertain the nature of certain secondary nitrogenous products formed along with Me_3N and N-free compds., when an aq. soln. of methylephedrine methohydroxide is repeatedly distd. (cf. *C. A.* 9, 2234). As the result of such treatment, Me_3N , methylephedrine and ephedrine are mainly formed while ephedrine phenylpropyleneoxide appears in less amt. During these expts. the following substances were characterized: *Methylephedrine methochloride*, $C_{10}H_{14}MeON.MeCl.H_2O$, right-angled plates from H_2O , m. 230° , $[\alpha]_D^{16} -30.54^\circ$; *methylephedrine chloroplatinate*, $(C_{10}H_{14}MeON.HCl)_2PtCl_4.2H_2O$, reddish yellow needles; m. (anhydrous) 181° , decomp. 184° . The behavior of methylephedrine methiodide toward Na-Hg was studied and the products of such action found in the main to be: Me_3N , methylephedrine, ephedrine and ephedrine phenylpropylene oxide. The *hydrochloride* of the last named substance forms compact right-angled plates sintering $146-8^\circ$ and m. $155-6^\circ$ (decompn.). The free base, $C_{10}H_{18}ON.C_6H_5O$, plates, soften 123° , m. 125° . The *aurate*, $C_{19}H_{22}NO_7.HCl.AuCl_3$, yellow needles, m. $144-5^\circ$. The *chloroplatinate*, $(C_{11}H_{12}NO_4.HCl)_2PtCl_4$, needles, m. $176.5-177^\circ$. The *methiodide* forms compact, yellowish crystals, m. 183° , the *methochloride*, needles, m. 203° . The methylation of ephedrine phenylpropylene oxide under varying conditions yielded

2 isomeric derivatives, one directly at the ordinary temp., $C_{11}H_{13}NO_2 \cdot MeI$, cubes, m. 183° (the corresponding *chloride*, needles, m. 203°), while the other from MeOH at 100° forms needles, m. 164° (the corresponding *chloride*, needles, m. $165-7^\circ$, and *chloroplatinate*, $(C_{11}H_{13}NO_2 \cdot MeCl)_2 \cdot PtCl_4$, orange needles, m. 188°). On treating ephedrine phenylpropylene oxide with BzCl *via* Schotten-Baumann, a *dibenzoyl derivative* resulted, $C_{19}H_{23}N(OBz)_2$, crystals, m. $141-2^\circ$. Expts. undertaken with a view to prepg. inactive ephedrine or pseudoephedrine by reducing $MeNHCHMeBz$ with Na-Hg lead to the formation of *methylaminoethylphenylcarbinol*, $C_6H_5CHOHCH(NHMe)Me$, felted needles, m. $114-5^\circ$ (*hydrochloride*, needles, m. $180-1^\circ$; *aurate*, m. 126° ; *chloroplatinate*, reddish warty crystals, m. $190-1^\circ$), having an odor very like pseudoephedrine (cf. Fournau, *J. pharm. chim.* 1904, 481; Buemming, *Diss. Marburg* 1909). W. O. E.

Organic fluorine compounds. I. J. RINKES. *Chem. Weekblad* 11, 360-4, 952-6 (1914); cf. *C. A.* 7, 769.—1-*Fluoro-2-chloro-4-nitrobenzene*: 60 g. of dry $p\text{-PhNO}_2$ and 6 g. anhydrous $FeCl_3$ at 130° were treated with dry Cl, and the resulting substance distd. with steam; it partly solidified in the receiver. The fraction which b. $227-32^\circ$ (45 g.) after crystn. from alc. solidified at 41° . 3-*Chloro-4-fluoroaniline* (a), from the NO_2 compd. with Sn and HCl, regular right-angled plates, m. 43.9° . *o-Fluoro-chlorobenzene*: 16 g. of (a) in 100 cc. of fuming HCl in ice and salt are diazotized with 10 g. $NaNO_2$, the resulting substance mixed with 60 g. $SnCl_4$ in 50 cc. fuming HCl, the hydrazine hydrochloride drained by suction, treated with NaOH and the base taken up in Et_2O . After evapn. of the Et_2O a colorless cryst. mass remained. This was dissolved in aq. AcOH, and dropped into 50 g. of $CuSO_4$ in 150 cc. boiling H_2O . The $o\text{-FC}_6H_4Cl$ distd. with a vehement gas evolution; it was washed with H_2O and then distd. under normal pressure. It is a colorless liquid, which smells like $PhCl$, b. 138.5° , m. -42.5° . *p-Fluoroanisole* (b): To obtain pure (b) R. started out from the F product of *p*-anisidine, which was hydrolyzed with $AlCl_3$ to $p\text{-FC}_6H_4OH$ which was esterified after purification by crystn. The *p-fluorophenol* thus obtained m. 46.5° . 11.2 g. of this were shaken for 1 hr. with 50 cc. of 10% NaOH and 120 cc. Me_2SO_4 . The (b) appears on the surface of the watery liquid; it b. 157° , m. -43.5° which is little higher than $p\text{-FC}_6H_4OMe$ prepared directly from *p*-anisidine (-45°). *p-Fluoronitrosobenzene* (c): 14.5 g. of finely powdered $(NH_4)_2S_2O_8$ was placed little by little in 20 g. of cold concd. H_2SO_4 , poured into 100 cc. iced H_2O , finely powdered Na_2CO_3 added until neutral and the ice-cold mixt. immediately added to 3.58 g. of $p\text{-FC}_6H_4NH_2$ (d) in 150 cc. H_2O . The (c), left in iced H_2O for some time, then drained by suction and purified by steam distn., m. 35.2° . 4,4'-*Disfluoroazobenzene* (e): The dark green soln. of 2.5 g. of $p\text{-O}_2NC_6H_4F$ in 7.5 cc. AcOH was mixed with 2.22 g. (d) in 5 cc. AcOH. After a short time the mixt. heated up to 45° and large crystals of (e) appeared. These, when drained by suction, dried on clay and recrystd. from alc., gave orange needles, m. 101.1° . R. found that only small quantities of $o\text{-FC}_6H_4OH$ could be obtained by diazotizing $o\text{-FC}_6H_4NH_2$, while better results might be had by diazotizing $o\text{-H}_2NC_6H_4OH$ (f) in presence of HF. 100 g. of (f) yielded 5 cc. $o\text{-FC}_6H_4OH$. (b), above, was made from *p*-anisidine (de Haen), 100 g. of which were placed little by little in 400 cc. of fuming HF, to which the calcd. amt. of $NaNO_2$ in a small quantity of H_2O , was added. The diazotized product is then dropped into 100 cc. of boiling HF. The distillate is partly neutralized, the (b) distd. with steam, dissolved in Et_2O , shaken with Na_2CO_3 , freed from Et_2O and distd. *in vacuo*. On a 2nd distn. under atm. pressure the main quantity b. 154.5° . *p-Fluorocyanobenzene* (g): 20 g. (d) obtained from the NO_2 compd. by reduction with very weak H_2SO_4 and Fe powder was added to a cold mixt. of 50 cc. strong HCl and 150 cc. HCl and diazotized with concd. $NaNO_2$ and the resulting compd. was added to a $Cu_2(CN)_2$ soln. (g) dists. over, and solidifies in the receiver to a yellow solid sepg. in colorless needles from naphtha. *p-Fluorophenylhy-*

drasine: To 20 g. (d) in 20 cc. cold HCl, a concd. soln. of 16 g. NaNO₂ was added and the resulting diazo compd. was mixed with 120 g. SnCl₂ in 100 cc. cold fuming HCl; the HCl salt which crystd. out was decompd. with NaOH, the base taken up in Et₂O, crystals in needles, m. 36.8°, and smells like PhNHNH₂. *p*-Fluorophenylhydroxylamine (h): 20 g. of *p*-FC₆H₄NO₂ in 120 cc. cold abs. alc. were satd. with dry NH₃, dry H₂S conducted into the soln. until a considerable deposit of NH₄SH had formed, allowed to stand 24 hrs. in an ice box, drained and the liquid mixed with 400 cc. dry Et₂O, which gave another cryst. ppt. The red alc.-Et₂O soln. of (h) was repeatedly shaken with small quantities of H₂O to remove adhering (NH₄)₂SO₄, the Et₂O removed from the slightly yellow soln. by distn., and the residue dissolved in boiling C₆H₆, from which the FC₆H₄NHOH sep'd. on cooling in irregular needles, m. 90°. 4.65 g. finely powdered (h) in 16 cc. ice-cold concd. H₂SO₄ and 270 cc. H₂O were treated with 4.6 g. of K₂Cr₂O₇ in 200 cc. cold H₂O, and steam blown into the oxidizing liquid; the resulting (c) dists. over in a few min. The crystals, when pure, are snow-white and after drying on a porous plate, m. 35.2°.

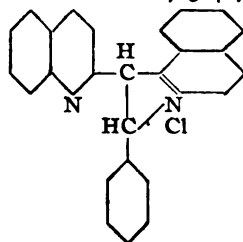
J. T. FLOHIL.

Action of nitric acid on the three isomeric fluorotoluenes. J. H. SLOTHOUWER. *Chem. Weekblad* 11, 956-8 (1914).—6-8 parts of HNO₃ (d. 1.48) were dropped, while stirring, into FC₆H₄Me at 0°. A glass plate covered with beeswax in which some figures were scratched was held over the liquid. The etching of the glass proved that F leaves the ring during the nitration. The yellow cryst. substance resulting from the nitration, dissolved in NaOH, pptd. by HCl, taken up in Et₂O, freed from Et₂O and twice recrystd. from H₂O, m. 32°, and proved to be identical with 4,3-HO(O₂N)C₆H₂Me (a). 5 g. of (a) further nitrated with HNO₃ (d. 1.52) at 0° gave rise to 2 g. dinitrocresol. During the nitration, lower acids occur after F has left the ring. Besides (a), which is the main product, very small amts. of 2 nitrofluorotoluenes, a solid, m. 27°, b_m 138-9°, and a liquid, b_m 134.5°.

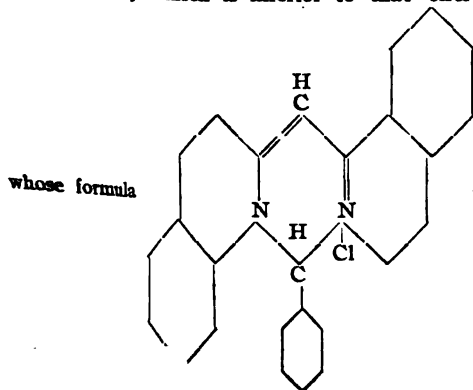
J. T. FLOHIL.

The structure of quinoline red. L. P. KRANTZ. *Chem. Weekblad* 11, 364-7

(1914).—K. announces that the structure of quinoline red,



as suggested by himself is inferior to that offered by Homann (*Diss. Jena* 1913)



whose formula

better explains certain properties of

J. T. FLOHIL.

Friedel-Crafts synthesis of sulfones. S. C. J. OLIVIER. *Chem. Weekblad* 11, 372-7(1914); cf. *C. A.* 9, 442.—O. investigated the action of AlCl_3 in Friedel and Crafts' synthesis of sulfones and draws the following conclusions: $\text{C}_6\text{H}_4\text{BrSO}_2\text{Cl} \cdot \text{AlCl}_3$ is the reacting compd. in the formation of $p\text{-BrC}_6\text{H}_4\text{SO}_2\text{Ph}$ in C_6H_6 and gives rise to $\text{C}_6\text{H}_4\text{BrSO}_2\text{Ph} \cdot \text{AlCl}_3$. Free sulfonyl chloride (present when AlCl_3 is not in excess) is not able to withdraw AlCl_3 from $\text{C}_6\text{H}_4\text{BrSO}_2\text{Ph} \cdot \text{AlCl}_3$. Neither of these addition compds. is dissociated in C_6H_6 ; the catalytic action is caused by the combined AlCl_3 , partly by that which is combined with sulfonyl chloride, partly by that which is combined with sulfone. The catalytic action is proportional to the total combined AlCl_3 . The small quantity of free AlCl_3 present in the soln. when an excess of this substance has been employed acts considerably stronger as a catalyst than the combined AlCl_3 . The formation of addition compds. is considered to be accidental. The velocity of reaction with C_6H_6 as a solvent may be represented by the formula $dx/dt = [k(\text{C}_6\text{H}_4\text{BrSO}_2\text{Cl} \cdot \text{AlCl}_3) + k_1(\text{sulfone}, \text{AlCl}_3) + k_2(\text{AlCl}_3)_n](\text{C}_6\text{H}_4\text{BrSO}_2\text{Cl} \cdot \text{AlCl}_3)$, in which $k_2 = k_1$, $k_2 > k_1$, $n = \text{unknown}$, perhaps 1. J. T. FLOHIL.

o-Nitrosophenol. II. OSKAR BAUDISCH AND S. ROTHSCHILD. Univ. Zurich. *Ber.* 48, 1660-5(1915); cf. *C. A.* 6, 2600.—*o*- $\text{ONC}_6\text{H}_4\text{OH}$ (a) is obtained in good yield when $\text{MeC}_6\text{H}_4\text{SO}_3\text{C}_6\text{H}_4\text{NO}$ is boiled a long time with lime over a free flame, cooled, filtered, evapd., to dryness on the H_2O , dissolved in a little H_2O bath, covered with petr. ether and shaken vigorously with HPO_3 ; the emerald-green petr. ether soln. is stable for months and can be used for the detection of traces of Cu; as the Cu salt of (a) is insol. in petr. ether, in testing for Cu Et_2O is added; this easily dissolves the Cu salt with deep red color. Another method of obtaining (a) is as follows: To 5 g. *o*- $\text{MeOC}_6\text{H}_4\text{NO}_2$ and 8 g. AmNO_2 shaken to an emulsion with 50 cc. concd. NH_4OH and 20 cc. of 96% alc. is added 7.5 g. Zn dust in small portions, the temp. rising to the b. p.; after 0.5 hr. the hot soln. is filtered, extd. twice with Et_2O to remove unchanged $\text{MeOC}_6\text{H}_4\text{NO}_2$, treated with excess of $\text{Cu}(\text{OAc})_2$ and acidified with AcOH ; copper *o*-methoxynitrosophenylhydroxylamine, $[\text{MeOC}_6\text{H}_4\text{N}(\text{NO})\text{O}]_2\text{Cu}$, seps. in Ag-gray crystals and, when washed with H_2O and boiled with xylene, gives the Cu salt of (a) (although in very poor yield). Manganese-*o*-nitrosophenylhydroxylamine *p*-toluenesulfonate, $\text{C}_{10}\text{H}_9\text{O}_3\text{N}_2\text{S}_2\text{Mn}$, obtained from 2 g. of the NH_4 salt in 50 cc. H_2O and 2-3 drops NH_4OH treated at 0° with $\text{Mn}(\text{NO}_3)_2$ and cautiously acidified with cold HPO_3 , white-gray ppt. from C_6H_6 -ligroin. Manganese-*o*-hydroxynitrosophenylhydroxylamine (b), from 10 g. of the NH_4 salt of the nitroso sulfonate boiled 45 min. over a free flame with 1.7 g. NaOH until all the NH_3 is expelled, cooled to 0° , treated with cold $\text{Mn}(\text{NO}_3)_2$, cautiously acidified with HPO_3 , quickly filtered, dissolved directly on the filter with AcOEt and pptd. with low-boiling ligroin, very unstable brown crystals continuously losing N_2O_2 and going over into manganese-*o*-nitrosophenol; the latter is obtained by heating 5 g. (b) in 200 cc. AcOEt 3-4 hrs. on the H_2O bath or still better by shaking with AcOEt the Na salt corresponding to (b) in H_2O in the presence of $\text{Mn}(\text{NO}_3)_2$ and HPO_3 at 0° , washing with NaCl , drying with Na_2SO_4 , concg. to a small vol. and pptg. with ligroin; it forms red-brown, almost black crystals with greenish surface luster, sol. in almost all org. solvents except ligroin with deep red color, best crystd. by boiling 1 g. 3 hrs. with 500 cc. AcOEt-EtOH (2:1) and filtering. In the same way from the Na salt, $\text{Al}(\text{NO}_3)_3$ and HPO_3 is obtained aluminium-*o*-nitrosophenol, almost black crystals. CHAS. A. ROUITLER.

m-Nitrosoanisole. OSKAR BAUDISCH AND ROSE FÜRST. Univ. Zurich. *Ber.* 48, 1665-70(1915); cf. preceding abstr.—Ammonium *m*-methoxynitrosophenylhydroxylamine, $\text{MeOC}_6\text{H}_4\text{N}(\text{NO})\text{ONH}_4$ (a) is obtained from 10 g. *m*- $\text{MeOC}_6\text{H}_4\text{NO}_2$ in 200 cc. of cold 96% alc. satd. with NH_3 gas, then treated with H_2S at room temp. until there is a copious deposition of $(\text{NH}_4)_2\text{S}$, allowed to stand 24 hrs. in the ice chest, filtered, freed of dissolved $(\text{NH}_4)_2\text{S}$ and polysulfides by pptn. with Et_2O and filtration, treated with

NaCl soln. until the Et_2O layer is clear and the latter washed with concd. NaCl until the wash waters give no test for H_2S ; the Et_2O soln., which gives all the reactions of hydroxylamines but from which the $\text{MeOC}_6\text{H}_4\text{NHOH}$ could not be isolated, is dried with Na_2SO_4 , treated at 0° with dry NH_3 and then with fresh AmNO_3 , whereupon it solidifies to a thick mush of (a), very stable chalky powder, m. 135° after pptn. from alc. with Et_2O (yield, about 50%); it easily dissolves, without color, in H_2O at room temp. and when the soln. (best in small quantities in test tubes) is treated at -10° with $\text{Br}\cdot\text{H}_2\text{O}$ at 0° as long as the Br color instantly disappears, *m-methoxynitrosobenzene* is formed as a pure white, granular ppt., sol. in all org. solvents with green color, turns green at 40° , m. 48° to emerald-green drops and becomes brown at 80° ; the green melt in the m. p. tubes, allowed to stand in the air, decomps. quickly, becoming completely brown in 2 hrs. The alc. soln. gives at once at room temp. a red compd. with 2,4-(O_2N) $_2\text{C}_6\text{H}_3\text{Me}$ and KOH; with quinaldine ethiodide alone, there is no reaction but on addition of a trace of alkali a dark violet-red color appears. When $\text{Cl}\cdot\text{H}_2\text{O}$ is used instead of Br a bright green product is obtained which m. 42° to deep green drops and again at 75° (with violent foaming) to a brown liquid; after a few days it becomes dirty greenish yellow, no longer dissolves with green but with yellow color in org. solvents, and no longer m. at 42° but only at 75° (foaming); on standing in closed vessels it decomps. completely to a dark brown, moist tar. Freshly pptd., it gives a deep red, Et_2O -sol. Fe salt and therefore probably contains considerable free *m*- $\text{MeOC}_6\text{H}_4\text{N}(\text{NO})\text{OH}$. The freshly pptd. product recrystd. several times from hot ligroin (b. $70\text{--}80^\circ$) gives the yellowish white needles, m. 77° , of the free *m-methoxynitrosophenylhydroxylamine*, which can be obtained from (a) and HPO_3 and is remarkably stable, weathering only after months on clay but more quickly in closed vessels. Aq. (a) and $\text{Cu}(\text{OAc})_2$ give a dark blue voluminous ppt. of the salt $[\text{MeOC}_6\text{H}_4\text{N}(\text{NO})\text{O}]_2\text{Cu}$, forming a light gray powder sol. in CHCl_3 with dark blue color. *Ferric salt*, yellow-brown, sol. in org. solvents with yellow to red color.

CHAS. A. ROULLER.

Some aminoazimido bases and their azo dye derivatives. O. KYM AND M. RINGER. Univ. Zurich. *Ber.* 48, 1671-85 (1915); cf. *C. A.* 6, 356.—As was expected, the azo dye derivs. of azimidobenzene compds., $\text{C}_6\text{H}_4\text{NH.N:N}$, having a 5-membered ring similar

to that of benzimidazole, benzothiazole or benzoxazole compds., $\text{C}_6\text{H}_4\text{R.CH:N}$ ($\text{R} = \text{NH}$,

S or O), are substantive dyes capable of dyeing cotton directly without mordants, although they stand behind the imidazole compds. in this respect. *5-Nitro-2,3-toluylenediamine* (a), in 50% yield from 10 g. 2,3,5- $\text{H}_2\text{N}(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{Me}$ in 33 cc. boiling alc. treated with 18 g. crystd. Na_2S in 30 cc. H_2O , then dild. with 4 vols. cold H_2O , the red cryst. ppt. dissolved in cold dil. HCl, filtered, pptd. with NH_3 and crystd. from dil. alc., felted orange-red needles, m. 185° , easily sol. in dil. HCl; *diacetyl derivative*, obtained with Ac_2O on the H_2O bath, pale yellow needles from dil. alc., m. 234° , insol. in cold dil. HCl, but dissolves on warming; NH_3 now, however, ppts. the anhydro compd., *5-nitro-1- α -dimethylbensimidazole*, $\text{Me}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{NH.CMe:N}$, obtained

directly by boiling (a) 4 hrs. with AcOH, dilg. with much cold H_2O , filtering, making just alk. with NH_3 and crystg. from H_2O ; it m. 186° , and dissolves easily in dil. HCl and also, with pure yellow color, in cold dil. NaOH. *5-Nitro-1-methylbensimidazole*, from (a) boiled a long time with HCO_2H , needles from H_2O , m. $199\text{--}200^\circ$, sol. in dil. HCl and, with yellow color, in dil. NaOH. *5-Nitro-1-methyl- α -hydroxybensimidazole*, from 1 g. (a) and 2.5 g. urea heated 1 hr. at $160\text{--}70^\circ$ until a solid cryst. mass is formed (evolution of NH_3), dissolved in warm dil. NaOH, filtered, pptd. with dil. HCl and crystd. from much hot H_2O , hair-like needles, m. $329\text{--}30^\circ$, sol. in cold dil. NaOH with

intense yellow color, excess of concd. NaOH pptg. a cryst. brick-red Na salt. *5-Nitro-1-methyl-2,3-asimidobenzene*, quant. obtained from (a) in cold dil. HCl and the calcd. amt. of NaNO_2 , yellow needles from dil. alc., m. $252-3^\circ$, sol. in hot alc., Me_2CO or AcOH with yellowish color, in concd. HCl and, with intense yellow color, in dil. NaOH, reduced by SnCl_2 , Sn and concd. HCl to the *amino compound*, brownish needles losing H_2O of crystn. at $80-5^\circ$ and m. $161-2^\circ$, easily sol. in cold dil. alkalies; *acetyl derivative*, obtained with NaOAc and boiling Ac_2O , needles from dil. alc., m. 283° , insol. in dil. HCl but easily sol. in dil. NaOH, gives with ice-cold NaOH and Ac_2O the *diacetyl derivative*, Ag-white needles from Me_2CO , m. $239-40^\circ$, which, boiled 1 hr. with H_2O , loses AcOH and regenerates the mono-Ac compd. $2,4,5\text{-H}_3\text{N}(\text{AcNH})_2\text{C}_6\text{H}_2\text{Me}$, from 2 g. of the NO_2 compd. added in small portions to 4 g. Fe filings in 100 cc. of warm 5% AcOH, warmed not more than 0.5 hr. (otherwise the imidazole is formed in considerable amt.), dild. with 60 cc. hot H_2O , filtered hot, freed from Fe with solid soda, filtered hot, concd. and crystd. from H_2O , m. $252-3^\circ$ (cf. Maron, C. A. 6, 362); with somewhat more than the calcd. amt. of NaNO_2 in cold dil. HCl, it at once gives *1-methyl-2-acet-amino-4,5-acetylasimidobenzene*, $\text{Me}(\text{AcNH})\text{C}_6\text{H}_2\text{N}(\text{Ac})\text{N}:\text{N}$, needles from Me_2CO , m.

220° , easily sol. in dil. NaOH and concd. HCl, loses both Ac groups when boiled 5 min. with dil. HCl; boiled 1 hr. with 50 parts H_2O it gives *1-methyl-2-acetamino-4,5-asimidobenzene*, needles, m. 235° , also obtained by recrystg. the di-Ac compd. twice from PhNO_2 or evapg. its $\text{C}_6\text{H}_5\text{N}$ soln. on the H_2O bath and converted back into the di-Ac compd. with Ac_2O and cold NaOH; it is sol. in dil. alkalies and in concd. HCl; 1 g. heated on the H_2O bath with 15 cc. H_2O , 5 cc. alc. and 5 cc. concd. HCl gives *1-methyl-2-amino-4,5-asimidobenzene*, needles from H_2O , m. 173° (on slow cooling of the aq. soln. it seps. in red-brown prisms with H_2O of crystn. in which it m. $80-3^\circ$), sol. in dil. NaOH, gives with concd. HCl a difficultly sol. salt at once dissolving on addition of H_2O . *o-Amino-p,m'-dinitrodiphenylamine* (b), obtained in 60% yield from 5 g. $\text{O}_2\text{NC}_6\text{H}_4\text{NHC}_6\text{H}_3(\text{NO}_2)_2$ in 30 cc. each of warm Me_2CO and alc. treated with 10 g. crystd. Na_2S in 20 cc. hot H_2O , heated 10 min. on the H_2O bath, cooled, dild. with 4 vols. of H_2O , the brown voluminous ppt. extd. with boiling Me_2CO and a few drops of NH_4OH until the ext. gives no ppt. with H_2O , the H_2O ppt. dissolved in boiling dil. HCl (1:4), pptd. with NH_4OH , allowed to stand some hrs. in the cold and crystd. from dil. alc., red needles, m. $207-8^\circ$, easily sol. in very dil. HCl, sol. in boiling NaOH with red color and loss of NH_3 ; *acetyl derivative*, golden yellow needles from Me_2CO , m. 205° . *N-m-Nitrophenyl- α -methyl-p-nitrobenzimidazole*, from (b) covered with hot Ac_2O and 1-2 drops concd. H_2SO_4 , whereupon the (b) dissolves with energetic reaction, then dild. with H_2O , brought to a boil, filtered and cooled, pptd. from dil. HCl with NH_4OH and crystd. from alc., Ag-white needles, m. $226-7^\circ$, easily sol. in cold dil. HCl, insol. in cold or hot alkalies, also obtained by heating the above Ac deriv. a short time at its m. p. or boiling it in dil. HCl. *N-m-Nitrophenyl-p-nitroasimidobenzene*, from (b) and NaNO_2 in cold dil. HCl, yellow-brown needles from $\text{C}_6\text{H}_5\text{N}\cdot\text{H}_2\text{O}$, m. 181° , insol. in HCl or NaOH. *N-m-Aminophenyl-p-aminoasimidobenzene*, from 1 g. of the di- NO_2 compd., 2.5 g. SnCl_2 and a little Sn cautiously warmed on the H_2O bath with 5 cc. concd. HCl until a clear soln. results, dild. with H_2O , filtered, supersatd. with cold NaOH, repeatedly pptd. from cold dil. HCl with NaOH, dried on clay, dissolved in hot Me_2CO , treated with an equal vol. of hot H_2O and slowly freed from Me_2CO on the H_2O bath, brownish needles, m. $214-5^\circ$, easily sol. in dil. HCl; when covered with Ac_2O it dissolves with evolution of heat and at once deposits the *diacetyl derivative*, sepg. from alc.- H_2O in gelatinous flocks which dry on clay to gleaming scales, m. $248-9^\circ$. For details concerning the prepn. of the azo dyes and the dyeing expts. cf. R.'s dissertation (Zurich, 1915).

CHAS. A. ROUILLER.

Fat acid esters of ethylene glycol. R. F. RUTMAN AND J. R. ROEBUCK. *Trans. Roy. Soc. Canada* [3] 9, June, 1915, 11 pp.—Glycol distearate (Wurtz, *Ann. chim. phys.* [3] 55, 436(1859), prepd. by nearly satg. the acid in alc. with NH_3 , treating with an equiv. amt. of alc. AgNO_3 , distg. off the excess of NH_3 and a little of the alc., cooling allowing to stand, filtering, washing and drying the resulting cryst. Ag salt, adding it in small portions to an excess of $(\text{CH}_2\text{Br})_2$ at about 131° , heating 2–4 hrs., distg. off the excess of $(\text{CH}_2\text{Br})_2$, extg. with boiling Et_2O , filtering warm, evapg. and crystg. from nearly abs. alc., pearly plates (sometimes needles from Et_2O), m. 75° , n_{D}^{25} 1.4385, d_{40}^{25} 0.8581; sol. in 100 g. abs. alc., 0.010 and 0.112 g. at 0° and 40° , resp. The intermediate product, $\text{BrCH}_2\text{CH}_2\text{O}_2\text{CC}_{17}\text{H}_{35}$, which must be formed, could not be isolated. Both the mono- and di-esters are more conveniently prepd. by heating 100 g. acid with 1.5 mols. glycol at $180\text{--}90^\circ$ in a flask provided with a Pt stirrer for 4–7 hrs., washing the resulting mixt. 2–3 times with hot H_2O , allowing to cool, removing the cake of fat, detg. the excess of acid by titration and sepg. it by fusing on the H_2O bath with the calcd. amt. of $\text{Ca}(\text{OH})_2$, extg. with Et_2O , filtering hot, evapg. and crystg. repeatedly from alc., there always remains 10–5% of almost non-cryst., very sol. substance. The yield of di-ester is always many times greater than that of mono-ester. *Mono-stearate*, m. 58.5° , n_{D}^{25} 1.4310, d_{40}^{25} 0.8780; solubility in 100 g. alc., 0.64 and 10.61 g. at 0° and 29° . *Dipalmitate*, m. 68.7° , n_{D}^{25} 1.4378, d_{40}^{25} 0.8594; solubility in 100 g. alc., 0.018 and 0.31 g. at 0° and 38° . *Monopalmitate*, m. 51.5° , n_{D}^{25} 1.4411, d_{40}^{25} 0.8786; solubility in 100 g. alc., 1.62 and 24.08 g. at 0° and 25° . *Dimargarate*, m. 65.5° , solidifies 64.7° , n_{D}^{25} 1.4392, d_{40}^{25} 0.8605; solubility in 100 g. alc. 0.024 and 0.101 g. at 0° and 25° . *Monomargarate*, thin plates from dil. alc., m. 50.2° , n_{D}^{25} 1.4440; 1.72 g. dissolves in 100 g. alc. at 0° . The *oleates* were obtained only in pasty condition at low temps. and rapidly hydrolyzed and oxidized. *Glycol chloride stearate* (a), $\text{ClCH}_2\text{CH}_2\text{O}_2\text{CC}_{17}\text{H}_{35}$, from equiv. amts. of $\text{ClCH}_2\text{CH}_2\text{OH}$ and $\text{C}_{17}\text{H}_{35}\text{CO}_2\text{Ag}$ heated 18 hrs. at $105\text{--}15^\circ$, extd. with hot Et_2O , filtered hot, evapg. and crystd. repeatedly from alc., m. 48.5° , d_{40}^{25} 0.9049, n_{D}^{25} 1.4433; solubility in 100 g. alc., 0.20 and 3.62 g. at 0° and 29° . *Chloride palmitate*, m. 41.5° , n_{D}^{25} 1.445, d_{40}^{25} 0.9097; solubility in 100 g. alc., 0.48 and 15.31 g. at 0° and 29° . *Glycol stearate palmitate*, from (a) and $\text{AgO}_2\text{CC}_{15}\text{H}_{31}$ heated 3–4 hrs. at 140° , or $\text{KO}_2\text{CC}_{15}\text{H}_{31}$ heated much longer, m. 65° , d_{40}^{25} 0.8584, n_{D}^{25} 1.4391, solubility in 100 g. alc., 0.011 and 0.213 g. at 0° and 39° . C. A. R.

Catalytic reduction of unsaturated compounds. X. Reduction of aromatic alcohols, aldehydes and ketones. A. SKITA. *Ber.* 48, 1685–98(1915); cf. C. A. 9, 3249.—While the expts. with BzH and Ph_3CO previously reported did not give much hope of the possibility of reducing aromatic aldehydes and ketones by the catalytic method to the corresponding hydro aldehydes and ketones, the products in these cases having been PhMe and hexahydrotoluene on the one hand and CH_3Ph and $(\text{C}_6\text{H}_{11})_2\text{CH}_2$ on the other, the results were entirely different with PhCH:CHCHO (a); 10 g. (a) in 100 cc. alc., 10 cc. of 1% PdCl_2 , 20 cc. of 2% gum arabic and 30 cc. H_2O absorbs 1 mol. H_2 in 1 hr., when the Pd flocculates out and absorption ceases; the soln. is filtered, the alc. distd. off *in vacuo* and the residue treated with H_2O , the resulting yellow oil extd. with Et_2O , dried with ignited potash and fractionated, giving almost exclusively $\text{PhCH}_2\text{CH}_2\text{CHO}$, together with 0.8 g. $\text{PhCH:CHCH}_2\text{OH}$. When 6 g. (a) in 45 cc. AcOH , 10 cc. of 5% H_2PtCl_6 , 25 cc. of 2% gum arabic and 10 cc. of inoculation soln. is reduced, the 1st mol. of H_2 is absorbed in 0.5 hr. under 1 atm. excess pressure and the 2nd only in 6 hrs., when there is practically no more absorption, even under 3 atm. excess pressure; the product obtained by extg. the neutralized reaction mixt. with Et_2O yields on fractionation 0.3 g. PhPr , b. 157° , while the main fraction consists of $\text{PhCH}_2\text{CH}_2\text{CH}_2\text{OH}$, b. 235° . When 5 g. (a) in 50 cc. AcOH , 10 cc. of 10% H_2PtCl_6 , 30 cc. of 2% gum arabic and 16 cc. of inoculation soln. (0.003 cc. Pt per cc.) is reduced

under 3 atm. excess pressure, 5 mols. H_2 are absorbed in 5 hrs., the 1st in 0.5 hr., the 2nd in 1.5 hrs. and the last 3 in 3 hrs., when absorption practically stops; the soln. is made alk., distd. with steam and the oil fractionated; besides small amts. of PhPr, b. 157° , $C_6H_{11}Pr$, b. 147° , and $PhCH_2CH_2CH_2OH$, b. $230-40^\circ$, the chief product is *hexahydrophenylpropyl alcohol*, b. $222-4^\circ$, $d_{20} 0.9358$, has a penetrating odor; *acetate*, $b_{18} 120-1^\circ$, $d_{20} 0.9398$; with $Na_2Cr_2O_7-H_2SO_4$ in hot dil. AcOH the alc. yields the *aldehyde*, $b_{18} 87-8^\circ$ (yield, 3 g. from 8 g. alc.), isolated through the *semicarbasone*, crystals from C_6H_6 -petr. ether, m. 128° . The fact that after the quick absorption of the 1st mol. of H_2 (formation of $PhCH_2CH_2CHO$), the 2nd mol. (formation of $PhCH_2CH_2CH_2OH$) is absorbed much more slowly than the last 3 (hydrogenation of the nucleus) is explained by the assumption that between the Pt metal and Pt compds. on the one hand and the aromatic double bonds on the other are formed double compds. which act as carriers of the H. In the reduction of $PhCH_2CHO$, besides the chief product *hexahydrophenylethyl alcohol* (b), liquid of a rose-like odor, b. $206-9^\circ$ (*acetate*, $b_{18} 104^\circ$), considerable more of the hydrocarbons, PhEt and $C_6H_{11}Et$, are formed than in the case of (a). With $K_2Cr_2O_7-H_2SO_4$ in hot dil. AcOH (b) gives 34% of the *aldehyde*, $b_{18} 79-80^\circ$, isolated through the *semicarbasone*, m. 153° after crystn. from dil. alc. (b) is obtained more quickly and in better yield when the $PhCH_2CHO$ is reduced in the form of the acetate of its enol. compd., *vis.*, $PhCH:CHOAc$, and it is well to isolate the intermediate compd., $PhCH_2CH_2OAc$; 3.9 g. of this, $b_{18} 118-20^\circ$, in 30 cc. AcOH, 10 cc. of 5% H_2PtCl_6 , 10 cc. of colloidal inoculation soln. and 5 cc. of 2% gum arabic absorbs 3 mols. H_2 under 3 atm. excess pressure in 2 hrs. Acylation, however, is not a general protection of the aldehyde group against reduction to the hydrocarbon; $PhCH_2OBz$, $PhCH_2OAc$, $PhCH(OAc)_2$ give PhMe; even $PhCH_2OEt$ gives chiefly PhMe. When, however, 15 g. $PhCH_2NHPh$, from BzH and $PhNH_2$ and subsequent reduction of the $PhCH:NPh$ with Na and alc., in 150 cc. AcOH, 60 cc. of 10% H_2PtCl_6 , 22 cc. of 10% gum arabic and 15 cc. of inoculation soln. is reduced under 3 atm. excess pressure, 6 mols. H_2 are absorbed in 3 hrs.; the filtered soln. is made alk. with concd. NaOH, extrd. with Et_2O , dried and fractionated, yielding, besides 3.5 g. of $C_6H_{11}NH_2$ and $C_6H_{11}Me$, 18 g. of *dodecahydrobensylaniline* (c), b. 270° , volatile with steam, forms with $NaNO_2-HCl$ a nitrosamine, which gives the Liebermann reaction with $PhOH-H_2SO_4$ and regenerates (c) with Zn and acids; *hydrochloride*, crystals from Et_2O -alc., m. 305° . Slowly treated in cold Me_2CO with $KMnO_4$ in aq. Me_2CO (c) gives the *bensalaniline*, which, on treatment with concd. HCl, yields 42% of $C_6H_{11}CHO$, b. $160-5^\circ$. Similarly, 5 g. $Ph_3CHNHPh$, $b_{18} 224-5^\circ$ (from the HCl salt, m. 202.5°), in 113 cc. AcOH, 35 cc. of 10% H_2PtCl_6 , 17 cc. of inoculation soln., 10 cc. of 2% gum arabic, 75 cc. of H_2O and 100 cc. of AcOH at 50° under 1 atm. excess pressure absorbs 3 mols. H_2 in 5 min. and another 3 in 20 min. (with colloidal Pt instead of H_2PtCl_6 , the times required are 25 and 60 min., resp., under 3 atm. excess pressure); there are obtained 0.3 g. $C_6H_{11}NH_2$, b. 134° ; 1.3 g. *dodecahydrodiphenylmethane*, b. $247-8^\circ$; and chiefly *dodecahydro[phenyliminodiphenylmethane]*, $Ph(C_6H_{11})CHNHC_6H_{11}$, $b_{18} 189^\circ$ (*hydrochloride*, needles from alc.- Et_2O , m. $276-7^\circ$), which with $Na_2Cr_2O_7$ in boiling 50% H_2SO_4 gives hexahydrobenzophenone; *semicarbasone*, crystals from C_6H_6 -petr. ether, m. 175° . That the reduction proceeds more rapidly with H_2PtCl_6 than with colloidal Pt is further confirmation of the correctness of the assumption of double compds. acting as H carriers.

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sym-m-Xylenol. K. v. AUWERS AND E. BORSCHKE. Marburg. *Ber.* 48, 1698-716(1915); cf. C. A. 9, 1057.—As previously reported, 3,5- $Me_2C_6H_3OMe$ (a), when treated with CCl_4 and $AlCl_3$, gives, instead of the expected *p*-HO ketone, the two *o*-derivs., 2,3,5- $AcMe_3C_6H_2OH$ (b), and 2,6,3,5- $Ac_2Me_2C_6H_2OH$ (c), the constitution of which is indicated by the fact that both compds. are volatile with steam and is proved

by the work described below. The Me ether of (b), m. 48–9°, b_{14} 135°, is obtained in 80–90% yield from equimol. amts. of (a) and AcCl in 3 vols. cold CS_2 treated with an amt. of AlCl_3 equal to the wt. of (a) with thorough cooling and frequent shaking and allowing to stand 1–2 days at room temp. *Oxime*, from the ketone, 2 mols. $\text{NH}_4\text{OH} \cdot \text{HCl}$ and 6 mols. NaOH allowed to stand 2 days in aq. alc. soln., prisms from C_6H_6 or PhMe , m. 135°; *semicarbazone*, from the ketone, $\text{H}_2\text{NCONHNH}_2 \cdot \text{HCl}$ and KOAc heated 2 days at 50°; microcrystals, m. 185°. If the oxime in excess of Ac_2O is allowed to stand some hrs. and then evapd. *in vacuo* over NaOH , it leaves a colorless oil, doubtless the *oxime acetate*, which regenerates the oxime on gentle warming with alkalis; if, on the other hand, the oxime is boiled 1 hr. with 2 parts Ac_2O and a little NaOAc and poured into dil. soda, it gives *o*-diacetylamino-sym-m-xylenyl methyl ether, $\text{Ac}_2\text{NMe}_3\text{C}_6\text{H}_4\text{OMe}$, flat needles from dil. MeOH or benzine, m. 80–1°, converted by boiling aq. or alc. alkalis into the *monoacetyl derivative*, prisms from C_6H_6 or needles from H_2O , m. 150.5°, which is also obtained from the oxime in Et_2O treated with an equiv. amt. of PCl_5 and ice; it is attacked by boiling alc. alkalis only with difficulty and is also quite stable towards hot HCl ; in fact, it is obtained when the oxime is heated at 100° in sealed tubes with concd. HCl . *o*-Aceto-sym-m-xyleneol (b) is prepd. like its Me ether, except that the reaction mixt. need not be cooled; when the evolution of HCl ceases, an amt. of AlCl_3 equal to that originally used is added and the mixt. is heated 1 hr. on the H_2O bath. Some (c) is always formed and passes over in the last portions of the steam distillate. The yield of (b), m. 57–8°, b_{18} 140–1°, is generally 60–70%. With alk. Me_2SO_4 it gives the Me ether above. *Oxime*, flat needles and prisms from dil. MeOH , C_6H_6 or PhMe , m. 143°; *semicarbazone*, crystals from alc. or C_6H_6 , m. 217–8°. Boiled with Ac_2O and NaOAc the oxime gives an oil, probably a tri-Ac deriv., which with alc. alkalis loses AcOH and becomes alkali-sol., acids then pptg. *o*-acetylamino-sym-m-xyleneol, scales from H_2O , m. 186–7°, which with boiling moderately concd. HCl (1:1) is hydrolyzed to the free $\text{H}_2\text{NMe}_3\text{C}_6\text{H}_4\text{OH}$, only little of the ethenyl base (see below) being formed. The *N*-Ac compd. is also formed when the oxime in AcOH is satd. with HCl gas; some of the free NH_2 compd. is formed as by-product. *Ethenyl-o-amino-sym-m-xyleneol*, $\text{Me}_2\text{C}_6\text{H}_3\text{N}:\text{CMe}_2\text{O}$, is the chief product when the oxime is rear-

anged with PCl_5 ; it solidifies to needles, m. 28.5°, b. 234–6°, has a penetrating characteristic odor; *hydrochloride*, long needles from H_2O , m. 139° (decompn.), easily hydrolyzed when heated; *nitrate*; *sulfate*; *chloroplatinate*; *chloromercurate*, flat needles from very dil. HCl . The base is also formed, together with $\text{H}_2\text{NMe}_3\text{C}_6\text{H}_4\text{OH}$, when the oxime is heated with concd. HCl in sealed tubes at 100°. *o*-Amino-sym-m-xyleneol, best obtained by heating 10 g. of the above oxime with 100 cc. each of HCl and H_2O until the crystals first formed redissolve, treating with steam for a short while to remove the ethenyl base, filtering hot and concg. to incipient crystn. of the HCl salt and pptg. from the latter in hot H_2O with NH_4OH , soda, NaOAc , or, best, Na_2SO_3 ; it crysts. from C_6H_6 in needles, m. 158–9°; *hydrochloride*, crystals from hot H_2O or dil. HCl , m. 270–80°, depending on the rate of heating, stable in light and air when dry. *Sodium salt*, from the base rubbed with NaOH , dissolves in H_2O but soon hydrolyzes and a yellow oxidation product soon begins to sep. *Dibenzoyl derivative*, felted needles from MeOH , m. 148–9°; gentle warming with alc. alkali gives the *N*-monobenzoyl derivative, crystals from MeOH or dil. alc., m. 211–2°. *o,o*-Diaceto-sym-m-xyleneol (c) has been obtained in 66% yield of the (a) used (systematic expts. on the best method of prepn. have not yet been carried out) by slowly adding with cooling 60 g. AlCl_3 to 10 g. (a) and 25 g. AcCl in 150 cc. CS_2 , gently warming 1 hr., distg. off the solvent, decompg. with HCl and ice, drying on clay and crystg. from benzine or MeOH ; it m. 109–10°. *Dioxime*, plates from C_6H_6 , m. 173–4°. *p*-Benzeneazodiacetoxyleneol, from (c) and 3 mol OH treated with an equimol. amt. of PhN_2Cl , allowed to stand some time

and acidified with AcOH, ruby-red crystals or flat needles from benzine, m. 138-9°. *Acetate*, $\text{Me}_2\text{Ac}_2(\text{PhN}_2)\text{C}_6\text{OAc}$, orange needles from MeOH or C_6H_6 ; treated in 20 parts alc. alternately with Zn dust and AcOH until decolorized, filtered and dild. with H_2O , it gives the *hydraso acetate*, silky needles from alc., m. 175-6°, insol. in alkalis. *2-Hydroxy-4,6-dimethylbenzaldehyde*, needles from dil. MeOH, m. 48-9°, sol. in alkalis with yellow color, gives a violet color with FeCl_3 , is obtained in small yield when 20 g. $3,5\text{-Me}_2\text{C}_6\text{H}_3\text{OH}$ (*d*) in 50 g. NaOH and 50 g. H_2O at 60-70° is treated with 40 g. CHCl_3 , heated for some time, steam distd., the distillate extd. with Et_2O , the ext. shaken several hrs. with concd. NaHSO_3 , the product decompd. with soda and again steam distd. The residue from the 1st steam distn. on cooling deposits a considerable amt. of $2,6,4\text{-Me}_3(\text{HO})\text{C}_6\text{H}_2\text{CHO}$, m. 190°; its Me ether, obtained by methylation of the HO compd., seps. from low-boiling petr. ether in needles, m. 45-7° (Gattermann, C. A. 2, 820, gives 18°). Nitration of 20 g. of (*d*) gives about 6 g. of *o*-nitro-*sym-m*-xyleneol, lemon-yellow needles from ligroin or dil. MeOH, m. 66°, volatile with steam, and a larger amt. of the *p*-nitro compound, yellowish prisms from ligroin, m. 107-8°. The *o*-compd. heated 3 hrs. at 160-70° with 1 mol. BzCl gives the *benzoate*, flat prisms from ligroin, m. 71-2°, reduced by Zn and AcOH to the $3,5,2\text{-Me}_2(\text{BzNH})\text{C}_6\text{H}_3\text{OH}$ above. *p*-Nitroso-*sym-m*-xyleneol, from a very dil. soln. of (*d*) and NaNO_2 in cold NaOH treated slowly with dil. AcOH and allowed to stand 24 hrs., prisms from alc., m. 182-3°. (*d*) in cold AcOH slowly treated with 1 mol. Br in 10 parts AcOH gives *p*(*p*)-*bromo-sym-m*-xyleneol, flat needles from ligroin or C_6H_6 , m. 115-6°, couples in alk. soln. with PhN_2Cl to a brown-yellow substance insol. in alkalis. Some di-Br compd. and unchanged (*d*) are also obtained. Using 2 mols. Br, the product is the *o,p*-*dibromo compound*, crystals from low-boiling petr. ether, m. 73-4°, while in more concd. soln. with the calcd. amt. of Br is obtained the tri-Br compd., m. 165-6°. CHAS. A. ROUILLER.

Formation of mono- and disazo compounds from phenols and phenol ethers. K. V. AUWERS AND E. BORSCHÉ. Marburg. Ber. 48, 1716-30(1915); cf. C. A. 8, 2389.—It was previously found in the study of mono- and dialkylphenols and their ethers that in general their coupling ability increases with the number of alkyl groups and that *m*-alkyls have the greatest influence. It has now been found that a 3rd alkyl has not much influence while an *o*-Ac group considerably decreases the coupling ability; tetra-alkylphenols and even $3,5,2,6\text{-Me}_4\text{Ac}_2\text{C}_6\text{HOH}$ couple as readily as simpler phenols. With the ethers a 3rd alkyl slows up the coupling somewhat and a 4th strongly impedes it. The coupling expts. were carried out in the same way as in the earlier work. *sym-m-Xyleneol isopropyl ether*, from the xyleneol and 1 mol. iso-PrONa digested 0.5 hr. in iso-PrOH on the H_2O bath, then heated 6 hrs. in sealed tubes with 1.5 mols. iso-PrBr, b. 208-10°; 2 g. coupled with azophor red yielded 2 g. *p*-nitrobenzeneazoxyleneol isopropyl ether, brown-violet needles from ligroin, m. 92-3°. *sym-m-Xyleneol allyl ether* (*a*), from the xyleneol and 1 mol. NaOEt in alc. boiled with the calcd. amt. of allyl bromide to the neutral point, b_{11} 109°; *p*-nitrobenzeneazo compound, flat, brown-red needles from benzine. *Isopseudocumenol methyl ether*, from the phenol and Me_2SO_4 , b. 213-6°; *p*-nitrobenzeneazo compound, brown-red leaflets, m. 130-2°. From 1 g. $2,3,5\text{-AcMe}_3\text{C}_6\text{H}_2\text{OH}$ and 1 mol. PhN_2Cl allowed to stand 1.5 days in cold 1% NaOH are obtained 0.95 g. *p*-benzeneazo-*o*-aceto-*sym-m*-xyleneol, orange needles from petr. ether, m. around 94°, easily sol. in aq. alkalis, and 0.34 g. of the *o,p*-disazo compound, brown needles from alc., m. 169-70°; similar expts with the Me ether gave mostly unchanged ether with small amts. of red, tarry products after several days. *o*-Ethyl-*sym-m*-xyleneol, from the *o*-Ac compd. with amalgamated Zn and HCl in 75% yield, flat needles from petr. ether, m. 80-1°, gives a greenish color with FeCl_3 ; methyl ether, b_{11} 110°. From 1 g. of the phenol is obtained 0.39 g. of the *p*-benzeneazo compound, bright red, flat needles from petr. ether, m. 119-20°, and 0.7 g. of the disazo compound, brown needles with golden

luster from alc., m. 148-9°, while the Me ether after 2.5 days yields 50% of *p*-nitrobenzeneazo-*o*-ethyl-sym-*m*-xlenol methyl ether, brown-red needles from benzine, m. 120-1°. *o*-Allyl-sym-*m*-xlenol, from (a) heated under a reflux condenser until the temp. of the liquid no longer rose, shaken with alkali repeatedly and distd. *in vacuo*, b₁₇ 135-6°, needles from low-boiling petr. ether, m. 50.5°, gives no color with FeCl₃; methyl ether, b₁₉ 116°. From 1 g. of the phenol is obtained 0.44 g. of the *p*-benzeneazo compound, red needles from petr. ether, m. 94-5°, and 0.81 g. *disazo* compound, violet-brown felted needles from alc., m. 132-3°; the Me ether in 2.5 days gives 24% of the *p*-nitrobenzeneazo compound, brown needles without luster from benzine, with bluish luster from MeOH, m. 94-4.5°. *o*,*o*-Diaceto-sym-*m*-xlenol methyl ether, prisms from dil. MeOH, m. 71-2°, does not couple with azophor red. The phenol is reduced by Zn-Hg and boiling HCl in 1.5 days to *o*,*o*-diethyl-sym-*m*-xlenol (60% yield), flat needles from low-boiling petr. ether, m. 88°, gives no color with FeCl₃; methyl ether, yellowish oil, b₁₀ 116-8°; ethyl ether, obtained with NaOEt and EtI, yellow oil, b. 254-5°. *p*-Benzeneazo compound of the phenol, red needles from petr. ether, m. 126-8°; *p*-nitrobenzeneazo compound, obtained after 2 days in AcOH and NaOAc, brown needles from benzine, m. 168-70°. *p*-Nitrobenzeneazo-*orcinol* 3-methyl ether, obtained almost quant. from the components in AcOH after 3 days, dark red needles with bluish luster from AcOH, m. 225-6°; dimethyl ether, also obtained almost quant. in the same way, silky red-brown needles from alc., m. 100-1°. *p*-Benzeneazo-sym-*m*-xylidine, from 3 g. xylidine, 7 cc. of 10% HCl, 50 cc. of 0.5 *N* PhN₂Cl and 8.32 g. NaHCO₃ allowed to stand several days, thin red needles from benzine, m. 67°. *p*-Benzeneazo-*vic*-*m*-xylidine, from the components in the above proportions and subsequent boiling of the crude product with HCl to destroy the admixed diazoamino compd., flat brown needles with bluish luster from benzine, m. 99-101°. *p*-Benzeneazo-*vic*-*o*-xylidine, ruby-red prisms from benzine, m. 96.5-7.5°.

CHAS. A. ROULLIER.

Structure of tyrosine (GEAKE) 11A. Magnetochemistry of inner-complex compounds (LIFSCHITZ) 2.

II. BIOLOGICAL CHEMISTRY.

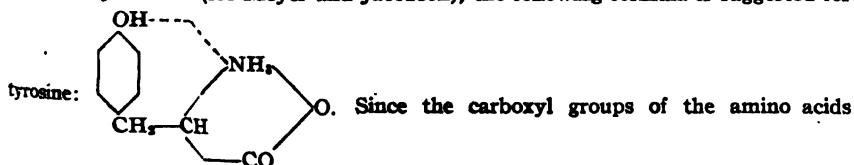
WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

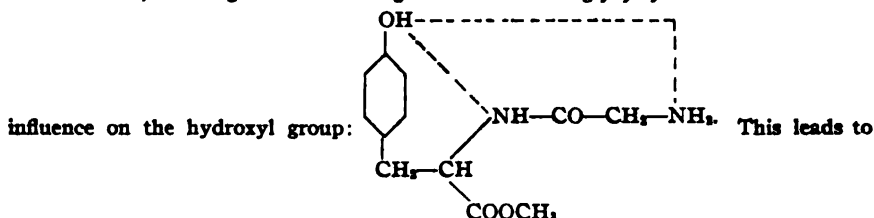
FRANK P. UNDERHILL.

Note on tyrosine. A. GEAKE AND M. NIERENSTEIN. Univ. Bristol. *Biochem. J.* 9, 309-12(1915).—G. and N. confirm their previous statement (*C. A.* 8, 3801) that tyrosine is not methylated by diazomethane in ethereal suspension. This is in accordance with their findings with other amino acids, and has led them to accept the "betaine" formula for these acids (see Meyer and Jacobson, *Lehrb. organ. Chem.* 2, ii,

733(1913)): $R-CH \begin{array}{c} \text{NH}_2 \\ \diagup \quad \diagdown \\ \text{CO} \quad \text{O} \end{array}$. To express the influence that the N atom has on the hydroxyl radical (see Meyer and Jacobson), the following formula is suggested for



can be methylated on acylation, when the "betaine" ring is opened (C. A. 8, 3563), the action of diazomethane on glycytyrosine was studied in relation to its action on tyrosine hydroxyls in caseinogen. The glycytyrosine methyl ester (A) was obtained, showing that the nitrogen atoms of the glycytyrosine still have an



the conclusion that the tyrosine hydroxyls in methylocaseinogen are not methylated by diazomethane. B. HOROWITZ.

The origin of the glucosamine obtained in the hydrolysis of *Boletus edulis*. WINIFRED ROSS. Univ. St. Andrews. *Biochem. J.* 9, 313-9(1915).—The action of concd. HCl on the fungus *Boletus edulis* produced glucosamine-HCl; glucosamine was not produced by H₂SO₄. The suggestion is made that the glucosamine thus isolated is derived from a complex, of the nature of glucoprotein, containing carbohydrate and amino residues, and that it does not exist in the form of a glucosamine glucoside.

B. HOROWITZ.

Reducing enzymes of dried yeast (Lebedev) and of rabbit muscle. A. HARDEN AND R. V. NORRIS. *Biochem. J.* 9, 330-6(1915).—The property of dried yeast (Lebedev) of reducing methylene blue, lost by washing, can be restored by treatment with the following substances: salicylaldehyde, benzaldehyde, anisaldehyde, isovaleraldehyde, phloroglucinol, dihydroxyacetone, glycolic acid, citric acid, glyceric acid, succinic acid, bouillon, boiled yeast ext., normal horse serum, acid sterile milk. The suggestion that these substances are capable of acting as acceptors for the O activated during the reduction process (cf Harden and Norris, C. A. 8, 3059) is not borne out by the fact that several of the following substances, all of which are without effect, are easily oxidizable: quinol, *p*-phenylenediamine, pyrogallol, resorcinol, citral, glycerol, propyleneglycol, 2,3-butyleneglycol, formic acid, acetaldehyde, glucose, levulose, glyccoll, alanine, tyrosine, malic acid, tartaric acid, mandelic acid, yeast nucleic acid, creatine, asparagine, guanidine-acetic acid, guanidine nitrate, glycol, Witte peptone, acetone, pyruvic acid, and methylglyoxal. Lactic acid, either as free acid or as the Na salt, was very active. Glycolic, glyceric, and citric acids produce slow reduction. Attempts to establish a quant. relation between the amts. of methylene blue reduced and the amt. of lactic acid oxidized, failed. Acetaldehyde was one of the oxidation products formed. This suggests that the lactic acid is first converted to pyruvic acid, and that the latter is then decomposed by the carboxylase of the washed yeast into CO₂ and acetaldehyde which, being incapable of further oxidation under the conditions of the expt., could be detected in the liquid. Minced muscle of the rabbit, washed several times with saline soln., behaves similarly to dried yeast, in that it loses the power of reducing methylene blue. Acetaldehyde reactivates washed muscle, though it has no effect on washed yeast. The expts. on muscle are being continued.

B. HOROWITZ.

The supposed synthesis of uric acid from its decomposition products by tissue extracts. HENRY M. SPIERS. Univ. Cambridge. *Biochem. J.* 9, 337-41(1915).—The author repeated the expts. of Ascoli and Izar (C. A. 3, 2011; 4, 1055) in which ox liver ext. was used. Na urate was added to this, and it was aerated and incubated.

Ascoli and Izar claim that this operation destroys the uric acid, but S. finds that on satg. the resulting mixt. with an inert gas such as CO_2 , H, or N, or by merely incubating the product in a closed vessel, the uric acid is quantitatively regenerated. Further, Ascoli and Izar, in attempts to det. what substances give rise to uric acid, found that dialuric acid and urea combined to form uric acid in presence of ox liver ext. under anaërobic conditions. S. failed to get any of these results. B. H.

The role of fluorine in the animal organism. G. BV. KAMPEN. *Chem. Weekblad* 12, 225-32(1915).—Mainly a discussion of A. Gautier's paper on this subject (*C. A.* 8, 1451). J. T. FLOHL.

The action of pectase. N. G. BALL. *Sci. Proc. Roy. Dublin Soc.* 14, 349-57 (1915).—Pectin was obtained from the roots of the carrot by mincing them and heating on the water bath for 2 hrs. to coagulate the albuminous substances. The pulp was squeezed out, the liquid treated with $\text{H}_2\text{C}_2\text{O}_4$ to ppt. the Ca^{++} and the pectin sepd. by addition of an equal vol. of alc., filtered off, redissolved in hot H_2O and then re-pptd. by more alc. In this way, about 0.3 g. pectin was obtained from 1100 g. carrots. Before use the pectin was dild. with H_2O to a 2% soln. and toluene was added as a preservative. Sap pressed from leaves of *Syringa vulgaris* was used as a source of pectase. The elec. resistance of a mixt. of pectase and pectin remained practically const. for over 2 hrs., thus proving that a true gel was formed. The viscosity of similar mixts. was measured at different temps. and it was found that the enzyme is much more active at 14° than at 0° although at 21° its activity had diminished, due possibly to the use of a different pectase soln. The viscosity increased slowly at first, then more rapidly until a max. was reached and this was followed by a rapid decrease. An increase in the amt. of electrolytes present lowered the max. while a decrease in the electrolytes raised it. The decrease in viscosity is probably to be explained by the action of the electrolytes in clumping together the particles of colloid forming the reticulum of the gel so that a suspension is produced. It appeared that the coagulation of pectin consists of 2 processes: gelification and subsequent coagulation of the gel. Gelification and coagulation are due to a minute trace of electrolytes. As far as gelification is concerned, the action of electrolytes is probably indirect and it may be that their presence is necessary in order to allow the enzyme to exert its activity. The coagulation of pectin is explained thus: Pectic acid is produced by the action of pectase on pectin. If electrolytes are absent, the mixt. remains liquid, but if any ions are present, partial pptn. of colloid takes place. At first these colloidal particles will be free from one another but as action of the pectase proceeds a semi-solid reticulum is built up. If electrolytes are present in large amount, clumping together of the particles of colloid takes place and a suspension is formed with a consequent diminution in viscosity. A max. viscosity will be reached when the rate of gel-formation becomes insufficient to counterbalance the clumping effect.

R. L. SIBLEY.

Studies on substances with specific action produced by various organs. I. Compounds which exert an influence upon the development and condition of definite tissues. EMIL ABDERHALDEN. *Univ. Halle. Arch. ges. Physiol.* 162, 99-128(1915).—Various organs were digested step by step with enzymes, (pepsin and HCl, and pancreatic and intestinal juices being used); the degree of digestion was followed with the biuret reaction and the $\text{NH}_3\text{-N}$ estns. Organs were then chopped fine, ground, and with NaCl soln. and dried. Parts were concd. *in vacuo*, and sterile solns. prepared with H_2O . Several problems were studied, such as the influence of the exts. upon the development of the remaining organs after certain or the development of growing animals.

Tadpoles were used as subjects. The thyroid, thymus, ovary and pituitary were used, alone and in various combinations. The thymus and thyroid glands contain substances which influence in a characteristic way the development of tadpoles. This indicates that the substances which influence development do not belong to the group of proteins or peptones. If they are derivs. of proteins they must belong to the simpler decompn. products or to definite components (amino acids?). The results are shown by a series of photographs.

C. J. WEST.

A labile form of protein and its relation to living protoplasm. OSKAR LOEW. *Biochem. Z.* 71, 306-20(1915).—A very labile form of protein compd. is found in many plant cells, usually in the cell juices, but in some cases also in the cytoplasm. This labile form differs from the ordinary proteins in that it is pptd. by NH_4OH and org. bases, usually undergoing at the same time a rapid change into a stable compd. This pptn. is not of the nature of neutralization. While very active bases ppt. the protein as small granules, weak bases like caffeine and antipyrine not only do not destroy the life of the cell but also do not change the labile character of the protein. The small droplets which first appear gradually unite to large refractive drops (caffeine-proteosomes) often having half the diameter of the cell and sometimes reaching 30μ in diameter. The changes which the labile form undergoes are easily followed under the microscope. The coagulation of the labile form consists in the elimination of water with the formation of a mass with a hollow space, a hollow sphere, or an amorphous unformed mass. HCN , NH_4OH and N_2H_4 produce the same result. The action of NH_3 produces a solid mass without the formation of the hollow spaces. The labile active protein behaves towards dyes in the same way as the living protoplasm, while the proteosomes coagulated by heat, alc., acids or spontaneously act like dead protoplasm. The intimate relationship between the reserve labile protein and the organized labile protein or living protoplasm has been demonstrated in several ways.

C. J. WEST.

Osmotic equilibrium between blood, milk and bile. F. H. VAN DER LAAN. Utrecht. *Biochem. Z.* 71, 289-305(1915); cf. *C. A.* 9, 2391.—Milk and bile have the same osmotic concn. as the blood from which they are secreted. The f. p. depression of normal ox blood is between 0.53 and 0.57° . It is independent of the kind of food. Hunger of a few days has no effect upon the f. p. of the blood or of milk formed. It is possible by suitable diln. of the contents of the intestine to decrease the value of Δ for the blood, or to increase it by feeding large amts. of Glauber's salt. The similarity between the f. ps. of milk and blood remains, even under these abnormal conditions. The f. p. method is the best for detecting watered milk. If a milk has a higher f. p. than 0.53° it must be considered as watered.

C. J. WEST.

Use of blood as human food and the behavior of formaldehyde in the organism. E. SALKOWSKI. Univ. Berlin. *Biochem. Z.* 71, 365-90(1915); cf. *Berl. klin. Wochschr.* 1915, Nos. 12 and 23.—Ox blood has nearly the same protein content as the best fat-free beef. The nutritive value of ox blood is equal to that of beef. Blood may be kept several weeks by use of boric or salicylic acids or by formalin. Blood preserved in this way is not directly utilizable for food but the blood protein prepd. from it in the usual way is utilizable. A method that leads to the direct use of the preserved blood—except by the addition of large amts. of sugar—is not known. Perhaps MeCl is suitable (based on expts. on milk). Coagulated blood protein may be kept unchanged for months in CHCl_3 water and 0.5% formalin. The CHCl_3 which adheres to it is easily removed. Blood coagulated by heat may be preserved unchanged for a long period by the addition of formalin. This may also be accomplished, to a less degree, by addition of large amts. of sugar. The addition of 0.6 to 1.0 g. formalin to the daily food of a dog of 12 kg. was easily tolerated; the utilization of the protein of the food was not influenced. About 0.6% of the formalin, the remainder being con-

pletely oxidized. The poisonous effect of HCHO when used internally is very much overestimated, exhaustive expts. are needed to serve as a basis for its therapeutic use. If one distills the urine of a dog fed with flesh and fat or with flesh, fat and rice, after the addition of 2% H_2SO_4 , the distillate gives the CHI_3 test. This is also true of human urine. The mother substance is not known; it cannot always be hydroxymethylfurfural, and may be in part lactic acid.

C. J. WEST.

Action of light upon the living organism. FRITZ SCHANZ. Dresden. *Biochem. Z.* 71, 406-14(1915); cf. *Münch. med. Wochenschr.* 1915, Nos. 19 and 29; *Arch. ges. Physiol.* 161.—Chlorophyll is shown to be a positive photocatalysor (hematoporphyrin, phylloporphyrin, glucose, acetone, lactic acid and urea are also positive). Certain German mineral waters contain substances which are negative photocatalysors. Cf. *C. A.* 9, 2906.

C. J. WEST.

The influence of the osmotic pressure upon the volume of red blood corpuscles and the problem of permeability. H. J. HAMBURGER. Groningen. *Biochem. Z.* 71, 464-7(1915).—A claim for priority over Hedin in the question of the influence of osmotic pressure upon the vol. of the red blood corpuscles, and a statement of the proper historical sequence of Hamburger's work on permeability.

C. J. WEST.

The action of rays upon colloids. WALTHER LÖB. Berlin. *Biochem. Z.* 71, 478-9(1915); cf. *C. A.* 9, 1490.—Reply to Fernau and Pauli (*C. A.* 9, 2909).

C. J. WEST.

Isolation of glucosamine hydrochloride from the mucoid of ascites fluid. ADOLF OSWALD. Zurich. *Z. physiol. Chem.* 95, 100-1(1915).—Six l. fluid gave 1.3 g. mucoid, which, when hydrolyzed with 40 cc. 3% HCl for 1.5 hrs., gave a soln. that reduced Fehling soln., and finally deposited crystals. These gave the tests of glucosamine-HCl. No analyses are given.

C. J. WEST.

Crystallization of human serum albumin. ADOLF OSWALD. Zurich. *Z. physiol. Chem.* 95, 102-3(1915).—Serum albumin was obtained from ascites fluid by crystn. from satd. $(NH_4)_2SO_4$ and dil. H_2SO_4 .

C. J. WEST.

Constitution of hemin and bilirubin. WILLIAM KÜSTER. *Z. physiol. Chem.* 95, 152-60(1915).—Polemical against Piloty (*C. A.* 9, 57).

C. J. WEST.

B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

Urochromogen and diazo reactions. M. LEVY. *Deut. med. Wochschr.* 41, 1212-3 (1915).—It is concluded that the agreement of the urochromogen reaction with the diazo reaction is very general. Only exceptionally did these reactions fail to coincide.

S. AMBERG.

Preliminary note on the preparation of collodion dialyzers of graded permeability. WILLIAM BROWN. Imperial Coll. of Science and Technology, London. *Biochem. J.* 9, 320(1915).—Collodion dialyzers, constant in character, and of a wide range of permeability, may be obtained by treating air-dried collodion membranes with varying percentages of alc. in water. The permeability of the membrane is directly related to the strength of the alc. used. A second method of prep. graded dialyzers, depending on a process of differential drying, has also been worked out. A detailed account of these expts. is promised shortly.

B. HOROWITZ.

Picric acid and benzidine stain; a transitional cell in general paralysis. B. LEMCHEN. *Med. Rec.* 88, 787(1915).—L. describes a modification of his stain as previously reported (*C. A.* 9, 3080). This stain permits the differentiation of a new cell, differing from others in its lack of granules, and in its homogeneity and eccentric nucleus. The cell appears in cases of paralytic insanity.

A. H. RAHR.

The phenoltetrachlorophthalein test of liver function. MAX KAHN AND JAMES R. JOHNSTON. *N. Y. Med. J.* 102, 848-50 (1915).—The test was applied to 34 patients suffering from hepatic and other diseases. The irregularity of results led to the conclusion that the procedure is not of clinical value. A. H. RAHE.

Potassium permanganate in the examination of cerebrospinal fluid. A. J. RUBENSTONE. *N. Y. Med. J.* 102, 1052 (1915).—If the quantities of fluid and KMnO_4 employed by Boveri (cf. *C. A.* 8, 3199) are doubled, the test is increased in delicacy. A series of more than 100 tests showed that there exists a definite ratio between the rapidity with which the reaction takes place and the degree of abnormality of the fluid.

A. H. RAHE.

A new method for the study of plant nutrients in sand cultures. A. G. MCCALL. *J. Am. Soc. Agron.* 7, 249-52 (1915).—Granite-ware pots 12 × 12 cm., which hold about 1500 g. of sand, were used in plant physiological studies. Hemispherical clay funnels having a smaller diameter than the rim of the pot are placed on the surface of the sand. The seeds are planted in a circle around the pot between the edge of the funnel and the rim of the pot. The pots are provided with tubes at the bottom so that the nutrient solns. which are added through the funnel at the top can be drawn off at the bottom. This is done by suction. By this method of growing plants in sand with nutrient solns., the solns. can be changed without disturbing or shocking the root system.

J. J. SKINNER.

Estimation of sugar in the urine. Estimation of very small amounts of sugar by a time reaction. F. CLAUSNIZER. Stuttgart. *Arch. ges. Physiol.* 162, 159-86 (1915).—This is a modification of Worm Muller's test (*Arch. ges. Physiol.* 27, 113 (1882)). Dil. the protein-free urine to a density of 1.005 at 15°. Pipet 25 cc. into a test tube 160 mm. × 18 mm., add 3 drops 30% NaOH and a small amt. of kieselguhr, shake and filter. Place 4.5 cc. of the clear filtrate in a test tube 140 mm. × 16 mm. and add 0.5 cc. of a sterile 0.2% glucose soln. and a drop of litmus. Treat this mixt. with 10% AcOH until the soln. is red and then add 3 drops more. Prep. second tube with 2.5 cc. alk. Rochelle salts and 2 cc. 5% CuSO_4 soln. Heat both tubes 60 sec. with shaking, allow to stand 20 sec., then mix and shake. The number of seconds which elapse before the appearance of the sugar reaction is a measure of the amt. of sugar present. A table is given of the amt. of sugar corresponding to the number of seconds.

C. J. WEST.

Simple method for the quantitative determination of very small amounts of potassium. H. J. HAMBURGER. Groningen. *Biochem. Z.* 71, 415-63 (1915).—The method consists of the detn. of the vol. of the ppt. formed by adding a Co soln., $\text{Co}(\text{NO}_3)_2 \cdot 3\text{K}(\text{NaNO}_2) \cdot n\text{H}_2\text{O}$, and centrifuging. Five cc. of the soln. (containing not more than 0.02 g. K) are treated with 1.5 cc. of a Co soln. (made by mixing 6 vols. of a soln. of 50 g. $\text{Co}(\text{NO}_3)_2$ in 100 cc. H_2O and adding 25 cc. AcOH and 10 vols. of a soln. of 50 g. NaNO_2 in 100 cc. H_2O) at room temp. and then allowed to stand 16 hrs. at 37°. After cooling to room temp., the fine orange yellow or yellow cryst. mass is centrifuged to const. vol. in a special tube and the vol. read. The capillary, 0.04 cc., is divided into 100 parts, of which 1 part is equal to 0.0001 g. K, irrespective of the concn. of the K in the liquid. There is complete proportionality between the amt. of K and the vol. of the ppt. It is necessary to keep the relation between the solns. 5:1.5, so that if 10 cc. of the soln. of K are used, 3 cc. of the Co soln. should be used. The presence of large amt. of Na does not influence the result. The same is true for Ca, Mg, and SO_4 , but H_3PO_4 must not be present except in small quantity. The H_3PO_4 may be removed by a mixt. of CaCl_2 - $\text{Ca}(\text{OH})_2$ or by magnesia mixt. One cc. of the filtrate is sufficient for an analysis. It is suggested that ppts. may be estimated by using a centrifuge.

Investigations on combustion in the lungs with remarks on the determination of the gases of the blood. V. HENRIQUES. Univ. Copenhagen. *Biochem. Z.* 71, 481-94 (1915).—Satisfactory duplicate analyses can be obtained of the gases pumped out of defibrinated or oxalated blood if care is taken to keep the blood in motion while the portion is being drawn (in order that the blood corpuscles may not ppt.) and if the blood is drawn quickly. The duplicates are not so satisfactory if the blood is taken slowly from animals which have been previously injected intravenously with hirudin. This is due to the gradual settling out of the corpuscles. Samples of blood from the right heart and from the pulmonary artery simultaneously have the same CO_2 and O content. Blood from the right heart thus corresponds in compn. to that which circulates in the lungs. A study of the gas content of the blood in the lungs and of the respiration gases demonstrates that there is no combustion taking place in the lungs.

C. J. WEST.

Estimation of small amounts of sugar in the urine. S. NAGASAKI. Univ. Utrecht. *Z. physiol. Chem.* 95, 61-77 (1915).—The approx. amt. of urine necessary to reduce 10 cc. Cu soln. is detd. Slightly less than this amt. is then added to 10 cc., the soln. boiled 5 min., and then small amts. added each min. until the reduction is complete. The amount required contains 20 mg. glucose. The true glucose content is detd. by fermentation. The detn. is not affected by the addition of milk or cane sugar. The content of "isomaltose," calcd. as glucose, is detd. by heating the urine after fermentation with 2% citronic acid, and fermenting. The same value is obtained by heating the urine with 1% HCl for 10 min., and then fermenting. The method is applied to a study of glucose ingestion in the human organism.

C. J. WEST.

Occurrence of arginase in the animal organism and its detection by means of the formol titration. S. EDLBACHER. Heidelberg. *Z. physiol. Chem.* 95, 81-7 (1915).—Sorensen's formol titration is a suitable and very reliable means for detecting arginase. It is to be preferred to the earlier method of Kossel and Dakin. As far as has been studied by E., arginase is found only in the liver; it is absent in the liver of birds and reptiles, as earlier observed by Clementi. It was not found in the kidneys of birds. Kossel and Dakin reported arginase in the kidney, thymus and intestine. This could not be confirmed by the present method. The results are the same whether the organ contains blood or not. The addition of serum to inactive organ suspensions and press juices did not activate the arginase action.

C. J. WEST.

Colorimetric estimation of uric acid in the blood. H. F. HÖRST. Univ. Christiania. *Z. physiol. Chem.* 95, 88-99 (1915).—Five cc. blood are weighed into a tared porcelain dish containing about 50 mg. K oxalate. 35 cc. H_2O , 5 drops 2% AcOH and 1 cc. HCHO soln. (35% HCHO, dild. with an equal vol. H_2O and neutralized with NaOH) are added, and the mixt. heated to boiling; 1 cc. AcOH is then added, the mixt. boiled 3-4 min., filtered, and the residue washed with 50 cc. H_2O . The filtrate is treated with 5 cc. 50% AcOH, and concd. to 1 cc. This is transferred to a centrifuge tube, the dish washed out with 2 cc. 0.1% Li_2CO_3 soln., and the soln. treated with a previously prepared mixt. of 20 drops concd. NH_4OH , 8 drops 3% Ag lactate soln. and 4 drops magnesia mixt. This is allowed to stand overnight, is then centrifuged, decanted, the residue washed with 3 cc. H_2O , and then treated with 6 drops freshly prepd. H_2S soln., 1 drop 50% AcOH and 3 cc. H_2O . This is then heated carefully until the H_2S is driven off, again centrifuged, the liquid transferred to a 25 cc. flask, washed out with 3 cc. H_2O , and then 2 cc. phosphotungstic acid (Folin) and 5 cc. satd. Na_2CO_3 soln. added and the mixt. made up to 25 cc. This is compared with a standard soln.

C. J. WEST.

feeding stuffs by the Van Slyke

Quantitative determination
method (GRINDLEY) 12.

C. BACTERIOLOGY.

ERNEST D. CLARK.

"Reaction" of bacteriologic culture media. W. M. CLARK. Wash. *J. Infect. Diseases* 17, 109-36(1915).—The H-ion concns. of various culture media after the addition of successive quantities of alkali and acid have been determined by the H electrode. From the data so obtained, titration curves were plotted which show (1) the amt. of acid or alkali which it is necessary to add to a given medium in order to bring about a given H-ion concn. such as would be indicated by a certain tint of phenolphthalein; (2) the buffer effect of various media at various H-ion concns. of different media adjusted to various degrees of reaction. Adjustment of different media to the same degree of reaction (Fuller's result in media having widely different H-ion concns. The "standard" result calculated from a titration the proper quantity of alkali to be added) is shown to be more vitiated by the practice of titrating media while hot. C. indicates the advisability of abandoning this method and substituting a colorimetric method. Data are presented showing the influence upon the H-ion concn. of oxidation-reduction and pptn. of proteins when accelerated by high temps. A discussion of the significance of the proper adjustment of the H-ion concn. of media is given.

The characteristics of bacteria of the colon type occurring on the coast of Washington. W. M. CLARK AND A. C. EVANS. Washington, D. C. *J. Infect. Diseases* 17, 137-59(1915).—By means of exact gas analyses on accurately obtained cultures, the ratio of the volumes of CO_2 and H_2 evolved during the anaerobic fermentation of glucose was detd. on 166 cultures of colon-like bacteria obtained from 35 localities from various localities. Of these cultures 151 gave CO_2/H_2 ratios varying from 1.0 to 3.0, and were thus sharply distinguishable from cultures from bovine sources. Other biochemical tests confirmed the distinction. Seven interesting cultures gave CO_2 only (the summary incorrectly says hydrogen only).

The differentiation of bacteria of the colon-aerogenes family by titration of H-ion concn. W. M. CLARK AND H. A. LUBS. Washington, D. C. *J. Infect. Diseases* 17, 160-73(1915); cf. preceding abstr.—The H electrode has been applied to the determination of H-ion concn. in various cultures of the group during the development of the metabolism of different species were detected. By simple means the H-ion concn. can be so adjusted that the final H-ion concns. diverge widely for the different species and these differences can then be sharply distinguished by means of *p*-nitrophenol or methyl red. This method gives results for this group of bacteria in accordance with the gas-ratio method.

The germicidal properties of dental cements. M. R. SMIRN. *Dental Cosmos* 57, 1209-28(1915).—The cements examined were (I) a black cement, (II) a red Cu_2O cement, (III) a white Cu cement, (IV) a light yellow cement, (V) a ZnO or oxyphosphate cement. The germicidal action of each cement as powder, plastic or loose pellet, "set" or "unset," inserted in extracted carious teeth was studied; the bacteria used were *Staphylococcus pyogenes aureus* and *B. coli*; at times *Streptococcus pyogenes*, *Staphylococcus aureus* and *B. anthracis* were also used. The mixing fluids possessed very different antiseptic properties due to their H_3PO_4 content. The antiseptic action of the cements was due to sol. compds. Loose or plastic pellets owed their germicidal power entirely to the excess of H_3PO_4 required to be added in mixing. Of the cements (II) apparently possessed germicidal power *per se*; the others showed the slight power they showed to the excess of mixing fluid required. The power of the best of the cements (I and II) was equal only to 1:50,000.

stroy *B. anthracis* even after one week, but destroying *Staphylococcus aureus* after two or three days. Used as pellets in carious teeth, cement (II) showed by far the best germicidal powers. With respect to germicidal power, the cements fell into two classes: the more efficient, (I) and (II), and the less efficient, (III), (IV) and (V). The germicidal efficiency depends considerably on the mixing fluid and on readily sol. constituents of the cement. In actual use, the germicidal action may be in part mechanical. For technic, reference must be made to the original paper. JOSEPH S. HEPBURN.

The value of hypochlorous acid in the treatment of gas gangrene. JOHN FRASER. *Brit. Med. J.* 1915, II, 525-9.—An application of "Eupad" and "Eusol" introduced by Lorrain Smith (*C. A.* 9, 2919). A. H. RAHE.

The utilization of certain pentoses and compounds of pentoses by *Glomerella cingulata*. L. A. HAWKINS. *Am. J. Botany* 2, 375-88(1915).—In these expts. on the effect of the fungus *Glomerella cingulata* upon pentoses and compds. of pentose sugars it has been shown that the amt. of material yielding furfural in the apple is decreased when the apple is rotted by this fungus. The decrease is brought about by the action of the fungus on the compds. in the apple which contain pentoses. These compds. are broken down and the material yielding furfural is used by the fungus. In the process the alc.-sol. furfural-yielding material is increased which indicates that the pentose sugars are split off from the compds. in which they exist in the fruit. The fungus is able to utilize either glucose, xylose, arabinose, arabin or xylan as a sole source of C. The 3 sugars are most efficiently utilized, xylose perhaps the best. The fungus grows better on xylan than on arabin. The filtered ext. of the fungus mycelium is able to act on xylan under aseptic conditions with the formation of an alc.-sol. substance, which reduces Fehling soln., forms furfural when boiled with HCl and possesses other properties of xylose. This ability of the ext. is lost on boiling. The breaking down of the xylan takes place gradually and the alc.-sol., furfural-yielding material is found to increase the longer the ext. acts upon the xylan, the rate being more rapid during the early part of the action. A cryst. compd. was obtained from the alc.-sol. portion of the prepn. of xylan which had been acted on by the ext. of the fungus mycelium. This compd. was apparently xylose. It is evident that there is a xylanase present in the ext. of fungus mycelium which hydrolyzes xylan to xylose. J. J. SKINNER.

D. BOTANY.

CARL L. ALSBERG.

Occurrence of manganese in wheat. WM. P. HEADDEN. Colo. Agr. Exp. Sta. *J. Agr. Research* 5, 349-55(1915).—Mn seems to be present in wheat wherever grown, irrespective of the conditions of soil and climate. In the wheat kernel it is present in about the same proportion as Fe, though Fe greatly predominates in soils. Fertilizers applied to the soil did not affect the amount of Mn stored in the kernels. Variation in the quantity of water supplied, from 1 to 3 feet, did not affect the amount of Mn in the grain. It seems improbable that a nonessential mineral constituent of plants would occur in all samples and in nearly the same quantity under such a variety of conditions. A short bibliography is given. W. H. FRY.

The role of ash elements in the life of plants. M. A. EGOROV. *Russ. J. Exp. Landw.* 16, 270-80(1915).—In experiments with castrated and uncastrated oats, it was observed that the former remained green nearer the time of maturation. This is probably explainable on the ground that Mg has not been removed from the sphere of the vital functions of the plants and carried to the grain as would be the case with uncastrated plants. W. H. FRY.

Some relations of plants to distilled water and certain dilute toxic solutions. M. C. MERRILL. *Am. J. Pharm.* 87, 549-55(1915); see *C. A.* 9, 2103. W. G. G.

Transmission by grain of effects of castration in stalks of corn. E. HECKEL. *Compt. rend.* 161, 338-40(1915).—The saccharin character of cornstalks appears to be transmitted during 4 years of male castration, practiced in a continuous line; and in general, the effect of castration is to increase the sugar content sometimes to double that of the non-castrated stalks. It is advised to proceed with the castration about 14 days after the appearance of male inflorescence. L. W. RIGGS.

The question of the toxicity of distilled water. R. P. HIBBARD. *Am. J. Botany* 2, 389-401(1915).—Distd. H_2O made by first shaping tap H_2O with animal charcoal and then distg. and redistg. first with H_2SO_4 , then $Ba(OH)_2$, was used for growing seedlings of *Lupinus albus*. Best growth took place in cultures in which the H_2O was changed 4 times each day. Cultures in which the H_2O was not changed developed roots similar to roots injured by dil. solns. of toxic salts. The roots were thick, short, blunt and crooked near the tip. The author concludes that the plant roots excrete a substance that inhibits growth. J. J. SKINNER.

An extension to 5.99° of tables to determine the osmotic pressure of expressed vegetable saps from the depression of the freezing point. J. A. HARRIS. *Am. J. Botany* 2, 418-9(1915).—The tables for this extension are given. The tables of the value of $P = 12.060\Delta - 0.021\Delta^2$ for f. p. lowering of 0.01° to 2.99° are given in a previous article (*Am. J. Botany* 1, 73-5(1914)). J. J. S.

Calcium hypochlorite as a seed sterilizer. J. K. WILSON. *Am. J. Botany* 2, 420-7(1915).—A soln. made by using $CaCl_2$, in proportion of 10 g. to 140 cc. of H_2O , allowing to stand several hrs., and decanting off the clear liquid, was used as a seed sterilizer. The soln. contains about 2% Cl, and the vol. employed was 5 times more than the vol. of seed. The time required for sterilizing varied with the kind of seed. For *Medicago sativa* it required 6 hrs. while *Frisolium pratense* required 24 hrs. The data shows that the time required in most cases for sterilizing seed and the exposure necessary to produce injury are many hours apart. This allows considerable latitude with respect to the time during which the disinfectant may be allowed to act. A table is given showing the time required for sterilizing and the time required to cause injury to the various kinds of seeds. The efficiency of the method was tested by inoculating various seeds, which had been sterilized, with a pure culture of *Bacillus radicola*; after 45 days only a few cases showed signs of contamination. The method offers a way for securing sterile plantlets for physiological expts. and also for eradicating such plant diseases as may be controlled by treating the seed. A convenient table is given, enumerating the different chemicals found to be best suited for sterilizing different kinds of seed, together with the investigators. J. J. SKINNER.

Acid accumulation and destruction in large succulents. E. R. LONG. *Plant World* 18, 261-72(1915).—The acidity of the sap of *Echinocactus wislizeni* and *Carnegiea gigantea* is higher in early morning than at sunset, the acids formed in the metabolism of carbohydrates tending to accumulate during the night and being partially destroyed by higher temp. and photolysis on the succeeding day. The acidity of the sap of these species following the nightly accumulation of acids is higher in the outer than in the inner region. The diurnal difference in acidity of the sap becomes smaller in successive zones as the center of the plant is approached, being as much as 50% in the exterior and slight in the innermost tissues. In the outer parts where carbohydrates are plentiful, sugar metabolism is great and acid production and nightly acid accumulation are large. In the innermost tracts of tissue carbohydrates are less plentiful, acid production is correspondingly less, and the increasing insulation as the center is approached tends to minimize diurnal temp. and light differences, so that in these parts diurnal differences in acidity are small. The movement of sap of low acidity from the central cylinder to the peripheral layers of these thick succulents has little effect upon

the acid content of these tracts, while variations of great amplitude result from the conjoint action of light and temp. J. J. SKINNER.

Organic nutrition of green flowering plants. TH. BOKORNY. *Biochem. Z.* 71, 321-64(1915).—Many plants can assimilate methyl alc., methylal and glycerol.

C. J. WEST.

Plant enzymes. IV. Invertase of the leaves of potatoes. P. DOBY. Magyarovar. *Biochem. Z.* 71, 495-500(1915); cf. *C. A.* 9, 476, 1190.—The enzymes were isolated by pressing the leaves and centrifuging the green or black liquid. The presence of the enzyme was shown by the fact that the liquid was not stable towards heat, and that the reaction showed the character of a monomol. reaction. The value of k was proportional to the concn. of the enzyme. The juice which was obtained with the lowest pressure showed the greatest activity. C. J. WEST.

F. PHYSIOLOGY.

ANDREW HUNTER.

Influence of hypertonic salt solution upon blood pressure. KARL RETZLOFF. *Z. exp. Path. Ther.* 17, 161-84(1915).—Results obtained by replacing blood in the organism with hypertonic NaCl solns. of different concns. lead to the conclusion that the increased blood pressure observed is due to the ion content of the salt soln.

A. H. RAHE.

Postural albuminuria of children. L. JEANNERETTE. *Arch. med. enfants* 18, No. 9(1915); *J. Am. Med. Assoc.* 65, 2039.—J. shows by extensive tests that albuminuria is brought on in children by standing still. The combination of lordosis, orthostatism and muscular immobility induced albuminuria in 49% of the children examd. The findings in various groups of children are listed in 12 tables. L. W. RIGGS.

Human milk. ALFRED W. BOSWORTH. New York Agr. Expt. Sta., *Tech. Bull.* 43, 3-5(1915); cf. *C. A.* 9, 1637.—The acidity of human and cow milk is practically the same and the practice of adding lime water to modified cow milk used for infant feeding as a means of correcting the acidity is thus shown to have no foundation.

R. C. ROARK.

Influence of food and exercise upon the blood sugar. W. VON MORACZEWSKI. Zürich. *Biochem. Z.* 71, 268-88(1915).—When fed during a period of insufficient food, carbohydrates increase the amt. of blood sugar. Proteins produce a smaller but more permanent increase. If an excess of food is given, carbohydrates have no influence upon the amt. of blood sugar while proteins and fats cause a very slight but long continued increase. With a carbohydrate or gelatin diet, exercise increases, and with a diet of flesh or fatty foods lowers the amt. of blood sugar. This is true for normal individuals. In diabetics and people with a tendency towards glucosuria, muscular exercise increases the amt. of blood sugar no matter what the diet may be. Tolerance for sugar is increased by muscular exercise; in diabetics, in spite of the increased blood sugar, muscular exercise leads to a decreased excretion of sugar.

C. J. WEST.

Studies on the physiology of coagulation. Influence of alkalis and acids. Action of several protein-precipitating agents. A new theory of the method of coagulation. E. HERZFELD AND R. KLINGER. Univ. Zürich. *Biochem. Z.* 71, 391-405(1915).—The optimal reaction for the formation of thrombin is neutral or bicarbonate alkaline. Alk. reaction retards the action of thrombin (pptn. of fibrin), while acid accelerates it. Many other agents that ppt. proteins are favorable to the action of thrombin. Attempts were made to apply the theory of Herzfeld as to the soly. and pptn. of proteins to the process of coagulation. It is shown that the stability of solns. of fibrinogen is

considerably influenced by certain protein decompn. products (especially fibrin peptone).
C. J. WEST.

Note on the immediate effects of reduction of kidney substance. H. T. KARSNER, H. A. BUNKER, JR., AND G. P. GRABFIELD. Harvard Med. School. *J. Exp. Med.* 22, 544-50 (1915).—The removal of approx. 0.16 of the kidney substance causes no marked alteration in the amt. of the non-protein N of the blood or urine, although there is a slight tendency toward accumulation in the blood for a period of 24 hrs., and an increased output in the urine for a period of 48 hrs. This is probably due to the operation. Excision of 0.5 of the total kidney substance was followed, in one case, by a distinct accumulation of non-protein N in the blood during the 1st 24 hrs., associated, however, with anuria, while in a 2nd case there was no accumulation and no anuria. The output of non-protein N for the 1st 48 hrs. appears to be diminished, again showing a slight tendency towards accumulation for, at the most, 48 hrs. The removal of approx. 0.66 of the kidney substance was followed by a very slight increase in output and, after 24 hrs., a slight but distinct increase in the amt. of non-protein N in the blood which lasted for 3 days. The reduction of the kidney substance to approx. 0.33 does not prevent the remaining fragment from excreting urine in normal amts. and concns.

C. J. WEST.

G. PATHOLOGY.

H. GIDRON WELLS.

Investigation of toxins and antitoxins. I. Partial synthesis of antitoxins. I. I. OSTROMUISLENSKII. *J. Russ. Phys. Chem. Soc.* 47, 263-300 (1915); cf. *C. A.* 9, 3090. —O. begins with giving his views on the nature of toxins and antitoxins and their interaction with each other. Chemically most of the toxins are nitrogenous substances of high mol. wt., feebly basic properties and colloidal nature, while the antitoxins are colloidal, amphoteric, and are either varieties of the same globulin or nearly related globulins having the same structure. Towards toxins the antitoxins act like weak acids, forming salts which, unlike alkaloidal salts or the salts of cryst. poisons, are innocuous. Unlike acids, however, each antitoxin possesses a specificity in that it is capable of neutralizing only a particular toxin. The specificity is due not to a particular chem. constitution, but to a particular phys. state of the colloidal antitoxin mols., such as the nature of their surface (as in the passivity of certain metals caused by formation of films on their surface), size, mass, elec. condition, possibly also configuration and number of mols. per colloidal particle. These phys. characteristics distinguish antitoxins from ordinary globulins which under ordinary conditions do not react with toxins. The assumption that the specificity of antitoxins is not due to chem. constitution is based upon the consideration that if such were the case the existence of an unreasonably large number of isomeric antitoxins would have to be assumed. The interaction of an antitoxin with the corresponding toxin is supposed to take place in 3 stages: (1) Mutual adsorption (intimate phys. contact) due to the above specific characteristics; (2) chem. neutralization, made possible only by this intimate contact, with the formation of a non-poisonous salt readily decomposable by acids or alk.; (3) gradual profound change of this salt due either to intramol. forces or to the effect of the surrounding medium, with the result that the salt ceases to be decomposable by acids or alkali. The last change takes place only upon prolonged standing (from 4 hrs. to weeks, months or years according to the nature of the salt). Having enunciated these views, O. proves by expts. that when an ordinary globulin is placed in conditions that enable it to adsorb a toxin it is converted into the corresponding antitoxin which then neutralizes the toxin. By decomp. the resulting salt with HCl a mixt. is obtained which contains the toxin taken and the antitoxin corresponding to it. The adsorption of toxins by globulins may be induced by various catalyzers (I, ICl_4 , CS_2) of which the

most convenient is a 6% soln. of NaCl. Thus by keeping a mixt. of the serum of horse blood containing 6% of NaCl and either diphtheria toxin or botulism toxin for 36 hrs. at 37° the resulting product lost all toxicity, but upon acidulation with HCl was proved to contain the toxin taken and the antitoxin corresponding to it. The sepn. of toxins from antitoxins may be accomplished in several ways: Gelatin permits toxins to pass through much faster than antitoxins; CaOCl₂ destroys toxins but does not affect antitoxins; digestion at 68° destroys antitoxins only, etc. Work is in hand for prepg. *in vitro* the antitoxins of cobra poison, cholera and other poisons. The conversion of globulin into an antitoxin by adsorption of the corresponding toxin in the presence of catalyzers readily explains the phenomenon of immunization of animals, as well as the fact that a small amt. (1 unit) of a toxin administered to a horse yields a large amt. (100,000 units) of the corresponding antitoxin. The animal fluids (blood, milk, etc.) doubtless contain various catalyzers which cause the natural globulins of these fluids to adsorb the administered toxin, thus changing it to the corresponding antitoxin. Nutrition and the physiological functions of the organism constantly change the reaction of the fluids from neutral to acid or alk. or *vice versa*. This splits up the salt-like combination of toxin and antitoxin, enabling the former to convert fresh portions of globulin into antitoxin. In just as plausible a manner is the fact explained that a subcutaneous injection of a toxin mixed with certain substances (I, ICl₂, etc.) is almost perfectly harmless, though in this case no immunization can take place. These substances merely act as catalyzers, immensely accelerating the adsorption of toxin by globulin, thus quickly producing the corresponding antitoxin. O.'s method makes it possible quickly to obtain any amt. of an antitoxin from a very small amt. of the corresponding toxin without the use of animals. Mere digestion of a globulin (horse blood serum) with the given toxin and alternate acidification and neutralization will bring about the result. The great advantage of this quick and cheap method of prepg. antitoxins over the usual immunization method is obvious, the latter requiring in some cases 16 months and frequently causing the death of the animals. Other advantages are: The needed antitoxin may always be had in fresh condition; it may be obtained from the blood serum of the patient himself; it ought to be possible to obtain certain antitoxins under conditions which are fatal to animals, such as the use of free Cl or I as catalyzers. or of temps. as high as 60°. Owing to the fact that some amorphous alkaloids (ricine and abrine) resemble toxins in their ability to produce antibodies in animals, while on the other hand cryst. toxins (cobra toxin) resemble alkaloids in forming poisonous salts, O. thinks there is no radical difference between alkaloids and toxins, so that it ought to be possible to induce the alkaloids to produce antialkaloids that would act as antidotes of the former in the same manner as the toxins produce their own antitoxins. All that is necessary to accomplish this result seems to be the polymerization of the alkaloids to amorphous colloidal substances. Initial steps in this direction are already to be found in the literature. The 1st alkaloid O. intends to attack with this aim in view is piperine (cf. *J. Chem. Soc.* 79, 922). II. New attempts to convert albuminous substances into specific antitoxins. I. I. OSTROMUISLENSKII AND D. I. PETROV. *Ibid* 301-7.—Continuing the work on the conversion of globulins into antitoxins (cf. above), it is shown that when horse serum is inoculated with a culture of diphtheria bacilli or with *Bac. botulinus* very little toxin is to be found in the liquid, owing to its adsorption in nascent state by the globulin of the serum, but its amt. greatly increases upon acidification with HCl. The absorption of toxin by the globulin is, however, incomplete, even in presence of a large amt. of free globulin. This is most probably due to the alkalinity of horse serum. Attempts to bring about greater adsorption by neutralizing the serum failed, there being no formation of toxins at all under these conditions. It was observed that the serum containing diphtheria toxin becomes much more active through diln. (with physiol. NaCl soln.). This is possibly due to disso-

ciation into toxin and antitoxin. III. Danyasz phenomenon. I. I. OSTROMUISLENSKII. *Ibid* 307-13.—When a toxin is treated with the equiv. amt. of the corresponding antitoxin, adding the former to the latter not all at once but in small portions at a time, the biologic neutralization of the toxin is incomplete, the resulting liquid remaining toxic (Danyasz phenomenon, *Ann. Pasteur* 16, 331(1902)). After discussing the numerous explanations of this phenomenon given by various authors and rather severely criticizing Ehrlich's views on this subject for its maze of unnecessary hypotheses of side-chains, haptophores, toxoids, toxones, etc., O. shows that his theory of the nature of the interaction of toxins with antitoxins (cf. above), in connection with the explanation given by the French school, readily accounts for D.'s phenomenon. The 1st step in the above interaction being mere adsorption, the difference in the effect of antitoxin on toxin according to whether the latter is added all at once or in successive portions is like that in treating pieces of filter paper with a dye in soln. When all the pieces are immersed together into the soln. they are all dyed the same tint, but when immersed one after the other the 1st pieces receive a much greater amt. of dye than the subsequent ones, and with a large number of pieces the last ones may even remain colorless. In the same way the 1st portions of toxin adsorb an amt. of antitoxin greater than their chem. equiv., so that the subsequent addition of toxin leaves some of it in free condition. That in D.'s phenomenon the toxin undergoes no chem. change as is supposed by some authors is shown by the fact that the acidification of the final liquid with HCl gives a soln. of the same degree of toxicity as corresponds to the total amt. of toxin taken. IV. New reaction for the characterization of toxins. I. I. OSTROMUISLENSKII. *Ibid* 313-7.—O.'s method of converting globulins into antitoxins (cf. above) may be used quickly to det. whether a given poison will produce in animals the corresponding antibody. For this purpose 3 cc. of the poison are mixed with 3 cc. of normal serum, to the liquid 0.36 g. of pure NaCl is added, and the whole set aside for 3-36 hrs. at 37°. In case an antibody is produced the liquid will become atoxic. It is advisable to carry out a blank expt. leaving out the serum. A negative result would therefore save time, expense and unnecessary slaughter of animals. The method was applied with positive results to the toxins of tetanus, diphtheria and botulism, and negative to morphine and strychnine. H. M. GORDIN.

Isolation of vegetable agglutinins by means of their isoelectric point. G. A. BROSSA. Berlin. *Arch. sci. med.* 39, 241-50(1915).—Many colloids have been pptd. by Michaelis and his co-workers at their iso-electric points. The method was tried out on the agglutinin derived from the fungus *Agaricus campestris* and it was found that this was most completely pptd. at a-H ion concn. of 2.6×10^{-4} . Lactic acid, in the presence of Na lactate, was used as the pptg. agent. The ppt., dissolved in a few drops of a mixt. of 1 part N/3 NaH_2PO_4 and 3 parts Na_2HPO_4 , showed about 0.5 the activity of the original ext., the result being partly due to the incomplete pptn. even at the isoelectric point and partly due to the alteration of the ppt. in contact with the soln. M. HEIDELBERGER.

Iodine content of the thyroid gland in various stages of life and in various pathological conditions. RINALDO PELLEGRINI. Padova. *Arch. sci. med.* 39, 276-316(1915).—There is no constant relation between the macroscopic development of the gland and the quantity of I contained in it. The av. dry substance is 22.5% of the wt. of fresh gland; it is higher in young people and in cases of death from fibrinous pneumonia, lower in old age and in tuberculosis. In individuals dying between 45 and 55 yrs. the values for I are highest; they are lowest in those who do not reach 15 yrs.; individual variations are, however, very great. The amt. of I does not depend upon the state of nutrition. There is an increase above the average in cases of sudden death, cirrhosis of the liver, and in acute inflammatory processes of the intestine, while a de-

crease is noted in tuberculosis, especially in advanced ulcerative forms, in pregnancy and child-birth, in anemia, in inflammations of the lungs, in pellagra, and in chronic inflammatory processes of the intestines. In a number of other diseases no changes could be noted, and in all cases individual variations were very great.

M. HEIDELBERGER.

Sandfly fever and bacteriology. C. J. STOCKER. *Brit. Med. J.* 1915, II, 503-4.—Vaccine treatment with a possibly non-specific organism gave inconclusive results. Complement deviation tests and animal expts. did not indicate that a specific causative agent had been used.

A. H. RAHE.

Hemolytic action of urine in certain conditions. C. S. MCKEE. Vancouver. *Brit. Med. J.* 1915, II, 596-8.—*Method.* One cc. of blood suspension (1 drop of blood to 4 cc. physiol. NaCl soln.) is mixed with 15 drops of the urine to be tested, and incubated for 2½ hrs. The cell emulsion is best prepd. as for the Noguchi-Wassermann test. The extent of hemolysis is measured by titration. Fifteen drops of urine are used as the test quantity, since additional urine will not change the result if hemolysis is not obtained with this amt. The laking action is not purely a question of quantity; a small amt. of urine may give a reaction more quickly than a larger amt. of the same sample. [This is evidently a colloidal reaction due to dilution. See Buxton and Rahe, *J. Med. Res.* 15, 113(1909); *Ibid* 311; *Ibid* 17, 483(1910).—ABSTRACTOR.] Incubation is a necessary part of the procedure and hemolysis occurs with both acid and alk. urines. The reaction is obtainable with urine from cases of erysipelas, gout, acute rheumatic fever, advanced tuberculosis, certain cases of syphilis, and in other conditions, but does not occur with normal urine. Urine, alk. at time of passage, becomes active only after standing at room temp. for 3 or 4 hrs. but the activity does not increase upon prolonged standing (24-48 hrs.). Acid urines lose in activity after standing 24-48 hrs. even though they do not become alk. To produce hemolysis with acid and alk. urinary compns., it is necessary to use these, added to salt soln. or normal urine, in far greater amts. than exist in hemolytic urines. When NaHCO₃ is added to either acid or alk. hemolytic urines, laking does not occur. The agent causing the hemolysis is apparently not a constituent of normal urine.

A. H. RAHE.

Note on the tetravaccine: typhoid plus paratyphoid A plus paratyphoid B plus cholera. ALDO CASTELLANI AND RALPH W. MENDELSON. *Brit. Med. J.* 1915, II, 711-13.—The results of 100,000 injections of the tetravaccine into 50,000 men showed that the amt. of agglutinins for each of the 4 organisms was the same as in control persons inoculated with the bacilli severally.

A. H. RAHE.

Hematuria in renal neoplasms. CHARLES DENACIARA. *N. Y. Med. J.* 102, 1093-5(1915).—A statistical study.

A. H. RAHE.

Experimental studies on the immunity conferred by diphtheria toxin-antitoxin mixtures. BRUNO BUSSON AND ERNST LÖWENSTEIN. *Serotherap. Inst., Vienna. Z. exp. Path. Ther.* 17, 289-310(1915).—In guinea pigs a higher degree of immunity is obtained with large doses of neutralized or slightly over-neutralized toxin-antitoxin mixts. than with a smaller amt. of partly neutralized toxin. In rabbits neutralized, and in goats partly neutralized, toxin gives the best results. The immunity conferred by neutral and slightly over-neutralized mixts. is to a considerable extent directly proportional to the degree of tissue absorption. Active and passive immunity in the guinea pig appears in 30-40 days and reaches its optimum in 59 days. Under-neutralized mixts., which produce no immunity when freshly prepd., become active after storage (1-2 months in ice chest). Rabbits develop a lesser degree of immunity than guinea pigs or goats. Tubercular guinea pigs do not exhibit increased sensitiveness to toxin-antitoxin mixts.

A. H. RAHE.

Blood cryoscopy and blood urea. MARTIN KROTOSZYNER AND GEO. W. HARTMAN. San Francisco. *J. Am. Med. Assoc.* 65, 1788-92(1915); cf. *J. Am. Med. Assoc.* 60, 188. and *C. A.* 7, 3979.—While the cryoscopic test requires strict attention to detail, when the technical difficulties are mastered the results are surprisingly uniform, and the test becomes in experienced hands an exact index of renal function. The following conclusions are given: Blood cryoscopy and blood urea run parallel in cases with normal renal function. Both tests show high points with renal insufficiency. The limited range between normal and pathologic points, while rendering the technic of cryoscopy more difficult, increases its delicacy and prognostic significance. The application of both tests intensifies in doubtful cases the significance of the findings.

L. W. RIGGS.

Case of pancreatic insufficiency. E. I. SPRIGGS AND A. J. LEIGH. *Quart. J. Med.* 9, No. 33(1915); *J. Am. Med. Assoc.* 65, 1952.—A careful study of food utilization.

L. W. RIGGS.

Glucuronic acid in urine during pregnancy. R. JEAN. *Arch. Mensuelles Obst. Gyn.* 4, No. 10(1915); *J. Am. Med. Assoc.* 65, 1953.—J. maintains that a qual. test for glucuronuria should be a routine procedure in examg. pregnant women. It should rank with the search for albumin and sugar, as it reflects the functioning of the liver and thus permits the discovery in time of impending insufficiency of that organ.

L. W. RIGGS.

Retention of nitrogen in chronic nephritis. R. R. ROCHAT AND M. HIJMANS. *Nederlandsch Tijdschrift Geneeskunde* Oct. 2, 1915; *J. Am. Med. Assoc.* 65, 1958.—In healthy persons the urea content of the blood was always below a certain standard, while for persons with chronic kidney disease it was always above that standard. The simplicity and reliability of Ambard's formula (cf. *J. Am. Med. Assoc.* 62, 813) for sifting out cases of kidney disease with retention of salt is confirmed, and saves inflicting useless restrictions on the patients. Diets are given for furnishing the necessary calories with a minimum of N.

L. W. RIGGS.

Clinical importance of the "urea index" in chronic kidney disease. D. KLINKERT. *Nederlandsch Tijdschrift Geneeskunde*, Oct. 2, 1915; *J. Am. Med. Assoc.* 65, 1958; cf. preceding abstr.

L. W. RIGGS.

Deposition of calcium soaps in the liver. R. HAGIWARA. *Basel. Centr. Path.* 26, 481-5(1915).—In the liver of a man dying in diabetic coma there was found extensive deposition of Ca, often in relation to the fat vacuoles, and according to microchem. reactions in the form of Ca soaps. Test for phosphates was not made. No explanation was found for the condition.

H. G. W.

Studies on aleucocytic animals. I. Analysis of the action of antibacterial sera and chemotherapeutic agents. II. Contribution on natural resistance to swine erysipelas. LIPPMANN. Koch Inst., Berlin. *Z. Immunität.* 24, 107-22(1915).—It is possible by intravenous injection of a bacteriotropic serum (Neufeld's pneumococcus serum) to prevent passage of the pneumococci into the blood vessels, but animals rendered free from leucocytes by Th develop bacteriemia in 8 hrs. at the latest; therefore pneumococcus serum can prevent sepsis only in the presence of leucocytes. A bacteriolytic serum (cholera) shows in aleucocytic animals, which still possess complement, the same bacteriolytic action in the Pfeiffer expt. as normal animals; therefore the leucocytes are not essential for bacteriolysis. Protozoa are destroyed as completely with salvarsan in the absence of leucocytes as in normal animals, but ethylhydrocuprein does not protect against bacteriemia in the Th animals and hence requires coaction of the body. Th-treated guinea pigs show a greater resistance than normal ones

to the bacteria of swine erysipelas, which is ascribed to the liberation of bactericidal substances from the leucocytes.

H. G. W.

The Wassermann reaction in rabbits after treatment with luetic liver extracts. HJALMAR EIKEN. Copenhagen. *Z. Immunität.* 24, 188-98(1915).—After injection of aq. exts. of luetic livers the W. reaction is positive in rabbits, generally but not always disappearing in a short time. Alc. exts. of aq. exts. of luetic liver will produce W-reactions, but this reaction is not obtained with alc. exts. of normal human heart or non-luetic infant liver. Passage through a Chamberland filter deprives the aq. exts. of their activity. The active rabbit sera do not give the Hermann-Perutz reaction.

H. G. W.

Observations on the coagulation reaction in lues. L. HIRSCHFELD AND R. KLINGER. Univ. Zürich. *Z. Immunität.* 24, 199-219(1915).—Globulin solns. shaken or diluted with water, which give positive Wassermann reactions or are themselves antihemolytic, increase the activity of exts. containing cytozyme. This is ascribed to adsorption of the cytozyme on the surface of the particles, which increases its activity. Active serum inhibits more than inactive, and serum that has been treated with bacteria inhibits less than before. After digestion with kaolin a positive coagulation reaction appears. The mixt. of a luetic serum with inactive acetone ext. can be recognized with complement, but not with platelet cytozyme; therefore the phenomenon of cytozyme activation is shown only by definite ppts. with surfaces of certain but undefined character. The reduction in coagulation activity of the ext. on reaction with luetic serum may be ascribable to a globulin pptn. which surrounds the particles in the exts. The greater delicacy of the coagulation reaction in lues may be due to the fact that the active reacting principle (lipoid) is identical with the indicator (cytozyme), while in the Wassermann reaction only the complement acts as indicator and the alterations are shown indirectly. Cf. C. A. 9, 469.

H. G. W.

Normal leucotoxins and their relations to phagocytosis and consanguinity. LEOPOLD LÖHNER. Univ. Gratz. *Arch. ges. Physiol.* 162, 129-58(1915).—Heterologous undil. serum (rabbit, guinea pig, swine, goat, sheep, ox, human) influences the carbon phagocytosis of horse leucocytes, causing a diminution of the % of phagocytes. Heat inactivation of the serum (0.5 hr. at 55.5°) decreased the diminution of the phagocytosis considerably but never increased phagocytosis. This diminution is due to the content of normal leucotoxins in the serum. The estn. of the carbon phagocytosis diminution is a safe means for the detection of toxin action where other methods give, in part at least, negative results. Normal leucotoxins are complex, thermolabile serum constituents. Certain observations seem to indicate that even in inactivated serum, specific leucotoxic bodies, thermostable substances, are present in small amts. In the main the phagocytosis decrease in inactivated serum is the result of the differences in the chem. constitution, especially perhaps in variations in the Ca^+ and OH^- ion content. The normal leucotoxins of different kinds of sera, measured by the degree of diminution of phagocytosis, are different. The toxin titer of sera of different individuals of the same species shows considerable variations, in many cases even greater than the differences of species. This leads to the conclusion that there is not a complete parallelism between the action of leucotoxins and the blood relationship of different organisms. The parallelism consists in the fact that the toxin action is the stronger the more distantly the species are related. The absence of a cytotoxic effect may not always be taken as a proof of an established blood relationship, nor is the presence of this action a proof of a marked diversity.

C. J. WEST.

New observations on beri-beri. Conclusions. H. SCHAUMANN. *Arch. Schiffs- u. Tropen-Hyg.* 19, 425-45(1915).—A review, with 95 references (1911-1915).

C. J. WEST.

Acidosis and its regulation in the human body. A. BEGUN, R. HERRMANN AND E. MÜNZER. *Prag. Biochem. Z.* 71, 255-67(1915).—It has been shown experimentally and clinically that acids, when introduced into the human organism as such, or when produced pathogenically, are neutralized by NH_3 and excreted as NH_4 salts in the urine. A change in the CO_2 -tension of the venous blood does not occur during this process. Decreased CO_2 -tension cannot serve as a measure of acidosis unless the other factors are simultaneously controlled. The CO_2 content of the venous blood decreases in prolonged acidosis because of the absence, after some time, of substances in the blood which can bind CO_2 , and perhaps also because of alterations in the tissues. Further investigation is needed to show the role of respiration. The CO_2 -tension of the alveolar air is, in part, dependent upon the CO_2 content of the venous blood and, in so far, is probably a function of the capacity of the blood to bind CO_2 . The CO_2 -tension of the venous blood can thus sink in the absence of acids; the extent and duration of this fall remain to be detd. C. J. WEST.

Ferment action. XXIV. The serum ferments and antiferment during pneumonia. JAMES W. JOBLING, WILLIAM PETERSEN AND A. A. EGGSTEIN. *Vanderbilt Univ. J. Exp. Med.* 22, 568-89(1915); cf. *C. A.* 9, 3095.—The crisis in pneumonia is usually accompanied by (a) decrease in the amt. of serum antienzyme, (b) the mobilization of a non-specific protease in the serum, (c) an increase in amount of serum lipase, (d) a decrease in the amt. of non-coagulable N and of the proteoses in the serum. The crisis is associated with the beginning of an active autolysis, depending upon an altered enzyme-antienzyme balance. The fibrin and leucocytic debris must be considered as potential sources of toxic substances. With rapid autolysis proceeding, only non-toxic materials are absorbed. **XXV. Serum changes following kaolin injections.** *Ibid* 590-6.—The intoxication produced by the intravenous injection of inert substances such as kaolin is due to protein split products derived from the serum proteins. The kaolin acts as an absorbing medium for the serum antienzyme causing an alteration in the enzyme-antienzyme balance. The intoxication is accompanied by an increase in the amt. of serum protease and proteoses. The serum lipase, the amino acids and the total non-coagulable N show relatively little change. The amt. of antienzyme shows an initial increase, followed by a loss. **XXVI. The effect of protein split products on the serum ferments and antiferment.** *Ibid* 597-602.—In dogs the toxic effect of primary proteoses is usually associated with the following serum changes: (a) an increase in amt. of serum anti-enzyme followed by a fall in titer, (b) some increase in amt. of serum protease, (c) an increase in serum lipase, (d) a decrease in serum proteoses and amino N. Secondary proteoses produce (a) less marked changes in the anti-enzyme titer, (b) a marked increase in amt. of serum protease, (c) an increase in serum proteoses, (d) only a slight change in serum lipase, (e) a primary decrease in amino N. The peptone used (prepd. from dog muscle) caused a change in anti-enzyme titer similar to that produced by the primary proteoses, a marked increase in amt. of serum protease, only a slight change in serum lipase, a primary decrease in proteoses followed by an increase, and an increase in amino acids. A very small dose of peptone resulted in a decrease in anti-enzyme titer, together with a primary decrease in serum protease. The peptone prepn. was non-toxic when introduced into the stomach or rectum, while injection directly into the lumen of the small intestine was followed by immediate intoxication. **XXVII. The effect of killed bacteria on the serum ferments and antiferment.** *Ibid* 603-11.—The intravenous injection of killed organisms is followed by the mobilization of a non-specific protease and lipase. The rapidity and extent of this reaction depends upon the toxicity of the organism and on the resistance of the organism to proteolysis. The temp. and leucocytic curve bear no relation to the enzyme change. The amt. of serum antienzyme is usually increased after the in-

jection. Of the organisms studied, the typhoid bacilli produced the most marked enzyme changes and the tubercle bacilli the least. The toxicity of the dried organisms cannot depend wholly upon proteolysis *in vivo* but must depend in part on the pre-formed toxic substances liberated on lysis. Serum protease should not be considered as the sole exciter of intoxication through the production of protein split products; it seems possible that its function may in part be one of detoxication. **XXVIII.** The acceleration of esterase action. JAMES W. JOBLING, A. A. EGGSTEIN AND WILLIAM PETERSEN. Vanderbilt Univ. *J. Exp. Med.* 22, 701-6(1915).—K citrate, K oxalate, and Ca lactate accelerate the action of tissue and serum esterases. Intravenous and intraperitoneal injections of large amts. of Na citrate do not cause a definite increase in the activity of the serum esterase. **XXIX.** The relation of serum esterase to liver destruction. *Ibid* 707-12.—Liver tissue showing fatty degeneration, obtained from animals poisoned with P or CHCl_3 , contains a decreased amt. of esterase. The serum of animals poisoned with P or CHCl_3 has a high esterase activity. The increased amt. of esterase in the serum is not derived from the disintegrating liver cells, as the esterase in the blood of the hepatic vein is less in amt. than that found elsewhere.

C. J. WEST.

Relation of the spleen to blood destruction and regeneration and to hemolytic jaundice. **XII.** The importance in the production of hemolytic jaundice of the path of hemoglobin to the liver. J. HAROLD AUSTIN AND O. H. PERRY PEPPER. Univ. Penn. *J. Exp. Med.* 22, 675-81(1915).—When hemoglobin is set free in the portal circulation a larger amt. is held by the liver and converted rapidly into bile pigment than is the case when it is set free in the general circulation; under the former condition overloading of the liver with bile pigment more readily occurs and jaundice is more apt to develop. This mechanical influence must, therefore, be a factor in the lessened tendency, after splenectomy, to the jaundice which follows blood destruction due to hemolytic agents. A large number of cells undergo their final disintegration in the spleen, after the action of hemolytic poisons, and the hemoglobin there liberated passes directly to the liver. When the spleen is removed, this disintegration occurs in other organs, notably in the lymph nodes and bone marrow, and the hemoglobin passes into the general circulation and reaches the liver more gradually and in a more dilute form. **XIII.** The influence of diet upon the anemia following splenectomy. RICHARD M. PEARCE, J. HAROLD AUSTIN AND O. H. PERRY PEPPER. *Ibid* 682-93.—The anemia which develops after splenectomy is most marked in animals on a mixed table scrap diet of meat, bread, cereals, and vegetables, which is essentially a cooked diet. Control studies in which a unilateral nephrectomy precedes splenectomy demonstrate that the anemia is not due to operation, hemorrhage, or accidents of convalescence but develops only in the absence of the spleen. The results of studies of the influence of food containing a large amt. of iron in presumably easily utilizable form, as in raw beef spleen, do not support the view that the anemia is due to lack of iron in the food. Observation on the influence of a diet of raw meat as contrasted with cooked meat shows a more severe anemia in animals on the cooked diet and suggests the possibility that heat alters some substance which, in the absence of the spleen, the body cannot utilize.

C. J. WEST.

The influence upon the spleen and the thyroid of the complete removal of the external function of the pancreas. J. E. SWEET AND JAMES W. ELLIS. Univ. Penn. *J. Exp. Med.* 22, 732-8(1915).—The complete removal of the function of the pancreas concerned in digestion is followed by marked changes in the spleen and in the thyroid apparatus. The spleen shows an extreme simple atrophy. The thyroid apparatus exhibits a constant change shown by the macroscopic transparency of the gland, by the microscopic increase in the amt. of colloid, by the chem. increase of the iodine

content of the gland, and by the functional test of the delayed appearance of tetany after the complete removal of the thyroid apparatus. C. J. WEST.

An experimental study of blood glucolysis. The effects of thyroid and adrenal extracts and phlorhizin on glucolysis *in vitro*. GEORGE M. MACKENZIE. Columbia Univ. *J. Exp. Med.* 22, 757-65(1915).—Blood glucolysis *in vitro* during a period of 3 hours' incubation proceeds at practically the same rate under sterile conditions as when no effort is made to prevent contamination. Fresh thyroid extract, epinephrine, and phlorhizin, do not contain any substances which have a const. effect upon the rate of blood glucolysis outside of the body. No evidence of the presence of an anti enzyme was found. C. J. WEST.

Diet and tumor growth. WILLIAM H. WOGLOM. Columbia Univ. *J. Exp. Med.* 22, 766-79(1915).—Lactose does not increase the receptivity of mice and rats for the transplantable carcinomata of their species. C. J. WEST.

Relationship of chronic protein intoxication in animals to anaphylaxis. WARFIELD T. LONGCOPE. Columbia Univ. *J. Exp. Med.* 22, 793-9(1915).—Such foreign protein as horse serum and egg-white in the amts. employed in these expts. do not produce evidences of intoxication immediately after injection into rabbits. Single large injections do, however, produce changes in the parenchymatous organs after a period of 10 to 21 days. These develop at the time or immediately after the animal has formed antibodies for the foreign proteins. The mechanism of the development of the lesions in the myocardium, liver, and kidneys of rabbits is thus the same, whether a single inoculation is given or whether repeated inoculations are made in sensitized animals. By the latter method, however, much more marked and extensive changes may be produced. C. J. WEST.

Bilirubin. HANS FISCHER. Univ. München. *Z. physiol. Chem.* 95, 78-80 (1915).—The possibility of bilirubin occurring in the urine in combination with protein is discussed. All samples thus far examd. contain small amts. of S (0.08-0.94%), which may be derived from protein. This was not removed by boiling with glacial AcOH for 2 hrs. Because of this the more probable formula for bilirubin is the one with 33 C atoms. C. J. WEST.

Immunization with autogenous proteins in bronchial asthma. HENRI ISKOWITZ. *N. Y. Med. J.* 102, 950-3(1915).—In the prepn. of the protein, 60 cc. of bronchial secretion, drawn from the bronchus by means of a bronchial catheter, is sterilized by heat, concd. to a gelatinous mass on the water bath and 60 cc. of physiological salt soln. added. 0.25% phenol is added as a preservative. The filtered soln. is injected in graduated amts., the first dose being 0.5 cc. of the prepn. dild. 1:10. A. H. R.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Poisonous gases. E. KOHN-ABREST. *Ann. fals.* 8, 215-39(1915).—Toxic gases and vapors may be roughly divided into 3 groups: (I) irritants, (II) poisons, (III) those possessing both of these properties. The most important irritants are: Cl, HCl, Br, HBr, HI, SO₂, and NO₂. These injure because of their distinctive effect on the mucous membranes, and cannot as a rule be detected, after death, in the victim by chem. means. To the second class belong those gases which act like chem. poisons and which remain in the organism in traces and can usually be identified chemically. In this group are CO, H₂S, H₂Te, AsH₃, PH₃, (CN)₂, HCN and CS₂. Group III contains COCl₂, CNCl, H₂Se. Data upon the physical properties and physiological and toxicological effects of each of the gases are given in detail, and incompatibles and active absorbents suggested. As a summary is given a table showing the d., wt. per l., color, temp. and pressure of liquefaction, and toxicity of each substance. H. S. BAILEY.

Emetine in the treatment of periodontal suppurations. ALLEN J. SMITH AND M. T. BARRETT. Univ. Penna. *Dental Cosmos* 57, 1201-9(1915).—Symbiosis of *Entameba gingivalis* Gros and bacteria in the pockets of pyorrhea alveolaris may give rise to toxins which produce arthritic, alimentary, hemic, nervous, and other complications. Vaccines may be used to destroy the bacteria, and emetine-HCl to destroy the ameba. Emetine-HCl soln. loses amebicidal power on standing for several days, being decompd. by bacteria. Local application of emetine was found preferable to hypodermic administration; administration *per os*, as pellets, was least efficient. Local application of aq. soln. of neosalvarsan was effective in cases of pyorrhea, due primarily to spirochetes—probably to those of Vincent.

JOSEPH S. HEPBURN.

Influence of oil of chenopodium on circulation and respiration. W. SALANT AND A. E. LIVINGSTON. *Am. J. Physiol.* 38, 67-92(1915).—Intravenous injection of an emulsion of oil of chenopodium, 0.02 to 0.085 cc. per kg., caused in dogs, cats or rabbits (1) a fall of blood pressure, greater with dogs than with cats or rabbits, and of cardiac origin, (2) a diminished pulse, (3) a decrease of vagus irritability, (4) a depressed respiration both in amplitude and rate. Respiratory depression and apnea may be due to the liberation of O in the body from ascardiole, a peroxide. Apparently it is not due to a lowered sensitiveness of the respiratory center to CO₂. The fact that chenopodium has less depressant effect on respiration in the rabbit is due to the relatively larger amt. of CO₂ in the blood. No methemoglobin nor appreciable hemolysis was noted.

J. F. LYMAN.

Lime therapy of diabetes. MAX KAHN AND MORRIS H. KAHN. *Med. Record* 88, 744-6(1915).—Treatment with Ca salts reduced a daily minimum output of glucose of 90 g. to less than 10 g. The combination of Ca with various organs appears to influence the glucose production. In the case of the liver, Ca seems to act as an aid to glycogenesis, while the lack of Ca salts induces glycogenolysis. A further report is promised.

A. H. RAHE.

The effect of smoking on the circulation. JOHN AIKMAN. *N. Y. Med. J.* 102, 501-7(1915).—The subjects of these tests were men from 16 to 31 yrs. old. One Turkish cigarette of the better grade was consumed in each test. Sixteen out of 27 subjects showed an increase of 8 heart beats per min., 7 showed a smaller increase and 4 showed no effect. Two of the latter had abnormally high pulse rates at the start. In every instance the effect lasted for at least 15 min. after smoking ceased. Twenty-five tests were made of systolic pressure, there being a fall in 12 cases, an increase in 5, and no change in 8. The av. fall was 6.16 mm. and the gain 5.8 mm. If changes of less than 4 mm. be disregarded, 4 subjects showed an increase and 8 a decrease. Twenty-four observations on pulse pressure showed an av. fall of 8.16 mm.; 7 showed increased and 2 unchanged pressure. In 5 cases, in which the change in pulse pressure was marked, there was an increase in 2 instances and a fall in 3.

A. H. RAHE.

The recovery of *Entameba buccalis* in pyorrhea pus and treatment by emetine hydrochloride. ERNEST STURRIDGE. *Proc. Roy. Soc. Med., Odontological Section* 8, 501-3(1915). *Entameba buccalis* was found in 78% of the cases of pyorrhea examd. Emetine-HCl injected into the pus pockets killed this organism in every instance. Treatment with Zn ions proved equally effective. The weak point in the emetine treatment is its failure to kill organisms other than entameba. Cf. C. A. 9, 3300.

A. H. RAHE.

The relation of the fatal dose to the surface. KARL KISSKALT. Univ. Königsberg. *Biochem. Z.* 71, 469-77(1915); cf. Dreyer and Walker, C. A. 8, 2001, 3203, 356.—From expts. on rats and mice it is shown that Dreyer's statement, that the maximal dose can be calcd. from the body surface alone, is incorrect, and that other factors must be considered.

C. J. WEST.

Chemopathological studies with compounds of arsenic. I. Types of the arsenic kidney. LOUISE PEARCE AND WADE H. BROWN. Rockefeller Inst. *J. Exp. Med.* 22, 517-24(1915).—Arsenious acid, atoxyl, arsacetin, arsenophenylglycine, salvarsan, neosalvarsan and galyi were studied. In general, two types of kidney were produced in the treated animals, the red and the pale, with a variety of subdivisions of each type, depending upon the modifications in the chem. constitution of the compd. used, dosage, and length of survival of the animal. **II. Histological changes in arsenic kidneys.** *Ibid* 525-34. The type of renal lesion produced by As compds. varies widely. Some arsenicals produce changes in which vascular injury predominates; others produce an equally dominant tubular injury. Each compd. of As tested produces a lesion-complex in the kidney that is relatively characteristic for that compd. The mode and character of the action of arsenicals are dependent upon their chem. constitution. **III. The pathological action of arsenicals on the adrenals.** *Ibid* 535-43.—The following figures represent roughly the doses in g. per kg. body wt. causing death in guinea pigs in 1 to 3 days: Arsenious acid, 0.010-0.012; arsenic acid, 0.015-0.020; Na cacodylate, 0.700-1.000; atoxyl, 0.080-0.100; arsenophenylglycine, 0.250 or less; neosalvarsan, 0.300-0.350. Toxic doses of all known arsenicals produce definite pathological changes in the adrenals of guinea pigs. These changes include congestion, hemorrhage, disturbances in the lipid content, cellular degeneration and necroses and reduction of the chromaffin content. The character and severity of the injury varies with the chem. constitution of the compd. used. Adrenal injury may be an important factor in arsenical intoxication. Therapeutic doses of some arsenicals may produce adrenal stimulation. Cf. *C. A.* 9, 3296. C. J. WEST.

Further study of the bactericidal action of ethylhydrocuprein on pneumococci. HENRY F. MOORE. Rockefeller Inst. *J. Exp. Med.* 22, 551-67(1915); cf. *C. A.* 9, 2921.—The serum of rabbits which have been previously treated with a single dose of ethylhydrocuprein exerts a bactericidal action on, and later inhibits the growth of, pneumococci in the test-tube. These actions are most evident in the serum of rabbits when the base is given in oil subcutaneously; they are least evident, or absent, when the hydrochloride in H_2O is introduced directly into the stomach. In the case of the base given in oil subcutaneously to rabbits in dosage of 0.1 g. per kg. of body wt., the bactericidal action of the serum is at its max. about 1 hr. after administration, and it passes into an inhibitory effect about 4 hrs. after the drug has been given. In men the same inhibitory and bactericidal actions of the serum are present when a single dose of 0.5 g. of the hydrochloride is given by mouth or subcutaneously, but the bactericidal action is not so marked as in rabbits. When the concn. of the hydrochloride in the serum has diminished to a certain point in relation to the number of pneumococci present, the pneumococci which have survived the bactericidal action for a few hrs. acquire the power of growing freely. C. J. WEST.

Action of the lethal dose of strophanthin in normal animals and in animals infected with pneumonia. ROSS A. JAMIESON. Rockefeller Inst. *J. Exp. Med.* 22, 629-45(1915).—When a given amt. of strophanthin is injected intravenously, the mortality is the same in normal cats and in cats suffering with exptl. pneumonia. The minimum lethal dose of strophanthin is the same in normal dogs and in those with exptl. pneumonia. The presence of an acute infection does not interfere with the action of strophanthin on the heart. Electrocardiographically the changes occurring in the heart action when strophanthin is injected are found to be similar in normal and in infected animals. These facts renders it probable that a like similarity may be anticipated in man, under normal conditions and in pneumonia. C. J. WEST.

The toxic substance in cottonseed meal (WITHERS) 12.

I. ZOÖLOGY.

R. A. GORTNER.

The influence upon tadpoles of feeding desiccated thyroid gland in variable amounts and of variable iodine contents. C. H. LENHART. Western Reserve Univ. *J. Exp. Med.* 22, 739-46(1915).—The feeding of dried thyroid gland to tadpoles causes an early differentiation in proportion to the quantity fed or the % of I content of the gland used. With the larger doses and the higher I %, metabolism is stimulated to such an extent that the animals emaciate rapidly and die early, before there is time for much differentiation. With smaller amts. and lower I % the size of the animals is roughly inversely proportional to the amt. or %, so that a close association of differentiation with pigmy size is not characteristic of thyroid feeding as such, as Gudernatsch seems to conclude. One may see early and marked differentiation along with large size. Non-thyroid I does not have this effect. The thyroid effect is inhibited by exposure to cold and by cracker feeding. Exposure to cold probably acts by lowering metabolism, cracker feeding by substituting food other than the animal's own tissues to meet the increased demands caused by the stimulating effect of the thyroid feeding. The reaction of tadpoles to thyroid feeding is so sensitive that the procedure might well serve as a biological test for the activity of thyroid tissue, superior even to chemical methods.

C. J. WAST.

12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

The development of food chemistry and pure food legislation in the German Empire. H. KUTTENKEULER. Elberfeld. *Naturwissenschaften* 3, 509-13(1915).—K. quotes the earliest laws passed in Germany and briefly reviews the present state control of foodstuff, quality, methods of production, storage, etc.

C. G. F.

A useful modification of the so-called Mohler reaction of benzoic acid. J. GROSSFELD. *Z. Nahr.-Genussm.* 30, 271-3(1915).—The use of hydroxylamine hydrochloride instead of $(\text{NH}_4)_2\text{S}$ for the reduction is recommended because the former has no color of its own to interfere with subsequent colorimetric comparisons. The method is based in other respects upon the modification of von der Heide and Jacob (cf. *C. A.* 4, 1523). The ether ext. is evapd. to dryness in a test tube, heated for 20 min. in a water bath with 0.1 g. KNO_3 and 1 cc. concd. H_2SO_4 , cooled and treated with 2 cc. H_2O . After cooling it is made alk. with 10 cc. of 15% NH_4OH and mixed with 2 cc. of a soln. of 2 g. hydroxylamine hydrochloride in 100 cc. water. In the presence of benzoic acid more or less of a red color appears according to the amt. present. Estn. may be made by comparison with the color developed by adding KCNS to a soln. of ferric alum (0.860 g. Fe alum in 1 l. of acidified H_2O).

L. D. ELLIOTT.

Report on vegetables. E. W. MAGRUDER. *J. Assoc. Official Agr. Chemists* 1, 199-200(1915).—For detg. the % of easily separable liquid in canned tomatoes the regular fertilizer sieve with 1 mm. round holes is very satisfactory. The tomatoes should stand on the sieve about 5 min., being gently stirred with a spatula when first poured on and at the end of the time. As a result of testing in this way 77 cans of tomatoes, M. considers that those which do not contain more than 50% of separable fluid are excellent.

H. S. BAILEY.

Report on water in foods. W. J. MCGEE. *J. Assoc. Official Agr. Chemists* 1, 218-21(1915).— H_2SO_4 , CaCl_2 , Na, CaCl_2 , P_2O_5 , BaO_3 , and glycerol as drying agents at room temp., under both 76 mm. and atm. pressure, were tested. The foods dried were cheese, cocoa, corn meal, and raw sugar. A study of the tabulated results shows that

H_2SO_4 , P_2O_5 , CaC_2 and metallic Na are about equal in dehydrating power. Probably CaC_2 and Na are the most practical reagents. Dehydration in a partial vacuum is not always more nearly perfect than over the same medium at atm. pressure. In a desiccator at room temp. under 760 mm. in 48 hrs. the materials used for tests lost 80 to 96% of their total H_2O , and at 75 to 100 mm. they lost as much in 24 hrs. The detn. of H_2O by the vacuum method over H_2SO_4 is recommended as an optional official method.

H. S. BAILEY.

The estimation of starch in cocoa by means of taká-diastase. CECIL REVIS AND H. R. BURNETT. *Analyst* 40, 429-32(1915).—Weigh 5 g. fat-free dry cocoa matter into a beaker, thoroughly stir with 50 cc. of 10% (by vol.) alc., and filter under pressure, preferably on a Büchner funnel. Wash with two 50 cc. portions of 10% alc., and then with 10 cc. of 95% (by vol.) alc., taking care that the cocoa sucks dry at no stage. Scrape and wash the moist cocoa into a 250 cc. flask with 125 cc. of boiling water. Mix well, and place in a boiling water bath with const. shaking for 15 min. to gelatinize the starch. Cool to 38°, mix with 0.05 g. taká-diastase rubbed in a little water, add 2 cc. toluene, and after shaking and stoppering place in an incubator at 38° for 24-36 hrs., shaking at intervals. Then add 10 cc. 0.1 N NaOH to stop the action. Cool to 15°, add about 100 cc. water, run in 10 cc. acid mercuric nitrate soln. (pure HgO dissolved in twice its wt. HNO_3 (d. 1.42) and the soln. dild. to 5 times its vol. with water) on the surface, and finally add water to the mark below the toluene. Mix well and filter. Carefully measure 100 cc. of the filtrate into a flask, add 0.5 g. $\text{Na}_2\text{HPO}_4 \cdot 12\text{H}_2\text{O}$, and after this has dissolved run in 10 cc. NaOH soln. with agitation. Ten cc. of the NaOH soln. should just neutralize 4 cc. of the mercuric nitrate soln., and on no account should there be an excess of alkali. A slight acidity is preferable. Mix and filter the contents of the flask, and use 50 cc. of the filtrate for a grav. Cu detn. The polarimetric readings are also made on this filtrate. Examns. of cocoa shell by this method gave only negligible reductions, showing that no true starch is present, and confirming microscopic results. Detns. by the acid conversion or diastase methods invariably indicate considerable amts. of starch.

P. B. DUNBAR.

Report on cocoa and cocoa products. H. C. LYTHERG. *J. Assoc. Official Agr. Chemists* 1, 200-2(1915).—The present (1913) methods of the A. O. A. C. for the detn. of milk fat and lactose are satisfactory. The Baier and Neumann method (*C. A.* 4, 353) for casein is recommended for provisional adoption.

H. S. BAILEY.

The tea of Tchakva near Batoum (Caucasus). P. G. MÉLIKOV AND M. ROSENBLATT. *Russ. J. Exp. Landw.* 16, 213-6(1915).—The mild and humid climate of Batoum as well as the soil (laterite) are completely favorable to the culture of tea (*Thea chinensis* L.). The processes of harvesting, desiccation, and fermentation recall those used in India. In its content of theine, tanning substances, total N, organic and mineral matter sol. and insol. in water, and matter sol. in ether, this tea resembles the teas of China and India. The soil of Tchakva is rich in Mn and the ash of the tea of this region is also remarkable for its considerable content of this metal.

W. H. F.

Some effects of storage on coffee. R. E. DOOLITTLE AND BURNETT B. WRIGHT. *Am. J. Pharm.* 87, 524-6(1915).—An investigation of the effect of storage on the gain or loss in wt. of freshly roasted coffee, prepd., transported and stored under ordinary commercial conditions. The results showed that there was an increase over the original wt. in all samples and at all weighings during the 60 weeks covered by this expt.

W. G. GAESSLER.

Caffeine determinations in coffee. G. FENDLER AND W. STÜBER. *Z. Nahr.-Genussm.* 30, 274-6(1915).—Supplementing their previous work (*C. A.* 8, 3599), F. and S. have tried the Burmann method (*C. A.* 4, 1777) for the detn. of caffeine in coffee. Operating upon a coffee containing 1.34% caffeine as described by B. only 0.45 to

0.79% was recovered. It was found that the process of subliming the caffeine quant. is incomplete at the end of 3 hrs. but that better yields are obtained if the sublimation is continued for 12 hrs. Even then too little caffeine is recovered and the results are too variable (0.93 to 1.25%), the method being pronounced inaccurate for these reasons.

A. F. SEEKER.

Report on tea and coffee. J. M. BARTLETT. *J. Assoc. Official Agr. Chemists* 1, 203-8(1915).—The methods proposed by Gorter, and Fuller, and a modification of Stahlschmidt's method, for the detn. of caffeine were tried out on a sample of coffee and of tea by 4 collaborators. The details of these methods and various modifications, and comments on them, are given. Results by all 3 methods are quite satisfactory on coffee, but those by the Fuller method were low on tea. This method yields a fairly pure caffeine, but the extns. are tedious and incomplete. In the Gorter method the caffeine is impure, so that it is necessary to det. the N in the residue to get correct results. Further work on all the methods is recommended before any is adopted.

H. S. BAILEY.

Report on vinegar. E. H. GOODNOW. *J. Assoc. Official Agr. Chemists* 1, 496-8 (1915).—Collaborative work on methods 6, 11, 15, 16, and 17 (solids, ash, fixed acid, volatile acid, and Pb ppt., resp.) *Bur. Chem. Bull.* 152 (1911) showed that these are accurate and reliable and should be adopted as provisional.

H. R. SMITH.

Report on food adulteration. J. HORTVET. *J. Assoc. Official Agr. Chemists* 1, 465-70(1915).—A summary of the reports for 1914.

H. R. SMITH.

A bacteriological study of retail ice cream. S. H. AYERS AND WILLIAM T. JOHNSON. U. S. Dept. Agr., *Bull.* 303, 24 pp.(1915); cf. *C. A.* 9, 1810.—A study of the number of bacteria in commercial ice cream as purchased from retail stores in Washington, D. C., during the summer and winter seasons showed a wide range in the bacterial content, and that the av. number of bacteria in ice cream from each manufacturer is distinctly lower during the winter months: The summer av. of 94 samples was 37,859,907 per cc. with a max. of 510,000,000 and min. of 120,000, while the winter av. of 91 samples was 10,388,222 with a max. of 114,000,000 and min. of 13,000 per cc. The bacterial groups bore much the same relation to each other in the av. summer and winter samples; however, in the summer samples, a higher % of the acid-coagulating group of bacteria and a lower % of the alkali and peptonizing groups than in the winter group was noted. Gas-forming bacteria of the colon-aerogenes group detd. on litmus-lactose-asparagine agar were found in 0.1 cc. in 88.33% of 120 samples examd., the greatest number being in the summer samples. Methods of examn. and tables classifying the bacteria found are given.

E. H. INGERSOLL.

Rapid method for determining water and fat in butter and margarine. A. A. BESSON. *Basel. Chem. Ztg.* 39, 770-2(1915).—The fat detn. is carried out in Huggenberg and Stadlinger's "Sapometer" (*C. A.* 6, 2341) as follows: Weigh 5 g. substance into a beaker, add about 40 cc. HCl (2:1), boil a few mins., cool (but not till the fat solidifies), wash carefully into the sapometer, add about 100 cc. Et₂O and enough H₂O (or Et₂O) to bring the Et₂O layer into the graduated portion of the app., shake well, let stand 15 mins., read the volume of the Et₂O soln., draw an aliquot portion into a weighed flask, evap. the Et₂O, then heat 30 mins. in a steam oven and weigh. The H₂O is detd. in an app. consisting of 2 Al dishes, the outer about 8 cm. diam. and 2.5 cm. high, the inner 6 cm. diam. and 1.5 cm. high. A cross lying on the inner dish supports an inverted Al funnel of about 2 mm. less diam. than the outer dish, and stem 1 cm. long, loosely closed with a wad. The app. is weighed, then about 5 g. substance weighed into the inner dish and the whole heated in an air bath so that 150-160° is reached in 15-20 mins. Cool the app. by standing in H₂O and weigh after about 10 mins. Cf. *C. A.* 1, 70; 3, 1098; 8, 1624; 9, 670.

J. H. MOORE.

Report on dairy products. J. HORTVET. *J. Assoc. Official Agr. Chemists* 1, 186-94(1915).—Samples of pure, sweet cream, the same cream homogenized with oleo oil (20%), and ice cream made from the same cream, with added gelatin, sugar and cottonseed oil, were submitted to 5 collaborators for analysis. The % of fat present was detd. by the Roese-Gottlieb and the continuous extn. method of Paul. The results indicate that the extn. method may be relied upon when carried out under proper conditions and by an experienced analyst. The results for fat by the extn. method will be higher than those obtained by the R.-G. method. It is recommended that the extn. method be adopted by the A. O. A. C. provisionally. Analytical results and details of the methods are given. H. S. BAILEY.

The effect of feeding on the composition of milk and butter, linseed cake and hempseed cake. H. T. CRANFIELD AND MARGARET G. D. TAYLOR. *Analyst* 40, 433-9(1915).—The compn. and quality of milk and butter produced by feeding hempseed cake is quite equal to that obtained by feeding linseed cake. The effect of removing cows from poor pasture to a well balanced ration in stall is shown by a large fall in % of fat and considerable rise in R.-M., Kirschner, and Polenske values, and a fall in the refractometer figure. P. B. DUNBAR.

The relation between the Reichert-Meissl, Kirschner and Polenske values for butter. H. T. CRANFIELD. *Analyst* 40, 439-42(1915).—The R.-M., Kirschner and Polenske values of 31 samples of butter (cf. preceding abstr.) are compared.

Kirschner value.	Average Polenske value.	Limits of Polenske value.
19-20	1.46	1.4-1.7
20-21	1.65	1.4-2.2
21-22	2.05	1.7-2.7
22-23	2.43	1.8-2.9
23-24	2.41	2.2-2.6

The ratios R. M.-K./P. varied from 1.97 to 2.98, but the majority of the samples lay between 2.2 and 2.8. P. B. DUNBAR.

Report on fats and oils. R. H. KERR. *J. Assoc. Official Agr. Chemists* 1, 181-6(1915).—With the assistance of 6 collaborators, the referee studied further the glycerol-KOH method for the prepn. of titer acids. On cottonseed oil the av. titer obtained by the proposed and the official method agreed to within 0.1°, on inedible grease within 0.01°, and on oleostearin were identical. The Emery method for the detection of beef fat in lard was submitted to 7 collaborators, each of whom worked on 8 samples of pure and adulterated lards. Their reports on the purity of these agreed very closely. It is recommended that the glycerol-KOH saponification method be adopted as official, and the Emery method as provisional by the A. O. A. C. H. S. BAILEY.

Report on fats and oils. R. H. KERR. *J. Assoc. Official Agr. Chemists* 1, 513-5(1915).—A study of 2 methods for the detection of phytosterol in mixts. of animal and vegetable fats: (1) Bureau of Animal Industry method (U. S. D. A. Bur. Animal Ind., *Circ.* 212) and (2) the digitonin method of Marcusson and Schilling (*C. A.* 8, 1022). Three samples were sent out: (1) Lard containing 5% cottonseed oil and 0.25% vaseline. This amount of vaseline would effectually prevent accurate observations by the present provisional method. (2) Pure lard, rancid. Rancidity interferes decidedly with the present method. (3) Lard containing 2.5% hydrogenated cottonseed oil and 2.5% soy bean oil. Three collaborators were led to correct conclusions by each method. The digitonin method is more simple and convenient but the reagent is expensive and difficult to obtain. The Bur. Animal Industry method requires more time and labor in manipulation but does not depend on an expensive reagent. Both

methods are decidedly superior to the present provisional method and are recommended for adoption by the association as provisional methods. H. R. SMITH.

Various methods for the determination of phytosterol by means of digitonin and a proposed new apparatus for this purpose. H. WAGNER. Duisberg. *Z. Nahr.-Genussm.* 30, 265-7(1915).—W. reviews the various methods proposed for this detn. The Marcusson and Schilling method (*C. A.* 8, 1022) is defective in that it does not ppt. the phytosterol existing as esters. The Klostermann method (*C. A.* 8, 536) appears to possess no special value, while that of Fritzsche (*C. A.* 8, 1315) also fails to ppt. the phytosterol esters and yields a product contaminated with digitonin. The Klostermann and Opitz procedure (*C. A.* 8, 3246) is too complicated though the results are good. Kühn and Wewerinke have proposed a method (*C. A.* 9, 1079) further modified by Kühn, Bengen and Wewerinke (*C. A.* 9, 2270) which W. considers to be the best of the procedures mentioned. W. employs a special app. for this detn.; it consists essentially of a short filtering tube into which a perforated porcelain plate can be fitted, the latter being covered, first with a paper disk, and then with a layer (5 to 7 mm. thick) of granulated pumice (0.5-1.0 mm. in diam.). The filter tube is fitted, by means of a rubber stopper, with a glass cup which surrounds the tube at the level of the porcelain plate and which is filled with warm water to prevent solidification of the fatty acids during filtration. When operating by the Klostermann method (*loc. cit.*) this app. is supplemented by a cylindrical separatory funnel fitted a short distance above the stem with a side outlet and stopcock. The digitonide may be pptd. in this funnel, the ppt. allowed to settle, and the clear liquid drawn off from the side outlet. The ppt. may be washed in the same way. The separatory funnel is then connected to the filtering tube described above by means of a ground glass joint, after which the stopcock at the stem of the separatory funnel is opened and the ppt. washed into the filtering tube by means of CHCl_3 or ether. After thorough washing of the ppt. the filtering tube may be disconnected from the separatory funnel, the water jacket, and the suction flask, dried at 105° in an oven, cooled and weighed. When operating by the K., B. and W. method the separatory funnel is not required. Illustrations are given. A. F. SEEKER.

Investigations on fatty fruits and seeds of our (German) colonies. V. Coula edulis and Limonia warneckei. H. WAGNER AND J. B. LAMPART. *Z. Nahr.-Genussm.* 30, 221-6(1915); cf. *C. A.* 9, 1811.—(1) *Coula edulis*. Nuts received from Kamerun are described and their dimensions given. The sound nuts yielded 30.48% fat, which was liquid at room temp., brown in color and had no especial odor or taste. Constants were detd. on the fat and fatty acids. (2) *Limonia warneckei*. The dimensions and description of some seeds obtained from Lome (Togo) are given. The amt. of fat extd. was 38.50%. Constants were detd. and other tests made on this fat. L. D. ELLIOTT.

Report on meat and fish. W. B. SMITH. *J. Assoc. Official Agr. Chemists* 1, 170-81(1915).—Methods for the detn. of starch in meat products proposed by Price and by Mayrhofer-Sachsse were studied. Although both depend upon the same principle, the Price method is the more simple, rapid and accurate. For the detn. of NH_3 nitrogen, the EtOH vapor method, the Folin-Pennington, and new Folin methods, were investigated. "Since the latest modification of the Folin method makes it as easy of operation as the EtOH method, it seems the best possible." For the detn. of sugar in meats, the provisional A. O. A. C. method (*Bur. Chem. Bull.* 107, Rev., p. 111), as given, and with the further addition of phosphotungstic acid, and a 3rd method based upon that of C. A. Browne (*Handbook of Sugar Analysis*), using $\text{Hg}(\text{NO}_3)_2$, followed by treatment with phosphotungstic acid were studied. The details of all methods are given. It is recommended that the Price method be made official for

starch, that the new Folin method (*C. A.* 7, 2643) be adopted for NH_3N , and that further study be made on the Hg phosphotungstic acid method for clarifying meat sugar solns., with reduction according to Munson-Walker or Bertrand. H. S. B.

Report on cereal products. H. L. WHITE. *J. Assoc. Official Agr. Chemists* 1, 195-9(1915).—The method of Bryan, Given and Straughn (*Bur. Chem., Circ.* 71) for sol. carbohydrates was tried out with 2 samples of flour. The results obtained warrant its adoption as an official method of the A. O. A. C. The official method, a vacuum desiccator, and a vacuum oven method for the detn. of H_2O in flour were investigated by 2 collaborators (details of results and methods are given). Apparently 5 or 6 days in a vacuum desiccator gives the max. loss of wt. Detns. of gluten in 2 flours were made by the Olsen method, and that given in *Bur. Chem. Bull.* 122, p. 54. Results on the detn. of the acidity of the water ext. of flours by extg. at 40° indicate that it is desirable to limit the extn. to 2 hrs., and that perhaps 1 hr. will be more satisfactory.

H. S. BAILEY.

Judging cereal flours. A. HEIDUSCHKA AND K. HEINICH. *Z. Nahr.-Genussm.* 30, 226-8(1915).—Because of war regulations in Germany resulting in the grinding of a greater proportion of the bran into the flour, interest in detg. bran content has been aroused. Work previously done on bran residue by Raumstedt (*C. A.* 9, 2952) was incomplete due to the lack of numerical data. H. and H. have devised a method which is both rapid and accurate. Grind 2.5 g. of meal very fine with 10 cc. H_2O , add 20 cc. concd. HCl (d. 1.19), mix thoroughly and allow to stand covered $\frac{1}{2}$ hr. at room temp. Centrifuge the mixt. about 10 min. (centrifuge 2000-3000 r. p. m.), decant, and filter the residue through an 11 cm. weighed filter. Wash the residue on the paper once with dil. HCl (25%), and twice with water, using 10 cc. in each washing, and dry to const. wt. By this method it is possible to get all the hydrolyzable substances of the meal into soln. and the insol. residue in a form possible to weigh. It is then possible to make a further microscopical analysis of the bran. This method can be used in conjunction with the starch detn. of C. J. Lintner (*C. A.* 2, 553). Tables are given showing % H_2O and bran residue in rye, wheat and white flour meals.

HELEN N. ELLIOTT.

Gossypol, the toxic substance in cottonseed meal. W. A. WITHERS AND F. E. CARRUTH. N. C. Agr. Exp. Sta. *J. Agr. Research* 5, 261-88(1915); cf. *C. A.* 9, 1516.—Cottonseed kernels, previously extd. with gasoline, were treated with ethyl ether. Evapn. of the ether leaves a crude product designated "gossypol extract." A purer product, "precipitated gossypol," was obtained from the ethereal soln. by the addition of gasoline, and a cryst. product, "gossypol acetate," by pptn. by acetic acid. Gossypol was fatal to rabbits when administered intraperitoneally in the form of gossypol ext. or cryst. gossypol acetate, either when fed in one large dose in the form of gossypol ext. or when fed in small daily doses in the form of gossypol ext., pptd. gossypol, or gossypol "acetate." The smallest amt. of gossypol administered intraperitoneally and found fatal to rabbits was 0.24 g. of cryst. gossypol acetate per kg. of live wt. Gossypol forms an oxidation product which is non-toxic. Cottonseed kernels are rendered less toxic by the partial extn. of gossypol and non-toxic by a more nearly complete extn. of it. Methods for rendering cottonseed kernels non-toxic depend upon extg. the gossypol or changing it to physiologically inert forms by oxidation or by pptn. A bibliography is appended.

W. H. FRY.

The question of the quantitative determination of potato addition to bread, and the determination of the milling grade of the flour used for bread-making. J. ABEL. *Z. Nahr.-Genussm.* 30, 129-138(1915).—A. finds that the ash of wheat and rye flour is high in mineral acids (phosphates) and low in bases while that of potato flour is high in bases and low in acids. The alkalinity of the various ashes was calcd. by adding

the mg. of each base figured as oxide in 1 g. of flour or bread and subtracting from the total the acid value figured as the total mg. of P_2O_5 , SO_3 and Cl in 1 g. of bread or flour. (CO_2 and SiO_2 were not counted.) In the case of rye and wheat this number is negative; in potato it is positive. The analytical procedure is as follows: Rub up 20 g. of the dried and pulverized bread (or flour) with ten cc. 0.5 N Na_2CO_3 , adding a little water to make a paste, if necessary. Transfer this to a Pt dish with the aid of a glass rod, which is cleaned with a piece of ashless filter paper. After drying gradually burn over a piece of asbestos which is arranged so as to prevent the flame from coming in contact with the charred material. Leach with a little hot water and ash again until no more gas is given off; evap. the aq. ext. and return to Pt dish. Dry at $110-120^\circ$ and heat until the dish is at low red heat. Transfer the weighed ash to a small Erlenmeyer flask with 30 to 40 cc. boiled water, and det. the CO_2 by the Fresenius-Classsen method. For driving out the CO_2 use 10 cc. of N HNO_3 . After expelling the CO_2 transfer the ash soln. with as little boiled water as possible to a 100 cc. glass-stoppered cylinder, add 5 cc. of exactly neutral $Ca(NO_3)_2 \cdot NH_4NO_3$ soln. (5 g. $Ca(NO_3)_2$ and 10 g. NH_4NO_3 in 100 cc. H_2O) and 20 cc. 0.5 N NH_4OH , make up to 100 cc., shake hard, and let stand for 24 hrs. Pipet 50 cc. of the clear supernatant liquor and neutralize with 0.1 N HNO_3 , using methyl orange as indicator. Then titrate the neutralized soln. for Cl with 0.1 N $AgNO_3$ against K_2CrO_4 (with bread dil. to 250 cc., with flour direct). In calcg. the alkalinity of the ash the N HNO_3 and 0.5 N NH_4OH used are disregarded as they exactly neutralize each other. The 10 cc. 0.5 N Na_2CO_3 used equals 50 cc. of 0.1 N Na_2CO_3 and the 0.1 N HNO_3 (x) used for back titration gives the alkalinity, $-50 + 2x/10$. This is only positive when $x = 25$. Since 1-2% NaCl is added in bread making, a correction for that is made by subtracting from the total ash the amt. of NaCl found by the Cl detn. Also 10 cc. 0.5 N Na_2CO_3 was added at the start and the corresponding quantity of Na_2O (0.155 g.) and CO_2 (0.110 g.) must be subtracted in order to get the net ash. Correction should also be made for the ash of the yeast soln. used. Figures are given for various breads and flours to prove the feasibility of detg. the addition of potato flour. This may be made quant. if the ash analysis of the original wt. of rye flour used is known. The milling grade of flour used in bread making can be judged if the ash of the flour is known. Increases in the ash would indicate the various grades.

H. L. LOURIE.

New methods of preparing conserved foods. W. SCHEFFER. *Z. Nahr.-Genussm.* 30, 261-5 (1915).—A review on the American "puffed" rice and wheat, with a study of their physical and microscopical properties.

HELEN N. ELLIOTT.

Quantitative determination of the amino acids of feeding stuffs by the Van Slyke method. II. H. S. GRINDLEY AND M. E. SLATER with H. C. ECKSTEIN AND J. C. ROSS. *J. Am. Chem. Soc.* 37, 2762-9 (1915); cf. *C. A.* 9, 2407.—In addition to the values previously given for cottonseed meal, tankage and alfalfa hay, the following are now reported for blood meal, wheat, rolled wheat, barley, oats and white soy beans, resp. (expressed in % of the total N): Ammonia N, 5.85, 17.59, 17.04, 15.16, 13.06, 10.12; humin N, 3.95, 9.21, 9.04, 8.79, 9.94, 6.63; arginine N, 9.16, 7.99, 8.20, 9.46, 11.42, 12.67; cystine N, 0.69, 1.34, 1.66, 1.26, 1.16, 0.67; histidine N, 8.53, 1.67, 3.21, 3.64, 4.32, 5.77; lysine N, 9.73, 2.47, 2.48, 2.19, 3.49, 6.14; amino N in filtrate from bases, 56.57, 47.67, 47.70, 45.81, 51.72, 49.79; non-amino N in filtrate from bases, 4.42, 13.59, 13.93, 13.84, 7.90, 8.56. The results are also given in % of the feeding stuffs. The results confirm the earlier conclusion that the V. S. method for the detn. of the chem. groups characteristic of the amino acids of proteins can be applied directly to feeding stuffs with at least a fair degree of accuracy. The values found, however, do not agree well, on the whole, with Nollau's (*C. A.* 9, 2780); this is probably due in the main to differences in the details of exptl. procedure. There are pronounced variations in

the free and combined amino acid content of the common feeding stuffs, expressed in % of the total N or of the feeding stuff. The high results for humin N are due, in part, to the presence of sol. carbohydrates during the hydrolysis of the proteins and probably in part to the presence of cellulose which mechanically prevents complete hydrolysis; these high results constitute a source of error in the direct application of the V. S. method.

CHAS. A. ROULLIER.

The utilization of bones for food. G. MORPURGO. *Oesterr. Chem. Ztg.* 18, 139 (1915).—A nitrogenous food can be prepd. from bones in a manner similar to the prepn. of glue. Bones, which have been boiled, are better suited than fresh ones. The ground material is treated with dil. HCl. The insol. matter, containing the valuable nutritive constituents, is treated with dil. NaHCO₃ soln. to ppt. the remaining Ca salts. The resulting product is concd. and added to soups.

ARTHUR LEDERER.

Proso and kaoliang as table foods. N. E. HANSEN. South Dakota Agr. Expt. Sta., *Bull.* 158, 147-76(1915).—Analysis of the unhulled seed of white Siberian proso introduced from Siberia by H. gave crude protein 13.12, ether ext. 2.10, fiber 8.30, ash 3.51, moisture 9.90%. This variety of millet is very drought resistant. Results of milling and eating tests are given, as well as a number of recipes for bread, cakes, etc., in which proso is one of the ingredients. Analysis of a flour made from kaoliang using a no. 100 screen analyzed as follows: fat 2.09, crude fiber 0.65, crude protein 7.81%. As the coarsely ground kaoliang runs 14.93% it is evident that this screen takes out too much protein. Recipes are given in which kaoliang is substituted for Kafir flour.

R. C. ROARK.

Judging flour and bread. K. ALPERS. Univ. Tuebingen. *Pharm. Ztg.* 60, 479-80(1915).—Examns. are made in harmony with regulations promulgated by the Bundesrat on account of conditions obtaining as the result of war.

W. O. E.

Shall we bake with yeast? O. KUHN, W. DEDERICHS, L. WEIL AND WA. OSTWALD. *Chem. Ztg.* 39, 204(1915). LOUISE KALUSKY, W. DEDERICHS AND WA. OSTWALD. *Ibid* 320. W. KIBY AND L. KALUSKY. *Ibid* 456. WA. OSTWALD, W. KIBY AND L. KALUSKY. *Ibid* 662. WA. OSTWALD AND A. BEDDIES. *Ibid* 744. DISCUSSIONS (cf. Ostwald, C. A. 9, 1951).

J. H. MOORE.

Selecting and breeding corn for protein and oil in South Dakota. A. N. HUME, MANLEY CHAMPLIN AND H. LOOMIS. S. Dakota Agr. Expt. Sta., *Bull.* 153, 59-77 (1914).—Yields in bushels per acre and content of protein and oil are given for different strains of corn. It was found that with increasing maturity the % of oil in the dry matter of corn increases.

R. C. ROARK.

Some facts about concentrated feeds. W. H. STROWD. Wisconsin Agr. Expt. Sta., *Bull.* 253, 3-60(1915).—Analyses.

R. C. ROARK.

Analyses of feeding stuffs. P. H. WESSELS. *Rhode Island Inspection Bull.* May, 1915, 2-16.

R. C. ROARK.

Texas feeding stuffs: their composition and utilization. G. S. FRAPS. TEXAS Agr. Expt. Sta., *Bull.* 170, 5-34(1914).

R. C. ROARK.

Inspection of feeding stuffs. ARTHUR W. CLARK. New York Agr. Expt. Sta., *Bull.* 404, 221-334(1915).—Analyses.

R. C. ROARK.

Use of blood as human food and the behavior of formaldehyde in the organism (SALKOWSKI) 11A. Occurrence of manganese in wheat (HEADEN) 11D. Color reactions of furfural and hydroxymethylfurfural (SCHENK) 17.

Economizing yeast in bread-making. H. A. KOHMAN, C. HOFFMAN and A. E. BLAKE. U. S., 1,158,933, Nov. 2. About 0.06% of NH₄Cl and 0.12% of CaSO₄ is

added to the dough. This addition either decreases the necessary time of fermentation if the usual amt. of yeast is used or permits the use of less than the usual amt. of yeast if the usual time of fermentation is allowed. Cf. *C. A.* 9, 2784.

Accelerating fermentation or saving yeast in bread-making. H. A. KOHMAN, C. HOFFMAN AND A. E. BLAKE. U. S., 1,158,934, Nov. 2. About 0.12% of CaSO_4 is added to the dough which promotes the growth of the yeast.

Desiccated milk. E. F. W. WIEDA. U. S., 1,159,455, Nov. 9. A dried milk powder each of the fat-containing particles of which is enclosed by a layer of sugar and gelatin is formed by mixing milk and cream with sugar and gelatin in a finely divided or homogenized condition, and then drying the mixt. The product may be used in making ice cream.

Smooth creamy bacterial milk product. C. F. C. KNUDSEN. U. S., 1,160,086, Nov. 9. Sweet skim-milk is coagulated by the action of about 2% of combined cultures of *B. bulgaricus* and *B. lactic-acidi*, heated to 35° for 14-18 hrs. and washed free from whey. The residue is an amorphous product containing protein and milk sugar and about 0.2% butter fat. It somewhat resembles cottage cheese but is free from acid and of low cohesion and better keeping quality than cottage cheese. It has a mild nutty flavor, smooth creamy consistency and cream color.

Cheese. J. W. SPENCER and F. P. SCHWINGEL. U. S., 1,159,808, Nov. 9. Coagulated milk is forced from the coagulating tank under air pressure into a moisture-expressing compartment and the air pressure is utilized also to express the whey from the coagulated milk.

Shredded wheat biscuits. J. L. KELLOGG. U. S., 1,159,045, Nov. 2. Crushed wheat is cooked with steam in a retort under 15 lbs. pressure per sq. in. The material is allowed to dry in the air for 24 hrs. after cooking, granulated and further dried by a current of air, treated by shredding rollers, baked in covered pans at a temp. of 205-260° and dried, after removal from the pans, at 120-150°.

Puffed flake cereals. F. B. MARTIN. U. S., 1,161,323, Nov. 23. Flaked cereal, e. g., corn, containing moisture is slowly dried at a low temp., preferably about 22°, to form a tough film on the flakes and then quickly heated to a considerably higher temp. to puff them by expansion of steam within the flakes.

Food. N. SULZBERGER. U. S., 1,160,783, Nov. 16. A mixt. of flour dough with peptonized vegetable albumin is baked to form crackers.

Laxative cracker. W. L. BREYFOGLE. U. S., 1,161,450, Nov. 23. Exhausted sugar beet pulp, 15, wheat flour 60, lard 10, honey 13, salt 1, NaHCO_3 0.5 and phenolphthalein 0.5 part is used in making crackers.

Soluble coffee extract. G. H. BENJAMIN. U. S., 1,158,431, Nov. 2. Green coffee beans are allowed to stand in warm H_2O for 12-24 hrs. to effect partial germination and production of maltose. Then they are heated to about 55° and treated with warm air to remove moisture, roasted, ground and extd. with H_2O at 55-65° and the ext. is concd. and dried with dehydrated air. Alc. and ether may be used for extg. the beans instead of H_2O .

Cooking pulse or similar foods. E. J. VAUDREUIL. U. S., 1,159,136, Nov. 2. A series of measured batches of the material are successively passed through a cooking app. and then scoured and strained to sep. the liquid.

Bread. G. F. HUMPHREY. Brit., 17,750, July 27, 1914. Mfg. bread or the like with little or no yeast or its equiv., by placing the dough in an oven heated initially

to about 180° F., reducing the pressure to between 10 and 20 in. of Hg, raising the temp. gradually to about 230° F., and, after the dough has risen sufficiently, allowing the pressure to rise to that of the atm. The bread, during baking, may be subjected to the action of elec. incandescent lamps or the like, and wet or satd. steam may be introduced to maintain the elasticity of the crust during the rising stage, and be followed by dry or superheated steam to harden the crust. The oven may be initially heated from the bottom alone and subsequently from the top alone.

Malt compositions. B. COMBE. Brit., 17,113, July 20, 1914. In making a food consisting of milk or cream, honey, barley malt, and, if desired, wheat flour, elec. currents are passed through the materials during the mixing. The currents may be passed between C grills in the mixing vessel.

Electrolytic treatment of grain, seeds, and flour. C. W. CHITTY, W. JAGO and W. WATSON. Brit., 16,664, July 13, 1914. Obtaining food products and flour-improving compns. by electrolyzing a mixt. of H₂O and wheat or other cereal, peas, beans, or other pulse, or their products such as middlings, bran, germ, or offals. The H₂O may be rendered conductive by adding H₂PO₄ or the acid or alk. product from a previous operation. A mixt. of the cereal substance and H₂O may be treated in a simple elec. cell, and the liquid, after or without the removal of the exhausted cereal substance, evapd. to dryness or otherwise treated to remove H₂O, the residue forming a flour improver. Or a glass cylinder may be employed, having at the bottom a Sn cathode, and at the top a Pt anode. Some of the alk. liquid produced at the bottom is drawn off, and the remaining liquor is strained from the solid residue, may be re-electrolyzed, and is then employed for treating flour. If an electrolytic cell having a porous partition be employed, wheat placed in the anode compartment will absorb the products of electrolysis and is then dried, ground, and added to flour. Or a mixt. of bran and H₂O in the cathode compartment, with H₂O in the anode compartment may be electrolyzed, and the liquor strained from the solid added to the product in the anode compartment and re-electrolyzed, being placed in the anode compartment of a cell having a porous partition, with H₂O in the cathode compartment. The product in the anode compartment is used for treating flour. With a cell having 2 porous pots into which the electrodes project, the pots are filled with H₂O and surrounded by a mixt. of cereals or their products and H₂O. The acid ext. produced in the anode pot is used for treating flour, and the liquid in the cathode pot and exterior part of the cell may contain food products. The liquid product may be concd. to form a food product to be employed directly or in combination with other substances. The grain used may be malted or germinated before use. A cathode of Al may be employed.

A sour milk preparation. W. KUNTZE. Ger., 285,211, Jan. 28, 1914. Heated sterilized milk is mixed, with or without evapn., after cooling to 45-55°, and with stirring, with previously dissolved pure citric acid (0.5-1 g. to 1 liter or equiv. amt. of lactic acid), and then inoculated with pure cultures of *Diplostreptococcus bulgaricus* in solid or liquid form in predetd. amts. From 1 to 2% of the liquid pure culture is taken. After the first inoculating material has distributed itself sufficiently, 1% of a pure liquid culture of *B. bulgaricus* is added, the acid-forming power of which has been weakened, for the time, by heating to about 60°, or for a shorter period to higher temps. The milk which has been thus pretreated and inoculated is hermetically sealed in sep. portions and is kept at 40-50° until coagulation has been effected. If pasteurized milk is inoculated with such cultures, the milk prepd. in this manner, does not sour further upon pr.

14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

Oxygen determination in water. J. SMIT. *Chem. Weekblad* 12, 476-81, 819-22 (1915).—A discussion of the method for detg. O in water as adopted by the Dutch "Codex Alimentarius."

J. T. FLOHIL.

Oxygen determination according to L. W. Winkler. I. G. BRUHNS. Charlottenburg. *Chem. Ztg.* 39, 845-8(1915).—B. describes in detail several alterations in W.'s method for detg. O in H_2O which make the app. and method more suitable for field work. Long experience has shown that the simplified method gives results accurate enough for tech. purposes, and comparative results are tabulated. Cf. *C. A.* 2, 680; 4, 72; 7, 2266; 8, 540, 1841; 9, 674.

J. H. M.

The preparation of ammonia-free water. E. J. PUGH. *Am. J. Pub. Health* 5, 1057-8(1915).—P. recommends that NH_3 -free H_2O be prepared by adding $Al(OH)_3$ to H_2O containing Nessler soln.

J. GAUB.

The value of the chemical examination of ground waters. R. HAACK. *J. Gasbel.* 58, 314-7(1915).—Discussion of the significance of the various constituents and interpretation of results. Cf. *C. A.* 9, 2276.

ARTHUR LEDERER.

Mechanical analyses of sands. PHILIP BURGESS. *J. Am. Water Works Assoc.* 4, 493-514(1915); *Can. Eng.* 29, 496-8(1915).

LANGDON PEARSE.

Development of ultraviolet water disinfection. ANON. *Eng. News* 74, 634-6 (1915).—The 320 plants installed or approaching completion in the U. S. comprize 20 for swimming pools. The cost is about \$750 per 1000 gal. per hr. capacity for machines of 200 to 3000 gal. per hr. and \$900 for those of 60 to 120 gal. per hr. capacity. Direct current is used at 110 to 500 v. For swimming tanks, a pressure filter is used followed by sterilization.

LANGDON PEARSE.

Treatment of water with hypochlorite. JOSEPH RACE. *J. Soc. Chem. Ind.* 34, 931-4(1915); *Can. Eng.* 29, 613-6(1915).—Thorough mixing aids efficiency. Velocity of reaction is lowered by reduction of temp. Color and turbidity increase the amt. of Cl required. At Ottawa use of $CaOCl_2$ reduced typhoid death rate from 85 (2 years preceding) to 21 and 13 per 100,000 (2 years following). R. recommends concrete tanks painted with asphaltum, galvanized Fe pipes of generous size, cast Al stirring vanes on bronze shafts and hard bronze or vulcanite valves. The cold water was odorless, but on heating it sometimes acquired a fish-like odor. Treated water had no effect on animals or plants. Corrosion in hot water systems was traced to CO_2 .

LANGDON PEARSE.

Saving by water softening. ANON. *Practical Engineer* 19, 766(1915).—In-crusting solids are reduced from 28 grains per gal. to about 0.5, greatly increasing the efficiency of the boilers. Comparative costs and savings are given. W. H. B.

Softening plant for converting hard, impure river water into boiler feed supply. J. C. W. GERRA. *Eng. Record* 72, 622-4(1915).—The water from the Mahoning River is treated at Youngstown, Pa., with lime and soda ash. The plant consists of steel reaction and settling tanks, 30 ft. in diam. and 26 ft. high, each holding 120,000 gal. Each tank is equipped with mechanical stirring devices, 3 centrifugal pumps for reagent—
for
at:
ical gravity filters of steel, each 15 ft. in diam. with a capacity
Automatic scales are used in measuring the chemicals. Med-
ided crushed quartz supported by a layer of gravel are used.
* no permanent hardness and the Ca and Mg salts are re-
ilities in distd. H_2O . The mechanical features of the plant

FRANK BACHMANN.

Method of softening and purifying feed-water. ANON. *Elec. World* 66, 413 (1915).—The app. consists of 3 tanks with filling and inside arrangements similar to those of a sand filter but with a layer of special porous mineral substance (permutite). One tank contains Mn permutite and 2 contain Na permutite. The feed H_2O passes into the tank containing Mn where Fe is removed by oxidation and deposited as a sludge, and into one of the other tanks where Ca and Mg are removed. The Ca and Mg remover consists of a perforated tray containing gravel or crushed marble, below which is an open space, then a layer of Na permutite resting on a bed of gravel which is supported on another perforated platform. A pipe connecting with the upper part of the tank delivers the raw water on the gravel where acid is removed and the water distributed over the permutite. Regeneration of the material is necessary. Both kinds of tanks have to be regenerated, the Mn by back washing and satn. with 2% $KMnO_4$ and the Na by back-washing and subsequent treatment with 10% NaCl. These tanks are duplicates and are used alternately as regeneration requires about 10 hrs. Analysis shows the efficiency of this app. W. H. BOYNTON.

The value of mechanical filters in the purification of water. MARTIN DEACON, S. RIDEAL, F. PULLEN CANDY AND OTHERS. *Surveyor* 47, 742-4 (1915).—Discussion of paper by OTT (cf. C. A. 9, 2787). W. D. C.

Seven years successful operation of double sand filtration plant at So. Norwalk, Conn. H. W. CLARK. *New England Water Works Assoc.* 1915; *Eng. Contr.* 44, 262-3 (1915).—The prevalence of tastes and odors caused by *Asterionella*, *Anabena*, *Dinobryon* and *Aphanizomenon*, particularly from Aug. to Oct., led to the construction of a plant comprizing aeration, filtration through sand (0.35 mm. effective size), aeration, and secondary filtration. For the year ending May 1, 1915, rates of filtration, in mil. gal. per acre, were on primary 3.3, on secondary 10. For a daily av. use of 2.5 mil. gal. the cost was \$5.23 per mil. gal. filtered. LANGDON PEARSE.

New filter and fixation process for plankton. C. M. LÜTTGENS. *Mikrokosmos* 1915-16, 25.—A filtration app. is described with illustrations. The advantages claimed for the process consist in the fact that a practically automatic sepn. of the plankton is accomplished and the organisms are prevented from drying out on the filter. The app. may also be directly used for the fixation of the plankton present on the filter. C. A. NOWAK.

Practical process for sterilization of polluted waters in the field. ROLLAND. *J. pharm. chim.* 12, 179-82 (1915).—Water in a barrel is treated with sufficient excess of $CaOCl_2$ of known strength to impart to the H_2O a distinct Cl taste. It then runs into a large funnel containing absorbent cotton, and upon a perforated disk, alternate layers of finely powdered charcoal, fine sand, powdered charcoal, coarse sand, again wood charcoal, crushed stone and straw to distribute the water. S. WALDBOTT.

Collective and individual sterilization of water in the field. HENRI PÉNAU. *J. pharm. chim.* 12, 123-32 (1915).—For troupes at rest, several methods may be used: (a) To sterilize 100 l. of clear H_2O , use 10 cc. Javel- H_2O (50 g. Cl per l.) or 2.5 g. $CaOCl_2$ (200 g. Cl per kg.); after 30 min. add 5 g. $Na_2S_2O_3$. (b) For 200 l. of H_2O , use 1 tablet of Pellerin (0.85 g. I); after 30 min. add 2 g. $Na_2S_2O_3$. (c) For brackish, or muddy water, use 5 g. $KMnO_4$ per 100 l., after 30 min. add 5 g. $Na_2S_2O_3$, filter, if possible. The amts. of active Cl or $KMnO_4$ should be doubled if the waters are very suspicious. (d) Hot drinks, e. g., tea are advized in winter. Individual sterilization, for troupes in action is based on the complete germicidal power of $KMnO_4$ (0.1 g. per l.) on colon bacilli at the end of 35 min., and reduction of excess of $KMnO_4$ by $Na_2S_2O_3$. Two powders are used: (1) *gray*: $KMnO_4$ powdered, 50; Na_2SO_4 dry powder, 30; pptd. $CaCO_3$ 20. (2) *white*: $Na_2S_2O_3$ powdered, 35; Na_2SO_4 dry, 35; pptd. $CaCO_3$ 30. The 2 mixts. are filled separately into 2 empty Lebel cartridge cases soldered together at the base,

each numbered plainly. The cases are closed with Al caps which serve as measuring cups. Each case contains enough powder to sterilize 40-50 l. of H_2O . S. W.

Erie water works improvements. *Munic. J.* 39, 358-9(1915).—Prior to introduction of rapid filters 7.06 lbs. $CaOCl_2$ per mil. gals. were used. After filtration only 3 to 3.5 lbs. are required. From 0.15 to 0.6 grain per gal. of $Al_2(SO_4)_3$ are used. Wash water averages 3.22 %: *B. coli* is entirely removed. LANGDON PEARSE.

Manufacture of sulfate of alumina at Columbus water softening and purification works. C. P. HOOVER. *J. Am. Water Works Assoc.* 2, 693-702(1915); *Eng. Contr.* 43, 448-9(1915); see C. A. 9, 495. E. BARTOW.

New water conservation scheme at Fall River, Mass. FAY, SPOFFORD AND THORNDIKE. City Report, Fall River, Mass. *Eng. News* 74, 760-1(1915).—A report of the Watuppa Ponds and Quequechan River Commission providing for regulation and storage of pure water supply from ponds, the diversion of sewage from the river, and the handling of condenser water. Oil separators were studied. LANGDON PEARSE.

Lowell filtration plant. W. B. CONANT. *Munic. J.* 39, 613-5(1915).—This plant is designed to remove Fe and Mn from H_2O . The plant has a daily capacity of 8 mil. gal. and includes six coke prefilters, two settling basins and six sand filters. The raw water contains Fe 1.6 and Mn 3.26 p. p. m. The entire cost is \$225,000 with an annual cost of \$18,225 or \$8.60 per mil. gal. LANGDON PEARSE.

Water supply and power at Medicine Hat. *Can. Eng.* 29, 509-14(1915).—The plant includes a standard 6 mil. gal. rapid filter. LANGDON PEARSE.

Small mechanical filter plant, Franklin Furnace, N. J. R. H. EURICH. *Eng. News* 74, 776-9(1915).—This plant has a capacity of 150,000 gals. per day, comprising a coagulation basin provided with perforated baffles, a clear well with 90,000 gals. capacity and 2 filter units. These run alternately for 12 hrs. each, then are washed with water at a vertical rate of 2 ft. per min. Bacterial counts show 0 to 3 per cc. on lactose agar after 48 hrs., *B. coli* negative in 10 cc. L. PEARSE.

Sooke Lake water supply for Victoria, B. C. C. H. RUST. *Am. Soc. Munic. Improvements* 1915; *Eng. News* 74, 996-9(1915); *Can. Eng.* 29, 590-2(1915).—An engineering description of a project costing \$2,500,000, serving 50,000 people, including storage reservoir, pipe line and appurtenances. A watershed of 15,000 acres was purchased at \$12 per acre to protect the supply. LANGDON PEARSE.

Water undertakings of England and Wales. ANON. *Surveyor* 48, 180-1, 247-51 (1915).—Abstracts from and comments on a Government report (House of Commons, Blue Book, ordered printed July 28, 1914) which gives full details of every public water supply in England and Wales. W. D. C.

Water-borne typhoid in Sacramento, Calif. N. E. WILLIAMSON. *Bull. Calif. State Bd. Health*, July, 1915; *Eng. Contr.* 44, 314(1915).—The use of 2.9 lbs. Cl per mil. gal. river water has reduced markedly an average typhoid fever death rate of 53.5 per 100,000. Typhoid fever cases were reduced 73%. The turbidity of the raw water varies from 50 to 1000 parts per mil. LANGDON PEARSE.

A water-borne dysentery epidemic. H. A. WHITTAKER. *Public Health Reports* 30, 3473-5(1915).—Eighty cases of dysentery were caused in the St. Paul Union Stock Yards by contaminated river water entering a pure water system through a fire connection. LANGDON PEARSE.

Water-supplies and health in Massachusetts. A. L. GAMMAGE. *Eng. News* 74, 1077-9(1915).—Data available in Mass., between 1904 and 1913, show no difference in the effect on public health of hard and soft waters, with hardness ranging from 4

to 150 parts per mil. The lowest typhoid and total death rates were found with waters of the least color. LANGDON PEARSE.

Permanent sediment records for water and sewage. G. C. WHIPPLE AND J. W. M. BUNKER. *Am. J. Pub. Health* 5, 989-93(1915); cf. *C. A.* 9, 340.—The Wizard sediment tester is used. It consists of a cotton disk, as a filter medium, held between 2 supports of wire cloth in a cap attached to a milk bottle. The H_2O is placed in the bottle and allowed to flow through the cotton. The amt. of H_2O to use depends upon the clearness of the H_2O , the presence of algae, etc. In the case of sewage less is used. The method is very good in the case of testing filter effluents. J. GAUB.

Sewage works operation and analytical methods. Committee report. W. L. STEVENSON, Chairman. *J. Am. Pub. Health Assoc.* 5, 935-43; *Eng. News* 74, 591-2; *Can. Eng.* 29, 498-500; *Eng. Record* 72, 316-7; *Munic. J.* 39, 434(1915).—The committee recommends detailed reports under the supervision of state boards of health and suggests special analytical methods for sewage works control. E. BARTOW.

Technical apparatus for the purification of waste water. P. ROHLAND. Stuttgart. *Chem. App.* 2, 235-7(1915).—A description of a testing pipe for submitting various materials to the action of waste H_2O to det. its deleterious effect, and of the Halvor Breda dosing app. for automatically adding the correct amt. of colloidal clay, or other purifier, to the H_2O . Cf. *C. A.* 8, 2014. J. H. MOORE.

Disposal of suspended matter in sewage. RUDOLPH HERING. *Intern. Eng. Congress* 1915; *Can. Eng.* 29, 644-8(1915).—H. summarizes the state of the art of sewage disposal, showing that with sanitary collection and delivery of sewage, the proper velocities in sewers being maintained, the liquid can be disposed of in a sanitary manner without nuisance. The materials separate into floating and suspended matter and liquid. Double-deck tanks prove most successful, provided the sludge be kept alkaline. Pptn. by chemicals is sometimes desirable. LANGDON PEARSE.

The action of certain bacteria on sewage. E. G. BIRGE. *Am. J. Pub. Health* 5, 1048-56(1915).—B. studied the effects of *B. coli communis*, *B. cloacae*, *B. pyocyaneus*, *B. proteus vulgaris*, *B. mesentericus ruber*, and *B. subtilis* on fresh, filtered and sterilized sewage under aerobic and anaerobic conditions, also in pure and in symbiotic cultures, observing their effects on free NH_3 , organic N, NO_2 and NO_3 . From the results it appears possible to predict what the changes in the chem. compn. of the sewage are going to be if a certain group or species of bacteria is predominant. *B. subtilis* can be used to good advantage in the treatment of sewage. J. GAUB.

Activated sludge. O. J. WILKINSON. *Eng. News* 74, 948(1915).—W. calls attention to the similarity of sprinkling filters to activated sludge, in that both depend upon the passing of sewage in thin films over active sludge. Grit should be removed. Uniform contact and distribution are requisite. The cost is not yet definitely known. LANGDON PEARSE.

Activated sludge treatment for the packing-house wastes. *Eng. News* 74, 1148(1915).—At the Chicago Stockyards, Armour & Co. have a 20,000 gal. exptl. plant. LANGDON PEARSE.

Choosing air compressors for activated sludge tanks. CARL H. NORDELL. *Eng. News* 74, 904-6(1915).—Reciprocating and hydraulic air compressors, turbo-blowers and positive pressure blowers are discussed. Positive pressure blowers are useful in small installations while turbo-blowers are best for large plants. LANGDON PEARSE.

Recovery of fat in sewage slimes. ROBERT COHN. *Pharm. Ztg.* 60, 424-5(1915).—Expts. made with material from Barmen-Elberfeld sewage point to a probable yearly recovery among other things of some 1277 tons raw fat from a daily treatment of 250 cu. meters of slime. W. O. R.

The utilization of the constituents of city sewage. EDWARD R. BESEMPFELDER. *Chem. Ztg.* 39, 813-5(1915).—The scheme outlined is to have traps in the waste H_2O pipes from kitchens, etc., to catch the oils and grease before they are mixed with the sewage, the traps to be emptied regularly by authorized persons. The sewage is then settled, the clear H_2O used as fertilizer, the greases extd. from the sediment and the residue, containing about 50% H_2O , coked in rotary calciners, the coke passing to water-gas generators. The products are tar, NH_3 , gas, and slag containing K, suitable for fertilizer. From tests on a large scale at Elberfeld B. estimates the yearly saving for Germany in crude fats, gas and $(NH_4)_2SO_4$ at about \$30,000,000. Cf. *C. A.* 3, 440; 4, 72, 804, 3268; 5, 341, 1146; 6, 1483; 7, 191, 192, 671, 882; 8, 542, 543, 1498, 2440, 3700. J. H. MOORE.

Separation of grease from sewage. P. N. DANIELS AND J. B. ROSENFELD. *Cornell Civil Eng.*, Oct. 1915; *Can. Eng.* 29, 541-3(1915).—Barrel expts. were conducted on the use of $Al_2(SO_4)_3$ (50 g. per 40 gal.), and SO_2 (2 oz. per 40 gal.). After 24 hr. settling, 4590 lbs. solid were recovered per million gals. of which 1046 lbs. were grease. The suspended matter was 170 parts per mil. The cost estimate for a plant to handle 3 mil. gal. daily was \$59,000, for annual needs \$56,670; the revenue is estd. at \$38,905. Although effective, SO_2 and alum are too expensive. LANGDON PEARSE.

Relative stabilities in polluted waters carrying colloids. ARTHUR LEDERER. *Can. Eng.* 29, 573-5(1915); see *C. A.* 9, 2785. LANGDON PEARSE.

Stream pollution by surface drainage. G. H. NORTON. *Am. Soc. Munic. Improvements* 1915; *Munic. J.* 39, 584(1915); *Eng. Contr.* 44, 327-8(1915); *Can. Eng.* 29, 561.—At times surface drainage becomes as important an element as city sewage in detg. the potability of a water. Treatment of sewage should only be sufficient to prevent undue burden on water purification plants. LANGDON PEARSE.

Dunbar's second report on the waste liquor from the potash industry. C. L. REIMER. *Z. angew. Chem.* 28, I, 241-5(1915).—A criticism of Dunbar's report on the mineralization of streams by waste water of the potash industry (*C. A.* 7, 3395; 8, 541. H. P. CORSON.

Dye for measuring sewage flow. F. E. DANIELS. *Munic. J.* 39, 550-1(1915).—Expts. using Uranin show a horizontal diffusion of a 10% soln. through a travel of 4.5 in. in 14 hrs. Weaker solns. diffused more slowly. This dye is therefore a reliable agent in studying flow through sewage tanks, drains, etc. LANGDON PEARSE.

Coloration of water with Uranin O. W. QUITZOW. *Das Wasser* 1915, 75-6, 95-7; *Wasser u. Abwasser* 10, 3(1915).—The K salt of fluorescein (Uranin) is employed to det. subterranean connections of surface and ground waters, velocities of underground water courses, etc. The dye possesses, however, an insufficient absorption power. For this reason the Na salt is to be preferred. None of these dyes will work in acid soils. In such a case the addition of NaOH is advisable. Helpful directions are given for the application of actual tests. ARTHUR LEDERER.

A summary of the experience gained in the treatment of the wastes from the scouring of wool. H. R. CROHURST AND A. D. WESTON. *Eng. Contr.* 44, 370-6(1915).—This article describes wool, its compn., impurities, handling, scouring, shrinkage, oiling and packing, combing, finishing and weaving. Av. analyses of wool wastes are given with fats from 46,300 parts per mil. down to 30. Suspended matter may run up to 66,000 p. p. m. The quantity varies per 100 lbs. of wool. For treatment, sedimentation separates only gritty matter, generally less than 30% of suspended matter. Chem. pptn. requires excessive amts. of coagulant. Coke and sand filters work only on waste mixed with domestic sewage. Purification by recovery may be by steeping, by use of volatile solvents, by cracking with acid, or by partial evapn. and centrifuging

to separate grit, potash and wool grease (Smith-Leach process). Sewage treatment methods usually fail, but acid recovery of grease may prove profitable when the price of grease is high. The Smith-Leach process may be profitable at times. L. P.

Refuse collection and disposal. *Munic. J.* 39, 722-39(1915).—Complete statistics for cities in U. S. are summarized in tables and text. LANGDON PEARSE.

Experience in refuse collection and disposal with reference to odors. SAMUEL A. GREERLEY. *J. Am. Pub. Health Assoc.* 5, 835-7(1915); *Eng. Contr.* 42, 576(1915).—Effect of odors is largely relative, depending on environment and industrial odors present. Good design followed by clean careful operation is advantageous. L. P.

Marysville, Ohio, sewage treatment plant provides for high degree of purification. E. D. BARSTOW. *Eng. Record* 72, 636-7(1915).—Population is 4000. The plan used involves screening, sedimentation in two-story tanks, treatment in crushed-stone contact beds and the use of the sprinkling filter. The capacity of the plant is 500,000 gals. per day. Steel-bar screens with 1 in. openings are used. The tanks are designed for a 3 hr. settling period and a sludge storage of from 4 to 6 hrs. The four contact beds are each 90 ft. square and are filled with crush stone to a depth of 4 ft. The filters are each 125 × 175 ft. with sand to a depth of 2 ft. The sludge from the tank is dried on beds of stone. The treatment plant cost about \$55,000. FRANK BACHMANN.

The fitting up and working of a sewage works laboratory. JAMES H. EDMONDSON. *Surveyor* 47, 739-41(1915).—The plan of a small lab. is shown, dimensions being given. Brief directions are given for the usual tests. W. D. C.

Refuse incinerator at Portland. *Munic. J.* 39, 774-5(1915).—The 150-ton incinerator cost \$99,900 in 1910. In 1914, the operating expenses were, in cents per ton of material, 30.25 for labor, 3.5 for supplies and repairs. The total expense was \$15,383. LANGDON PEARSE.

Garbage collection and incineration in Sewickley. E. E. DUFF, JR. *Munic. J.* 39, 719-22(1915).—In a town of 5000, a 10-ton incinerator cost 8000. The operating cost of collections and incinerator are 5,324 per year. LANGDON PEARSE.

A year of activated sludge at Milwaukee, Wisc. GEORGE W. FULLER. *Eng. News* 74, 1146-7(1915).—F. accepts the theory of activated sludge as correct, but comments on practice. At Milwaukee 2 to 3 hrs. aeration removes 96 to 99% bacteria, and nitrifies the effluent according to the amt. of air used. Odors are removed. The sludge dries readily. The process may fail through excessive aeration, presence of mineral grit, or insufficient aeration. LANGDON PEARSE.

Activated sludge progress at Houston, Texas. E. E. SANDS. *Eng. News* 74, 717(1915); *Can. Eng.* 29, 503(1915).—A 14,000 gal. tank is in operation. L. P.

Garbage reduction in Columbus, Ohio. T. D. BANKS. *Munic. J.* 39, 846-7(1915); cf. *C. A.* 9, 2413.—The total amt. treated in 1914 was 21,629 tons. The garbage per capita has increased from 190 (1910) to 211 lbs. with an av. daily amt. of 69.3 tons, the daily av. being 46.3 in Feb. and 100.6 in Sept. Grease, hides and tankage were sold, the receipts being 3.085 per ton of garbage, expenditures 1.859 for operating, with a profit per ton of \$1.226. Allowances for depreciation and interest reduce this to \$0.24 per ton actual profit. Analyses are given. L. PEARSE.

Disposal of Greater New York's sewage. C. E. GREGORY. *Mun. Engineers of N. Y. City* 1915; *Munic. J.* 39, 692-4(1915).—The work of the Metropolitan Sewerage Commission and the Bureau of Sewer's Plan is described. Settling or screening will be used. A clean harbor, free from visible slime or floating matter, is sought, with a dissolved O content above 20% satn. Dredging will be used to relieve existing conditions temporarily. N. Y. harbor should care for 7 million people. LANGDON PEARSE.

Electrolytic sewage treatment plant at Durant, Oklahoma. W. L. BENHAM. *Munic. Eng.* 49, 141-6(1915).—This plant handles about 428,000 gal. daily. Details of stability and bacteriological tests are given, showing reductions in bacteria.

LANGDON PEARSE.

Construction and operation of Gloversville sewage works. H. P. EDDY AND H. J. HAMMER. *Eng. News* 74, 744-7, 780-1(1915).—The design, construction and cost, \$188,754, of a 3 million gal. sewage treatment works are given. The plant serves a population of over 20,000. Lack of dilution necessitated a high degree of purity. The plant comprises coarse screens, primary settling tanks (Dortmund type, vertical velocity 8.7 per hr.), fine screens ($1/2$, $1/4$, $1/8$ in. mesh) on tank effluent, dosing tank, sprinkling filter (3 units of total area 3.07 acres, of 1 to $2\frac{1}{2}$ in. crushed limestone, 4.6 ft. deep), secondary settling tanks, and sand filters (3 beds, 3 ft. deep, of total area 2.72 acres). Four sludge beds are provided of total area 2.63 acres. The flow is estimated at 2.75 mil. gal. daily. About 4 cu. ft. of screenings are daily removed from the coarse screens. Nine cu. yd. per mil. gal. of primary tank sludge are caught and from 0.8 to 2.5 cu. yd. secondary tank sludge. The sludge is pumped to sand drying beds. Two sprinkling filters are operated at a time, the third being rested from 2 to 7 days. No odors are noticeable over 200 ft. away. Flies are reduced by the use of CaOCl_2 . Temporary wooden covers are used over the filters in winter. Analyses of effluents are given. Cost of operation per year was \$5179 in 1913 and \$5952 in 1914.

LANGDON PEARSE.

Garbage disposal at Reading, Pa. W. C. MATTHIAS. *Munic. J.* 39, 544-5 (1915).—The incinerators use 1 ton coal to 10 tons garbage. Costs are given.

LANGDON PEARSE.

Albany sewage disposal works. JOHN H. GREGORY. *Eng. News* 74, 692-5 (1915).—The plant is intended to prevent visible nuisance and sludge deposits in the Hudson River. It has a capacity of 30 mil. gal. with a max. of 45 mil. gal., comprizing pumping station, grit chamber, Imhoff tanks and sludge drying beds. A complete engineering description is given.

LANGDON PEARSE.

A comparison between bleach and liquid chlorine disinfection. C. R. AVERY. *Ann. Rep. Prov. Bd. of Health, Ontario* 33(1915); *Can. Eng.* 29, 661 (1915).—A. concludes that if the same amt. of available Cl is present, both bleaching powder and liquid Cl are equally efficient. Detailed results are given.

LANGDON PEARSE.

Hydrocyanic acid gas as a routine fumigant. R. H. CREEL, F. M. LAGET AND W. D. WRIGHTSON. *Pub. Health Reports* 30, 3537-50(1915).— SO_2 , while fairly effective, does not penetrate; it diffuses poorly, giving vermin a chance to survive. Thus it requires an exposure from 6 to 12 hrs. as against 1 hr. by HCN. CO is valueless for lower forms of animal life and requires complicated app. for generation. Both of these fumigants cause danger by fire which is not the case with HCN. HCN is penetrating and very toxic, easily generated, requires little app. and is not destructive to inanimate objects. The effect on human life depends upon the care used in performing the fumigation.

J. GAUB.

A note on the testing of disinfectants. S. RIDEAL AND J. T. A. WALKER. *Am. J. Pub. H.* 27, 1175(1915).—Discussion is invited on the approved technic of the

(1) Use of a buret instead of the pipet; (2) variations in resistance and culture of *B. typhosus*—for the phenol column—life in $2\frac{1}{2}$ and after. Dilns. ranging between 1 in 80 and 1 in 140 may be too affected when the diln. is higher than 1 in 110 or lower than 1 in 100 becomes so attenuated as to call for dilns. higher than 1 in 1000. J. GAUB.

Fertilizer from municipal waste (TURRENTINE) 15.

Apparatus for purifying water. M. B. CRESSWELL. U. S., 1,158,450, Nov. 2. The process includes boiling, skimming and sedimentation.

Apparatus for purifying and aerating water. J. F. QUIGLEY. U. S., 1,161,971, Nov. 30.

Apparatus for purifying and softening water by chemical treatment. R. H. GRAY and A. F. STAHLHUT. U. S., 1,159,929, Nov. 9.

Apparatus for purifying water electrolytically. J. A. MURDOCK. U. S., 1,159,699, Nov. 9.

Filter for purifying water, etc. I. KITSKE. U. S., 1,162,244, Nov. 30. The filtering material is formed of small particles of sawdust, charcoal or charred blood bonded together with a phenol-CH₂O condensation product.

Composition for softening water. G. BUCHNER. U. S., 1,162,024, Nov. 30. A mixt. of borax 20 and Na₂HPO₄ 70 parts is added to H₂O to "soften" it, preferably with 10 parts of Na₂CO₃ or CaCO₃.

Preserving mineral waters containing carbon dioxide. D. M. PERINE. U. S., 1,160,317, Nov. 16. Mineral waters which tend to give off CO₂ and form a ppt. on exposure to the air are charged with CO₂ before much of the natural CO₂ of the H₂O has been permitted to escape and then sealed in bottles under pressure to retain the CO₂ during storage.

Obtaining solids from sewage. J. ORTEN-BÖVING. U. S., 1,161,600, Nov. 23. Sewage sludge is heated under pressure, cooled to about 30° by heat interchange with untreated sludge and then freed from most of its H₂O by settling, decantation and filter-pressing.

Purifying sewage by sedimentation. L. LINDEN. U. S., 1,160,918, Nov. 16.

Apparatus for purifying sewage or other liquids by sedimentation. L. LINDEN. U. S., 1,162,624, Nov. 30.

Fumigating composition. F. SIGNORET. U. S., 1,159,109, Nov. 2. Grains of about 3 mm. in diam. are coated with sol. silicate and the mixt. is dried and molded into blocks or pieces of the desired form for burning.

Disinfectant. P. FLEMING. U. S., 1,162,152, Nov. 30. A mixt. of chlorinated xylenol and chlorinated cresol is used. The mixt. is found to have a greater germicidal action than that of either component alone.

Purifying liquids. H. KRIEGSHKIM. Brit., 17,494, July 23, 1914. Purifying or freeing H₂O from Cl, which has been added for sterilizing purposes, by filtering the H₂O through a microscopically porous body, such as a silicate of Al or a zeolite, which has been coated with or penetrated by a catalyst, such as oxides of Fe, Pb, Co, etc.

Softening water. PERMUTIT AKT.-GES. Ger., 285,377, Jan. 10, 1913. Addition to 280,691 (C. A. 9, 1647). A larger yield of softening agent is obtained by heating alkali silicate solns. with Na₂HPO₄ soln. The resulting ppt. is from 4 to 5 times greater than that obtained according to the principal process.

15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

Soil fertility. J. E. RUSH. Carnegie Inst. Technology. *Science* 42, 632-4 (1915).—A general discussion of the interrelation of soil physics, chemistry and bacteriology.
W. H. FRY.

Albuminous bases which are formed of organic substances of soils by hydrolysis. A. SCHMUK. *Russ. J. Exp. Landw.* 16, 281-98(1915).—By boiling soil or humic acid a sufficient time with H_2SO_4 , 2 amino acids were isolated and identified. The 3rd amino acid which comes for the most part from albuminous substances was not found. The quantity of arginine and lysine was detd., by calcn. from N, in 3 different soils. The presence of arginine and lysine and the absence of histidine is not an indication for a group characteristic belonging to the class of albuminous combinations; at the same time it is not contradictory to the fact that these substances are formed of soil albumin during its hydrolytic destruction.

W. H. FRY.

A method for the estimation of hygroscopic moisture in soils. W. D. HAIGH. *Roy. Coll. Sci., Dublin. Sci. Proc. Roy. Dublin Soc.* 14, 529-34(1915).— CaC_2 is mixed with soil in an app. which is described, and the vol. of C_2H_2 evolved is detd. This method was compared with the ordinary method of heating in an oven, and it was found that the results obtained by the carbide method were more consistent and agreed more closely between themselves than did the results obtained from the same sample in the oven.

W. H. FRY.

The determination of nitrates in soil. R. S. POTTER AND R. S. SNYDER. *J. Ind. Eng. Chem.* 7, 863-4(1915).—With soils low in nitrates the use of $CaCO_3$ is to be preferred to CaO , and when the colorimetric method is to be used the carbonate is always better. Carbonate in all cases yields as clear and as nearly colorless a soln. as the oxide.

W. H. FRY.

A new method for the determination of lime requirements in soils. W. H. MCINTIRE. *Agr. Exp. Sta., Knoxville, Tenn. J. Assoc. Official Chemists* 1, 417-8(1915); *J. Ind. Eng. Chem.* 7, 864-7(1915).—A stock soln. of $CaCO_3$ is obtained by passing CO_2 through about 10 g. pptd. $CaCO_3$ suspended in 5 l. distd. water. Excess of carbonate is removed by gravity filtration. The clear soln. of dissolved $CaCO_3$ is received in about $1/10$ of its volume of carbonated distd. water. This soln. is kept cool and under pressure. Pipet 100 cc. of the carbonate soln. into a 150 cc. porcelain evapg. dish and add 10 g. of $1/2$ -mm. or 100-mesh soil. Evap. to a thin paste, the mixt. being stirred after the pptn. of the $CaCO_3$ from soln. and again when reaching volumes of about 75 and 50 cc. The paste is then used to effect scouring of the sides of the evapg. dish by means of a rubber tipped glass rod. The soil is washed into a 300 cc. Erlenmeyer flask by means of CO_2 -free distd. water to a volume of about 60 cc. A series of flasks is connected with a shaking device, 5 cc. of 85% H_3PO_4 are added and the liberated residual CO_2 detd. by passage of the gas through 25 cc. of 4% NaOH in a Camp absorption tower, the air passing into the system being first purified of CO_2 . CO_2 -free distilled water is used to increase the volume of 25 cc. NaOH to an amount sufficient to cover the beads before the passage of CO_2 through the absorbent soln. A vacuum of 4 in. is maintained in the app. during the 30 min. agitation and aspiration. The amt. of $CaCO_3$ in 100 cc. of the carbonate soln. is detd. by boiling off the excess of dissolved gas and decomposing the pptd. carbonate by the above procedure. The difference between the added and the residual $CaCO_3$ in the soil is then detd., correction being made for the CO_2 in the atmosphere of apparatus and the carbonate in the NaOH soln.

W. H. FRY.

Report on soils. J. W. AMES. *Agr. Exp. Sta., Wooster, Ohio. J. Assoc. Official Agr. Chemists* 1, 411-7(1915).—Comparative work on methods for detn. of carbonates and organic C is reported.

W. H. FRY.

Report on availability of potash. E. E. VANATTA. *Agr. Exp. Sta., Columbia, Mo. J. Assoc. Official Agr. Chemists* 1, 398-9(1915).—Progress report on pot tests with feldspar.

W. H. FRY.

Report on determination of potash. T. D. JARRELL. Agr. Exp. Sta., College Park, Md. *J. Assoc. Official Agr. Chemists* 1, 400-11(1915).—The work includes tests on the use of denatured alc. for washing K_2PtCl_6 with special reference to denaturing agents, the necessity for the use of HCl in the aq ext., and the perchlorate method. Cf. C. A. 9, 3318. W. H. FRY.

Report on phosphoric acid. A. J. PATTEN, Agr. Exp. Sta., East Lansing, Mich., AND L. S. WALKER, Agr. Exp. Sta., Amherst, Mass. *J. Assoc. Official Agr. Chemists* 1, 360-9(1915).—Comparative work on basic slag by the official gravimetric and molybdic, optional volumetric, Lorenz, and iron citrate methods is reported. Cf. C. A. 9, 3318. W. H. FRY.

Report on neutral ammonium citrate. L. S. WALKER. Agr. Exp. Sta., Amherst, Mass. *J. Assoc. Official Agr. Chemists* 1, 369-75(1915).—The results of comparative work on 3 fertilizers are given. W. H. FRY.

Triammonium citrate. ROBERT A. HALL. Univ. Minn., Minneapolis, Minn. *J. Assoc. Official Agr. Chemists* 1, 375-80(1915).—Dry NH_3 gas was passed into an abs. alc. soln. of citric acid. Triammonium citrate was thus pptd. quant. The properties and analysis of the salt are given. W. H. FRY.

Report on nitrogen. R. N. BRACKETT, Agr. Exp. Sta., Clemson Coll., S. C., AND H. D. HASKINS, Agr. Exp. Sta., Amherst, Mass. *J. Assoc. Official Agr. Chemists* 1, 380-96(1915).—Comparative results of various methods for detg. N are given and discussed. W. H. FRY.

Analysis of nitrogen in leather waste. R. P. ROSE. Mellon Inst., Pittsburgh. *J. Assoc. Official Agr. Chemists* 1, 396-8(1915).—Neutral and alk. permanganate methods are compared. W. H. FRY.

The interpretation of soil analyses. G. S. FRAPS. Agr. Exp. Sta., College Sta., Tex. *J. Assoc. Official Agr. Chemists* 1, 418-21(1915).—The estn. of the total N, the active P_2O_5 , the active K_2O and the acid consumed of the soil at present affords the best measure of the soil fertility and the best means of judging of its deficiencies. W. H. FRY.

Report on nitrogenous compounds of soils. C. B. LIPMAN. Agr. Exp. Sta., Berkeley, Cal. *J. Assoc. Official Agr. Chemists* 1, 422-4(1915).—Methods for the detn. of NH_3 , nitrites, nitrates, and total N, are discussed. W. H. FRY.

Report on alkali soils. R. F. HARE. Agr. Exp. Sta., State Coll., N. Mex. *J. Assoc. Official Agr. Chemists* 1, 424-6(1915).—Results of a comparison of methods for black alkali are given. Cf. C. A. 9, 3316. W. H. FRY.

A review and discussion of some of the methods for the determination of alkali in soils. R. F. HARE. Agr. Exp. Sta., State Coll., N. Mex. *J. Assoc. Official Agr. Chemists* 1, 426-34(1915).—Various necessary detns. are discussed. W. H. FRY.

Influence of growth of cowpeas upon some physical, chemical and biological properties of soil. C. A. LECLAIR. Univ. Mo. *J. Agr. Research* 5, 439-48(1915).—Cowpeas (*Vigna sinensis*) tend to maintain the friability of loose and compact seed beds. While they take more water from the soil than evaps. from uncultivated adjacent lands, the removal of water is from below the 2nd foot of soil. Land that was plowed and left uncultivated or plowed and seeded to cowpeas contained a greater quantity of nitrates in the soil at the end of the season than unplowed land similarly treated. The bacterial activities of the soil upon which cowpeas were grown tended to show that the soil organisms are probably a factor in preventing the packing of soil, as also is the mechanical shade effect of the crop grown upon the land. W. H. F.

Changes in soils brought about by heating. A. WILSON. *Sci. Proc. Roy. Dublin Soc.* 14, 513-20(1915).—Part of the increased productivity of heated soil may be due to

the increase in sol. matter induced by heating, and to the change in soil texture, which has a remarkable effect on the retention of water by the soil. The increase in the amt. of sol. matter is seen in (a) the range of coloration of the solns. extd. from soil heated at different temps.; (b) the increase in elec. cond. of the soln.; (c) the increased depression of f. p. found in exts. from soil heated at the higher temps. About half the total depression throughout the expts. is due to electrolytes. W. H. FRY.

Soil temperature as influenced by cultural methods. JOSEPH OSKAMP. Purdue Univ. Agr. Expt. Sta. *J. Agr. Research* 5, 173-80(1915).—Temp. records were taken under natural field conditions during a period of 2 years on 3 plots in a young apple orchard as follows: (1) Tillage with a cover crop, (2) straw mulch and (3) grass land. The data are given. It is concluded that a system of clean cultivation with a winter cover crop is characterized by extreme diurnal and annual fluctuations in soil temp., and that a straw mulch equalized these fluctuations to a marked extent, as does also a grass crop, though in less degree. W. H. FRY.

Soil temperature. J. W. LEATHER. *Mem. Dept. Agr. India (Chem. Ser.)* 4, 19-84(1915).—Temp. changes in a highly calcareous soil in the alluvium of Pusa are recorded. Comparisons are made between a fallow soil and one growing oats and hemp by means of max. and min. thermometers. There is a close correspondence between the temp. of fallow soil at 1 inch from surface and that of the air in the shade. The soil minimum is about 2° higher than the air and the soil max. about 3° higher than the air max. The diurnal change at 1 in. depth is about 1.5° greater in the soil than in the air. A change in the sp. ht. of the soil, due to change of moisture content, does not effect the max. or min., but rainfalls during the dry season have a marked effect. The effect of a covering crop on soil temp. prevents the surface soil from rising to the temp. which fallow land assumes and also modifies the diurnal change. The temp. of exposed soil at 1 in. depth rises 3° above that of air and that of cropped land about 2° below it. J. J. SKINNER.

Some problems of forestry soil science (a critical consideration). G. A. R. BORGESANI. Rome. *Internat. Mitt. Bodenkunde* 5, 225-31(1915).—Forest litter is considered. Transformation processes, measure, and appropriateness of removal are discussed. W. H. FRY.

Fertilizers. A. MCGILL. Inland Revenue Dept., Ottawa, Canada, *Bull.* 317, 45 pp.(1915).—Of 420 samples analyzed 398 were accepted as satisfactorily meeting their guarantee. E. H.

Fertilizer from municipal waste. J. W. TURRENTINE. *U. S. Dept. Agriculture Year Book* 1914, 295-310; *Munic. J.* 39, 739-40(1915); cf. *C. A.* 9, 2558.—Street sweepings are low in fertilizer value and may contain mineral oil. Dead animals are valuable; garbage, when treated by the reduction process, may be. Av. costs are quoted. LANGDON PEARSE.

Report on insecticides. R. C. ROARK. Bur. Chem. *J. Assoc. Official Agr. Chemists* 1, 435-57(1915).—This work includes a study of methods for the detn. of moisture, CO₂, Cu, arsenic and lead oxide as they occur in one or more of the following: Bordeaux, Bordeaux-lead arsenate, and Bordeaux-Paris green. Work was also done on the comparison of new methods for the detn. of nicotine, and of arsenious oxide in Paris green, with the present official methods. W. H. FRY.

Chemical Abstracts.

and enriching phosphate fertilizers. M. M. HAY and T. L. WILSON. 1473, Nov. 28. Mono-Ca phosphate or similar phosphoric fertilizer materials in a closed chamber and NH_3 and air are passed through the material under no effect absorption of the NH_3 .

Utilizer. S. B. NEWBERRY and H. N. BARKETT. U. S. 1,158,711, Nov. 2. The rock is heated to 1400-1650° with 5-15% its wt of hydronitride, carbonate of Na or K. The alkali metal compounds are volatilized and the phosphate is citrate-sol.

16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Progress in the chemistry of the fermentation industry in 1914. A. BAUDOUIN. E. H. gew. Chem. 28, I, 437-40. 445-8. 455-6 (1915).—Col-

Wine. B. G. HARTMANN. J. Assoc. Official Agr. Chemists 1, 131-8 (1915).—Col-
 ative work on the Hartmann-Eoff method for tartaric acid in wine was found to
 satisfactory results in white wines. The method is as follows: Titrate the acidity
 e wine after bringing to incipient boiling, with 0.1 N NaOH, using phenolph.
 ure 50 cc. into a 250 cc. beaker, completely neutralize with N NaOH and make
 100 cc. Multiply the number of cc. of N NaOH used above by 0.075, weigh this
 in g. of tartaric acid (prepd. by drying powdered acid for 2 hrs. in water oven;
 dissolve it in 50 cc. of the neutralized and dild. wine. After soln. add 15 g. of KCl
 1 cc. of glacial AcOH and stir until dissolved. Add 20 cc. of 95% alc., stir 1 min.
 side for 15 hrs., to collect cream of tartar crystals, filter and titrate the crystals
 0.1 N NaOH, using phenolph. Add to the buret reading 1.5 cc. and multiply by
 From this subtract the tartaric acid added and multiply by 2 to get the results
 in the sample. Analyses of 2 wines by this method agreed closely with results
 ed by the Kling racemate method (C. A. 4, 1590). Collaborators suggested the
 on of Rochelle salt instead of tartaric acid to convert all the tartaric acid present
 wine to bitartrates, and also the possibility of stirring the soln., to ppt. the cream
 tar, with a mechanical stirrer to supplant the standing for 15 hr. without for-
 accuracy when the acid present exceeds 0.1 g. per 100 cc. of the sample. Data
 free tartaric acid and cream of tartar in the wine from the total tartaric acid
 above and alkalinity of the ash are also given.

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 free tartaric acid and cream of tartar in the wine from the total tartaric acid
 above and alkalinity of the ash are also given.

from the province of Schleswig-Holstein, Germany, for the
 analysis of wine. H. R. SARRU.
 J. Assoc. Official Agr. Chemists 1, 485-90 (1915).
 B. G. HARTMANN. J. Assoc. Official Agr. Chemists 1, 485-90 (1915).
 study on methods for the detn. of tartaric acid in wines and also the use of
 phenolph. as an indicator for detg. the acidity of highly colored solns. The re-
 collaborative work show that the bulletin method for tartaric acid is entirely
 (a) soln. containing free phosphoric acid. The two methods of Hartmann
 (1) and (2) completely neutralized, although giving
 and results are in good agreement. In the detn. of the total tartaric acid
 in alc. solutions, the new method promises to fill a long felt want in the
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 of tartaric acid in wine. H. R. SARRU.

does the coloring matter in grape wine. A high citric acid content and a low tartaric and tannic acid content indicate its use as an adulterant in grape wine. H. N. E.

Beer. J. G. RILEY. *J. Assoc. Official Agr. Chemists* 1, 138-43 (1915).—Collaborative work on phosphoric acid in beer showed that the method by which 25 cc. of beer measured at 15.6° and free from CO₂ is ashed after the addition of 25 cc. of standard Ca acetate soln. and the P₂O₅ detd. volumetrically in the ash after soln. in HNO₃ gives more concordant results than the uranium acetate, straight ashing, or wet combustion methods. The analyses given indicate that a beer made from malt, 55% (by wt.) with corn, 45% contains about 1/2 as much phosphoric acid as a straight malt beer. This method has been recommended as the official method for phosphoric acid in beer. H. A. L.

A cause of sluggish fermentation. ED. MOUFANG. *Allgem. Z. Bierbr.-Malzfabr.* 43, 305-8, 313-4 (1915).—Sluggish fermentation was observed in a number of cases, when the malt employed was prepd. from barley which had not been dried before malting. The trouble could not be remedied by different mashing methods, but was eliminated when steam-cooking of the wort was replaced by direct fire or steam pressure cooking. M. sees the cause of sluggish fermentations in his cases in the presence of a colloidal substance which is not pptd. by steam-cooking in the ordinary way.

L. W. HAAS.

Methodics of the biological examination of brewing waters. H. WILL. *Z. ges. Brauw.* 38, 329-31, 337-40 (1915).—In his exptl. work W. finds that the microorganisms in the same brew water may behave in a widely different manner towards different beer worts. The biol. exam. of brew-waters therefore may lead to a totally wrong interpretation as to the biol. condition of a brew-water, whenever a foreign wort is used in the tests.

L. W. HAAS.

The determination of ammonia in wine and its significance. W. I. BARAGIOLA AND C. GODET. *Z. Nahr.-Genussm.* 30, 169-216 (1915).—A survey with a good bibliography is given of the work hitherto done on NH₃ detns. in wine and in other biochemical fields. Six methods were used by the authors in their work: (1) Distn. *in vacuo* with MgO: Place 100 cc. of wine and 5-10 g. of freshly ignited MgO in a liter Claisen flask having 2 necks; use a liter suction flask containing 10 cc. 0.2 N H₂SO₄ surrounded with ice water as a receiver, and a second suction flask connected with the suction pump as a safety flask; fit a capillary tube extending to the bottom of the flask into the second neck of the Claisen flask, the tube being connected with a gas wash bottle contg. H₂SO₄. Distil at 15 mm. (Hg) pressure in a water bath heated to about 40°, until a residue of about 15-20 cc. remains in the flask, washing out the app. at the end with a stream of air. Titrate the distillate with 0.1 N alkali using Congo red. (2) Distn. *in vacuo* with Na₂CO₃ and NaCl: Charge the distn. flask with 100 cc. wine, 20 g. NaCl and 15 cc. of satd. Na₂CO₃ soln. proceeding as above. (3) Distn. in steam with NaOH: Place 100 cc. of wine, 400 cc. of water, and 20 cc. NaOH (sp. gr. 1.3) in a liter flask and distil the NH₃ into 0.2 N H₂SO₄. (4) Pptn. of NH₄ as MgNH₄PO₄: For exact analysis the free NH₃ must be sepd. from amines and other bases in the distillate by pptn. as MgNH₄PO₄ and the NH₃ therein subsequently titrated. (1) is sufficiently accurate for food inspection and technical work since the true NH₃ content is only slightly increased by amino compds. and other bases carried over in the distn. (5) Distn. with MgO at ordinary pressure: Follow the usual procedure. (6) Pptn. of the NH₄ in the distillate of (1) and (4) with PtCl₄: Follow the usual procedure. The NH₃ content of sound wines varies from none to 150 mg. N per l. The French limit of 20 mg. is untenable. Fruit wines are especially low in NH₃. The detn. of NH₃ has a large significance in the "balancing" of acids and bases in wine in physico-chem. investigations.

L. D. ELLIOTT.

Drying and enriching phosphate fertilizers. M. M. HAFF and T. L. WILLSON. U. S. 1,161,473, Nov. 28. Mono-Ca phosphate or similar phosphatic fertilizer materials are placed in a closed chamber and NH_3 and air are passed through the material under pressure to effect absorption of the NH_3 .

Fertilizer. S. B. NEWBERRY and H. N. BARRETT. U. S., 1,158,711, Nov. 2. Phosphate rock is heated to $1400\text{--}1650^\circ$ with 5-15% its wt. of hydroxide, carbonate or sulfate of Na or K. The alkali metal compds. are volatilized and the phosphate rendered citrate-sol.

16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Progress in the chemistry of the fermentation industry in 1914. A. BAUDREXEL. *Z. angew. Chem.* 28, I, 437-40, 445-8, 455-6(1915). E. H.

Wine. B. G. HARTMANN. *J. Assoc. Official Agr. Chemists* 1, 131-8(1915).—Collaborative work on the Hartmann-Eoff method for tartaric acid in wine was found to give satisfactory results in white wines. The method is as follows: Titrate the acidity of the wine after bringing to incipient boiling, with 0.1 *N* NaOH, using phenolph. Measure 50 cc. into a 250 cc. beaker, completely neutralize with *N* NaOH and make up to 100 cc. Multiply the number of cc. of *N* NaOH used above by 0.075, weigh this result in g. of tartaric acid (prepd. by drying powdered acid for 2 hrs. in water oven) and dissolve it in 50 cc. of the neutralized and dild. wine. After soln. add 15 g. of KCl and 2 cc. of glacial AcOH and stir until dissolved. Add 20 cc. of 95% alc., stir 1 min., set aside for 15 hrs., to collect cream of tartar crystals, filter and titrate the crystals with 0.1 *N* NaOH, using phenolph. Add to the buret reading 1.5 cc. and multiply by 0.015. From this subtract the tartaric acid added and multiply by 2 to get the tartaric acid in the sample. Analyses of 2 wines by this method agreed closely with results obtained by the Kling racemate method (*C. A.* 4, 1590). Collaborators suggested the addition of Rochelle salt instead of tartaric acid to convert all the tartaric acid present in the wine to bitartrates, and also the possibility of stirring the soln., to ppt. the cream of tartar, with a mechanical stirrer to supplant the standing for 15 hr. without forfeiting accuracy when the acid present exceeds 0.1 g. per 100 cc. of the sample. Data to calc. free tartaric acid and cream of tartar in the wine from the total tartaric acid as detd. above and alkalinity of the ash are also given. H. A. LEPPER.

Report on wine. B. G. HARTMANN. *J. Assoc. Official Agr. Chemists* 1, 485-90(1915).—Further study on methods for the detn. of tartaric acid in wines and also the use of dry phenolph. as an indicator for detg. the acidity of highly colored solns. The results of collaborative work show that the bulletin method for tartaric acid is entirely unreliable in solns. containing free phosphoric acid. The two methods of Hartmann and Eoff, (1) one-half neutralized and (2) completely neutralized, although giving fairly good results are far from satisfactory. In the detn. of the total tartaric acid content in alc. mixts., sapon. of the esters must precede the final detn. The indicator for acidity seems to be very satisfactory and promises to fill a long felt want in the analysis of highly colored solns. H. R.

The extraction and composition of elderberry wine from the province of Schleswig-Holstein. G. MAUE. *Z. Nahr.-Genussm.* 30, 231-4(1915).—The process of manuf. of elderberry wine takes from Oct. to March for its completion. After the is extd. it is necessary to add sugar but not a yeast to bring about fermentation. Analyses are given. The coloring in elderberry wine responds in the same way to reagents

does not stain. At rest, the volutin occurs mostly in the form of large drops, while in vital cells it is distributed in small droplets over the whole vacuole wall; in this latter condition it is only visible after staining. The volutin drops are distinguished from fat globules by their smaller refraction of light. In stored yeasts the volutin gradually disappears, first at the surface of the bulk of yeast. In spite of this fact volutin is no real reserve material. Stored yeast retains for some time the capacity of restoring in aq. sugar solns. larger quantities of volutin than it originally contained. With fermenting yeast the volutin is in fine distribution, clinging to the vacuolar walls. The presence of sugar puts the volutin almost instantaneously in this condition and position, indicating that the vacuoles are the probable places of the formation of alc. and CO_2 . The more volutin present, the higher the fermenting power of yeast. Bottom beer-yeast is always richer in volutin than common compressed yeast. In plain sugar solns., the quantity of volutin increases, reaching a max. after 1.5 to 2.0 hrs. After 2 hrs., a translocation takes place, the volutin being pressed to the cell wall by the accumulating glycogen. Later a decrease is observed, due to the passing of volutin over to daughter cells and to assimilation. A decrease due to fermentation alone could not be established. In the presence of certain salts (stimulants or nutriment for yeast) the formation of volutin is decidedly stimulated. K_2HPO_4 proved to be a specific "volutin former." Peptone added to wort decidedly increases the volutin content of the cells. In volutin-free cells, the former is formed in very small droplets. Daughter cells receive it always by translocation from the mother cells; spores, too, receive part of their volutin. The volutin remains preserved in yeast dried without application of heat. On heating living cells, it disappears at 60° . In amoebae-eating yeast, fat and volutin accumulate, indicating difficult digestibility or non-digestibility of both. With culture yeasts, fermenting power and volutin content are closely related, and it is obvious that the volutin must be the fermentation enzyme itself or its zymogen or another substance playing a very important role in fermentation. With some species of lactic bacteria, a relation between volutin content and acidity produced could be established and also with acetic bacteria examd. From these facts it seems that the volutin with different molds is different. In these cases the metachromatism would be a general reaction for a certain group of enzymes (as, e. g., the guaiacum reaction for oxidases).

L. W. HAAS.

Maraschino. J. G. RILEY AND L. SULLIVAN. *J. Assoc. Official Agr. Chemists* 1, 490-6(1915).—The methods of manuf. of genuine and imitated maraschino are briefly reviewed and the analyses of 10 samples of genuine Dalmatian maraschino, 9 samples of the French, 4 of the Dutch and 3 of the American products are given. The following conclusions are drawn: Dalmatian maraschino prepd. from the marasca cherry has a delicate fragrance and aroma and a distinctive flavor which is different from products prepd. from other varieties of cherries and fruits. Such maraschino may contain traces of BzH and HCN . The amt. of congenics (acids, esters, aldehydes, furfural and fusel oil) is low, indicating the use of alc. in the manuf. of the product. The French, Dutch, and American products generally have an entirely different flavor from the Dalmatian product. Genuine maraschino when dild. with water and satd. with NaHSO_3 and extd. with ether imparts its original odor to the ether. If the ether is evapd. at a low temp., the aroma of the original product can be detected. This is a useful test where the BzH flavor is strong, as the NaHSO_3 fixes the BzH and allows the removal of other flavors by means of ether.

L. W. HAAS.

Waterproofing cement beer-fermenting tanks. F. W. RICKERS. U. S., 1,162,515. Nov. 30. The walls of the tank are treated with H_2O for sufficient time to dissolve out the sol. Ca and Mg compds. Then the walls are heated to drive out occluded air and

moisture and while they are still hot are coated with a plastic water-proof lining, *e. g.*, pitch or paraffin.

Saccharifying and fermenting starch. A. C. MOLHANT. *Brit.*, 17,009, July 17, 1914. See U. S., 1,134,281 (*C. A.* 9, 1365).

17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

Evodin, a crystalline constituent of the fruits of *Evodia rutacearpa*. Y. ASAHINA AND M. ISHIO. *J. Pharm. Soc. Japan* 404, 1148(1915).—Evodin was first isolated by Keimatsu (*J. Pharm. Soc. Japan* 248 (Oct., 1902)) and found to be insol. in H_2O , alc., ether, petr. ether, and somewhat sol. hot C_6H_6 , EtOAc, HOAc, and $CHCl_3$, m. 285° . The formula as detd. by A. and I., is $C_{17}H_{18}O_4$. The acrid properties are due to an ethereal oil, which A. and I. were unable to isolate on account of its susceptibility to oxidation and tendency toward polymerization. A number of other cryst. compds. were extd. but were not further sepd. They contained over 10% N. An abstr. in German precedes the article. H. W. DAUDT.

Color reactions of furfural and hydroxymethylfurfural. D. SCHENK. *Apoth. Zig.* 30, 382-3(1915).—A discussion of the more important color reactions, with especial reference to their applicability in testing flour. W. O. E.

A comparison of the results secured by the use of chemical and physiological assay methods for tincture of aconite. CHARLES C. HASKELL AND H. W. ZIRKLE. *Am. J. Pharm.* 87, 537-40(1915).—Four samples of tincture of aconite secured from representative manufacturers showed little variation in compn. as detd. by the official method of assay. By tests of these same samples, upon guinea pigs, great variations in toxicity were apparent. The results secured by the guinea-pig test were confirmed by the use of Hatcher's method. The assay process demanded by the U. S. P. for tincture of aconite is not only useless but actually harmful in giving a false sense of security. W. G. GAESSLER.

Concerning two sweet tasting drugs. R. ROBERT. Rostock, Germany. *Am. J. Pharm.* 87, 555-9(1915).—(1) A really hemolytically active saponin does not exist in glycyrrhiza. The only biologically active substance is a preformed prosapogenin, which resides in the bark of the plant. (2) Glycyrrhiza pharmacologically belongs to the group of saponin-containing plants. It is, however, the mildest in the group and consequently the least harmful expectorant of all of them. Properly purified glycyrrhizin is exceedingly sweet, a diln. of 1 in 20,000 still having a lasting pure sweet taste. This property should make it a valuable substitute for saccharin as a sweetening agent. (3) It is practically impossible to distinguish by biological tests the true saponins from preps. made from unpeeled glycyrrhiza. There is, however, a chemical test; namely, the aglykones of glycyrrhizin yield on zinc-dust distn. naphthol derivs., while those of the true saponins appear to be cholesterol derivatives, giving color reactions similar to those of the cholesterol. (4) The fact that the different saponins differ physiologically from each other is of significance to authorities and legislatures. The position taken by the Australian Government, that saponins must be excluded from all food stuffs, has been untenable, since saponins have been found to exist in spinach, lettuce, caraway, etc. Present laws concerning saponins should be so amended as to require that in every case the name of the plant which yields the saponin entering into the food stuffs should be printed on the label. Since the knowledge concerning the individual saponins is steadily growing, it is possible that before long all non-poisonous saponins will definitely be sepd. from the poisonous saponins. W. G. GAESSLER.

Ammonia. AZOR THURSTON. Agricultural Comm. of Ohio. *Ammonia Bull.* July, 1915, 19 pp.—Analyses are given of 157 samples of *aqua ammonia*. The pharmaceutical requirement is 10% by wt. of NH_3 gas. The samples analyzed averaged 5.56% NH_3 gas and only 6% were of standard strength. E. H.

Ernst Ludwig. THEODOR PANZER. *Chem. Ztg.* 39, 857-8(1915).—Died Oct. 14. An obituary. J. H. MOORE.

Progress in the field of tobacco chemistry. RICHARD KISSLING. *Chem. Ztg.* 39, 873-5(1915).—A review, with bibliography. J. H. MOORE.

Thymol. A. DUBOSC. *Mat. grasses* 8, 4314-5(1915).—A consideration of various plants as sources from which thymol may be obtained. E. J. K.

Incorporation of sulfur into vaseline. L. PAUL. *Seifensieder-Ztg.* 42, 868-9, 886-7(1915).—At a temp. of 250-300°, S and vaseline form a black powder. By heating 10 g. of vaseline and 1.5 g. S to 80° the reaction begins but leaves a red-brown residue which, however, changes at 180°, and at 270° the vaseline volatilizes and the heating should cease. The mass can be filtered if 10 cc. petroleum are added. The residue after a second treatment as above is termed V. S. and is a black odorless powder which does not melt at 300°. The petr. ether-sol. matter contains a salve residue which P. terms V. S. L. and which has a sulfurous, burned-rubber odor. A yield of 50% of V. S. can be obtained. The possible uses in pharmacy or the color industry of these preps. has not yet been ascertained. E. SCHERUBEL.

Determination of methyl alcohol (FENDLER) 7. Volatile oil of *Cymbopogon sennaarensis*, Chiov (ROBERTS) 10.

Preserving hops. H. WENNERSTEN. U. S., 1,161,272, Nov. 23. Comminuted hops are formed into a pasty mixt. with warm sugar sirup. The particles are coated with the sirup. The exclusion of the air from the hops results in the better retention of their volatile constituents.

Coating pills and tablets, etc. K. KAWAI and Z. MIWA. U. S., 1,161,690, Nov. 23. A mixt. of gelatin 38, agar-agar 1.5, H_2O 56, sugar 16 and glycerol 36 parts is used in the coating.

Tarry medicinal product from oil of cade. I. BUGARSZKY. U. S., 1,160,992, Nov. 16. Oil of cade is distd. under 20 mm. pressure and the fraction taken which comes over between 220° and 300°. The product has a sp. gr. of 1.053, a honey-like consistency and is completely sol. in alc., CHCl_3 and CS_2 . Cf. C. A. 9, 2424.

Making esters of lactic acid or other similar fatty acids. R. GRÜTER and H. POML. U. S., 1,160,595, Nov. 16. Lactic acid is heated to 107-180° while passing air through it to form anhydride and the latter is then heated under a reflux condenser with alc. containing 2% of HCl to promote the formation of lactic ester. Instead of HCl, $\text{Al}_2(\text{SO}_4)_3$, or titanous acid compds. or anhydride may be used to accelerate the formation of lactic, glycolic or similar esters.

Dihalogen-substituted derivatives of paraffin hydrocarbons. F. E. MATTHEWS and H. J. W. BLISS. U. S., 1,158,524, Nov. 2. The pat. relates especially to the manuf. of $\text{C}_6\text{H}_{11}\text{Cl}_2$ and $\text{C}_6\text{H}_{11}\text{Cl}_3$, which are made by distg. a mixt. of satd. and olefin hydrocarbons such as is produced by cracking mixed satd. hydrocarbons from $\text{C}_{10}\text{H}_{22}$ to $\text{C}_{12}\text{H}_{26}$, in order to obtain relatively pure olefin hydrocarbons, and then treating this fraction with just sufficient Cl (or other halogen) to effect satn. of the unsatd. hydrocarbons.

Diacyldiaminophenol compounds. D. MARON. U. S., 1,159,403, Nov. 9. 3-Acetyl-amino-4-lactylaminophenetole is made by dissolving lactyl-*p*-phenetide in

glacial HOAc, nitrating, reducing and treating the 3-amino-4-lactylphenetide with As_2O_3 . It forms needles m. 139° , sol. in hot H_2O and easily sol. in alc. and acetone. 3-Ethoxycarbonylamino-4-lactylaminophenetole m. $108-9^\circ$. 3-Acetylamino-4-ethoxycarbonylamino-phenetole m. $143-4^\circ$. 3-Acetylamino-4-ethoxycarbonylamino-phenol m. $208-9^\circ$ and 4-acetylamino-3-ethoxycarbonylamino-phenetole m. 115° . All are antipyretics.

α -N-Methylpyrrolidylpropan-1-one. K. HESS. U. S., 1,158,496, Nov. 2. α -N-Methylpyrrolidylpropan-1-one is made by heating an acidulated soln. of α -pyrrolidylpropan-1-ol for 4 hrs. to $115-120^\circ$ with CH_2O , pptg. with alkali and extg. with ether. It is an oily liquid of disagreeable odor, sol. in H_2O and the common org. solvents. It b_{12} $70-5^\circ$ and forms a picrate, m. at 103° . From α -pyrrolidylpropan-2-ol an oily liquid is obtained which b_{14} $79-83^\circ$ and yields a picrate, m. 174° , and an oxime m. at 125° .

Hexamethylenetetramine-silver glycocholate. K. KAUTZSCH. U. S., 1,161,867, Nov. 30. A colorless or slightly colored powder is made by reaction together of Ag glycocholate and $(\text{CH}_2)_6\text{N}_4$ or of Ag_2O , glycocholic acid and $(\text{CH}_2)_6\text{N}_4$. It is readily sol. in H_2O , in hot 90% alc. and in MeOH and almost insol. in ligroin and is decompd. with HCl in aq. soln. with formation of $(\text{CH}_2)_6\text{N}_4\text{-HCl}$, AgCl and glycocholic acid.

Silver-ammonium glycocholate. K. KAUTZSCH. U. S., 1,161,866, Nov. 30. A colorless powder of the formula $\text{C}_{26}\text{H}_{39}\text{O}_7\text{CO.NH.CH}_2\text{COOAg(NH}_2\text{)}$ is made by reaction of NH_4OH on Ag glycocholate, or NH_4 glycocholate on Ag_2O or Ag_2SO_4 on Ba glycocholate and NH_4OH . It m. at about 195° while effervescing and darkening in color, is readily sol. in H_2O and hot 90% alc., more difficultly sol. in cold 90% alc., insol. in ether, C_6H_6 and toluene and is decompd. in aq. soln. with HCl, yielding NH_4Cl , AgCl and glycocholic acid.

Apparatus for manufacturing alcohol in solid form. G. MORFURGO. Aust., 7,653, Nov. 13, 1914. Separately prepared alc. solns. of NaOH and stearic acid are mixed cold, so that the Na stearate forms after mixing, whereupon the mass, at first semi-liquid and gelatinous, solidifies to a homogeneous product.

Arsenobenzene derivatives. C. F. BOEHRINGER & SÖHN. Brit., 15,657, June 30, 1914. 2,2-Dihalo-4,4'-bismethylamino-3,3',5,5'-tetraaminoarsenobenzenes, useful in therapeutics, are prepd. by nitrating a 2-halogen-4-methylaminobenzene-1-arsenoxide or -1-arsonic acid, or a deriv. of either compd. containing a 2nd Me group or an acid residue attached to the N atom, and reducing with strong reducing agents the 2-halo-4-methylnitroamino-3,5-dinitrobenzene-1-arsonic acid resulting. The prepn. of the Cl compd. is described. 2-Halo-4-dimethylaminoarsenobenzene-1-arsenoxide is prepd. by heating *m*-halodimethylaniline with AsCl_3 . 2-Halo-4-dimethylaminobenzene-1-arsonic acid is prepd. by oxidation of the corresponding arsenoxide.

Urea derivatives. BAYER & Co. Brit., 13,866, June 8, 1914. Urea derivs. of the naphthalene series are prepd. by the action of COCl_2 upon derivs. of 1,8-aminonaphtholsulfonic acids containing 1 or more aminobenzenesulfonyl groups or derivs. thereof, in place of some or all of the aminobenzoyl residues referred to in 9,472, 1914 (C. A. 9, 2697). In examples *m*-aminobenzenesulfonyl-, and *m*-aminoanisoyl-*m*-aminobenzenesulfonyl derivs. of 1,8-aminonaphthol-3,6-disulfonic acid are treated with COCl_2 . The products are useful in therapeutics. Nitro- and aminobenzenesulfonyl derivs. of 1,8-aminonaphthol-3,6-disulfonic acid are prepd. by treating the acid with *m*-nitrobenzenesulfonyl chloride, and subsequently reducing the product. *m*-Nitro- and *m*-aminoanisoyl-*m*-aminobenzenesulfonyl derivs. of 1,8-aminonaphthol-3,6-disulfonic acid are prepd. by treating *m*-aminobenzenesulfonyl-1,8-aminonaphthol-3,6-disulfonic acid with *m*-nitroanisoyl chloride and subsequently reducing the product.

Ureas. FABRIQUES DE PRODUITS DE CHIMIE ORGANIQUE DE LAIRE. Brit., 17,501, July 23, 1914. Ureas of the general formula $RR^1N.CO.NR^2R^3$, where R, R^2 = alkyl and R^1 , R^3 = aryl, are prepd. by the usual methods, *e. g.*, by forming an alkylarylurea chloride and condensing this with a 2nd alkylarylamine. According to examples: ethylphenylurea chloride is prepd. from ethylaniline and $COCl_2$ and is condensed with methyl-*o*-toluidine; methylphenylurea chloride is similarly prepd. and condensed with ethyl-*o*-toluidine; diethyldi-*o*-tolylurea may also be obtained by the action of 1 mol. of $COCl_2$ on 4 mols. of ethyl-*o*-toluidine. The products are liquids or solids of low m. p., and are suitable for stabilizing nitro compds., or nitric esters, *e. g.*, nitrocellulose explosives, celluloid, etc.; they readily absorb nitrous fumes.

Alcamines; alcamine esters. A. B. DAVIS. Brit., 17,085, July 18, 1914. Alcamines and esters thereof of the general formula $R^1R^{II}N.CH_2C(OR^{IV})(R^V).CH_2.CH_2.R^V$, where R^1 , R^{II} = alkyl, aryl, or one of them = H, R^V = alkyl, aryl, or aralkyl, R^{IV} = H or acyl, are prepd. by treating chloromethyl ω -bromopropyl ketone with an alkyl, aryl, or aralkyl Mg halide, condensing the resulting chlorohydrin with an amine to produce the alcamine, which may then be esterified; the ester may be converted into salts, such as the HCl. According to an example, the parent materials used are chloromethyl ω -bromopropyl ketone, $EtMgBr$, Me_3NH and $BzCl$. Cf. C. A. 9, 2696.

Alcamine esters. A. B. DAVIS. Brit., 17,086, July 18, 1914. Alcamine esters of the general formula $R^1R^{II}NCH_2C(OR^{IV})R^{III}CH_2CH_2CHMe_3$, where R^1 , R^{II} = alkyl, or one of them = H, R^{III} = alkyl, aryl, or aralkyl, and R^{IV} = acyl, are prepd. by treating chloromethyl isoamyl ketone with an alkyl, aryl, or aralkyl Mg halide, condensing the resulting chlorohydrin with an alkylamine to produce the alcamine, and esterifying; the ester may be converted into salts such as the HCl. According to an example, chloromethyl isoamyl ketone, ethylmagnesium halide, Me_3NH and $BzCl$, are the parent materials. The products are local anaesthetics.

Acetaldehyde. CONSORTIUM FÜR ELEKTROCHEM. IND. Brit., 16,957, July 17, 1914. In the manuf. of CH_3CHO by passing an excess of C_2H_2 through a hot soln. containing Hg compds., the conditions are so adjusted that a state of thermal equilibrium is attained or approx. attained; this is effected by adjusting the rate of flow of C_2H_2 and the temp. of the reaction vessel so that the heat evolved by the reaction is balanced by the heat lost by evapn. of H_2O , and by addition of fresh H_2O to keep the vol. of liquid const. The reaction may be performed in thermally insulated vessels, or in a vessel surrounded by a water-bath. A temp. of about 80° is suitable; H_2SO_4 of 6-35% strength is a suitable acid; HgO is periodically added, and the Hg formed removed.

Papaverine derivatives. A. PICTET. Brit., 17,578, July 24, 1914. Condensation products are obtained by treating tetrahydropapaverine or its derivs. with aliphatic or aromatic aldehydes, or with the corresponding acetals in presence of a mineral acid. According to examples, products are obtained from tetrahydropapaverine and methylal or acetal, and from aminotetrahydropapaverine and acetal. The aminotetrahydropapaverine is prepared by reducing nitrotetrahydropapaverine. The products have therapeutic properties.

Phenylcinchoninic acid. KALLE & Co. Brit., 17,725, July 27, 1914. 2-Phenylquinoline-4-carboxylic acid is prepd. by condensing isatin with acetophenone in the presence of aq. caustic alkali solns.

Nicotine from tobacco. F. T. BIRDWOOD. Brit., 17,024, July 17, 1914. In app. for extg. nicotine, NH_3 , etc., from tobacco, cigars, or cigarettes, by heating in receptacles in a chamber, the nicotine is condensed upon a conical surface and is run off from a trough by a pipe.

Tobacco. F. T. BIRDWOOD. *Brit.*, 17,265, July 21, 1914. Nicotine, etc., is removed from tobacco, cigars, cigarettes, etc., by subjecting them to the action of reduced pressure in a dry atm. with or without the aid of heat. The tobacco is placed in containers in a chamber connected to a condenser and exhaust pump and heated by a jacket supplied from a heater with hot air, which may pass in addition or alternatively through the said chamber to which air may be admitted.

2-Naphthylquinoline-4-carboxylic acids. CHEM. FABRIK AUF AKTIEN (v. E. SCHERING). *Ger.*, 284,232, June 19, 1914. Isatin or methylisatin in alk. soln. is condensed with acetonaphthones or their nucleus condensation products or aniline or its derivs. with naphthaldehydes or pyroracemic acid. The products are applied therapeutically.

Acyl compounds of anthranilic acid, its homologs and derivatives. F. HOFFMANN-LA ROCHE & Co. *Ger.*, 284,735, Sept. 2, 1913. Therapeutically active products result from the action of salicyl chloride on anthranilic acid, its homologs and derivs.

Strongly active stable technical pancreas preparations. LEPETIT, DOLLFUS & GANSSER. *Ger.*, 285,050, Aug. 5, 1913. Glycerol may be employed. Cf. *C. A.* 9, 724.

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

Chemical industry and academic education. OSKAR NAGEL. *Chem. Ztg.* 39, 749-50(1915). J. H. MOORE.

The university and industry. NICHOLAS M. BUTLER. *J. Ind. Eng. Chem.* 7, 1069-71(1915).—An address. E. J. C.

Evaporation of potash brines. W. B. HICKS. U. S. Geol. Survey, *Professional Paper* 95-E, 65-72(1915).—In literature on the evapn. of sea water and other natural waters there is a lack of data regarding K. The present expts. show the distribution of K when certain solns. are evapd. on the steam bath. For solns. containing KCl and NaCl, K_2CO_3 and Na_2CO_3 , K_2SO_4 and Na_2SO_4 the K/Na ratio after evapn. was 0.54, 0.67 and 0.58, resp., showing that the K was best concd. in the K_2CO_3 soln., but much of the K was crystd. from the soln. before this condition was reached. In more complicated mixtures containing several components, including $Na_2B_4O_7$, the amt. of K sepd. at different stages of the evapn. was detd. Apparently any soln. containing over 4% K begins to sep. K rapidly on further evapn., so that other processes than evapn. are to be recommended. R. C. WELLS.

New method for increasing potash supply. ANON. *Oil, Paint and Drug Rep.* 88, No. 19, 34(1915).—Brief description of a Canadian method in which feldspar is heated with limestone and Fe oxides. The partly fused mass is treated with dil. acid. E. W. BOUGHTON.

The present status and the future of the soda industry in Japan. TORAKICHI NISHIKAWA. *J. Chem. Ind. (Japan)* 18, 946(1915). E. H.

Canadian production of salt. FELIX S. S. JOHNSON. *Commerce Reports* 265, 602-3(1915).—Rock salt beds occur in the part of Ontario bordering on Lake Huron, the St. Clair River, Lake St. Clair and the Detroit River, an area of about 3000 sq. mi. The deposits vary in thickness from thin beds interstratified with dolomite and shale to solid beds of 200 ft. in thickness. The av. depth of the salt is more than 1000 ft. E. H.

Salt peter. A. MCGILL. Inland Revenue Dept., Ottawa, Canada, *Bull.* 323, 15 pp. (1915).—Analyses are given of 166 samples collected under the name of "salt peter." 109 were found to be KNO_3 , 49 were NaNO_3 , 7 were mixts. of KNO_3 and NaNO_3 and 1 was Na_2SO_4 . E. H.

Catalyst for the synthesis of ammonia. F. W. DE JAHN. U. S., 1,159,364, Nov. 9. Metallic Na is treated with NH_3 at about 300° and a catalyst is formed by distributing the resultant Na-N compd. over pumice, which has previously been washed with acid and H_2O and ignited, or other inert carrier. The Na may be melted on the pumice (before treatment with NH_3) in an atm. of H.

Catalyst for the synthesis of ammonia. F. W. DE JAHN. U. S., 1,159,365, Nov. 9. A mixt. of Co 59 and metallic Na 69 (or K 117) parts is treated with NH_3 at about 300° and the resultant Co-Na- (or K)-N compd. is used as a catalyst in making NH_3 from H and N at 520 – 540° under 80–90 atm. pressure. The Co may be reduced, from its nitrate, on the pumice. Catalysts containing (instead of Co) Mn, Ce, B, Ti, U or Si may also be used.

Pure alumina from clay containing iron. M. BUCHNER. U. S., 1,162,130, Nov. 30. Clay is treated with H_2SO_4 or other inorganic acid to dissolve both the Fe and Al and the soln. is treated with ammoniacal waste gases to ppt. hydroxides of Fe and Al and form a soln. of NH_4 salt. The ppt. is sepd. and the $\text{Al}(\text{OH})_3$ is dissolved with hot NaOH soln. and alumina and alkali are recovered from the soln.

Toughening crystalline fused aluminium oxide. L. B. COULTER. U. S., 1,161,620, Nov. 23. Granular fused Al_2O_3 is heated to about 1600 – 1800° to produce a stable physical equil. and greater resistance to crushing as well as more uniform diffusion of coloring matter throughout the grains.

Zirconium oxide. P. ASKENASY. U. S., 1,158,769, Nov. 2. A soln. of basic ZrCl_4 or other inorganic Zr salt containing Fe with or without other discoloring substance, is heated under pressure to a temp. above the b. p. of the soln. under atm. pressure and the ppt. is sepd. from the impurities, which remain in soln.

Alkali metal salts from kelp ashes. C. KLINGBIEL. U. S., 1,162,617, Nov. 30. A soln. leached from kelp ashes is treated with H_3PO_4 to destroy the thiosulfates present and the excess of H_3PO_4 is neutralized and K salts then may be more nearly all crystd. from the soln. than without the presence of phosphates.

Potassium sulfate. G. S. MORGAN. U. S., 1,161,239, Nov. 23. Alunite is roasted with CaO at a temp. of 650 – 930° , the roasted product is leached, the soln. concd. and K_2SO_4 recovered by crystn.

Recovering potash from greensand marl. H. P. BASSETT. U. S., 1,159,464, Nov. 9. Greensand marl consisting principally of glauconite is washed and screened to remove lighter particles and relatively large particles of quartz, etc., and the concentrates after drying are mixed with NaHSO_4 and NaCl and heated with coke to a dull red heat for 20–40 min. or without coke for 1–3 hrs. The coke is used in sufficient amt. to reduce only a portion of the NaHSO_4 to sulfide. The reaction products are treated with H_2O to recover the K_2SO_4 and other sol. substances formed.

Manufacture of zeolites. P. DE BRÜNN. U. S., 1,161,200, Nov. 23. Solns. of alkali metal silicates and aluminates are mixed and the resulting jelly- or paste-like ppt. is washed, filter-pressed and the press-cake dried. Cf. C. A. 9, 2573.

Nitrogen compounds of aluminium and alkali or alkaline earth metals. D. A. PENIAKOFF. U. S., 1,159,989, Nov. 9. Porous masses formed by agglomerating a mixt. of coal and an alk. earth or alkali metal aluminate are heated in a current of N to produce cyanides or other volatilizable N compds.

Adhesive mixture. J. W. and R. SCHLEICHER. U. S., 1,162,712, Nov. 30. Talc 1 and 3.6° Bé. soln. of water-glass 16 parts are mixed, forming an adhesive for use either hot or cold for making veneer boxes, etc.

Ink for printing on cloth. C. J. BULLINGER. U. S., 1,162,027, Nov. 30. A harmless ink, for printing on cloth, which is easily removable by brushing or by washing with H_2O but resistant to hydrocarbons, is formed of gelatin glue 1, H_2O 76, Zn white 52, glycerol 3 oz., and thymol 16 grams.

Fire-extinguishing composition. W. W. WALKER. U. S., 1,161,090, Nov. 23. A foam retaining and fume deterring ingredient for use in fire-extinguishing compns. is formed by boiling "spent licorice root" (obtained as a residue from the extrn. of licorice root with H_2O) with NaOH soln. under 120 lbs. per sq. in. pressure.

Sharpening worn files chemically. A. J. ZIRSEN. U. S., 1,161,816, Nov. 23. Worn files are covered with H_2O and then fuming H_2SO_4 and HNO_3 are added to the bath to heat it and act on the files.

Molding varicolored casein masses. F. THOMAS. U. S., 1,159,878, Nov. 9. Varicolored spherical casein masses are formed by allowing several differently colored streams of alkali caseinate to fall vertically in the form of drops, to a common point in a soln. containing CH_2O and $CaCl_2$ or other alk. earth salt. The casein solns. used may have different viscosities, to prevent too great blending. The varicolored particles thus obtained are used to imitate horn, etc.

Small casein spheres. F. THOMAS. U. S., 1,159,879, Nov. 9. Separate cells or chambers open at their upper ends are formed within a body of coagulating soln., formed, e. g., of $MgCl_2$ or $CaCl_2$ and CH_2O , and streams of alkali caseinate soln. are allowed to flow freely into each of the cells. This produces spherical masses of coagulated casein which are then sepd. from the remaining coagulating liquid. Rough blanks for buttons, beads, etc. are thus obtained.

Lithographic printing plates. J. JAMES. U. S., 1,162,168, Nov. 30. The impression paper is pressed on the plate and the paper soaked off, the plate then coated with a soln. of gum arabic, rubbed with ink, dusted with talcum powder, etched with an acid soln. containing gum arabic, again coated with gum arabic, dried, washed with turpentine, coated with an asphalt soln. in turpentine and after testing is finally coated with a mixt. of kauri gum, turpentine and Chinese oil and again etched.

Electric insulating composition. J. F. MENNINGEN. U. S., 1,162,092, Nov. 30. A mixt. of sand 5, asbestos 3 and shellac 4 parts with a solvent is molded under pressure while heated, then heated without pressure to volatilize the solvent of the shellac and finally again heated under pressure to compact the somewhat shrunken article. Cf. C. A. 9, 179.

Electrical insulation. L. H. BAEKKELAND. U. S., 1,160,362, Nov. 16. Paper pulp is beaten with a phenolic condensation product capable of transformation into infusible form by heating, and after thorough mixing is effected the product is pressed into the desired form and heated sufficiently to render it infusible. 15-50% of condensation product is preferably used. Knife handles, buttons, etc., may also be made of the compn.

Paper-like phenolic condensation mixture, for use in making molded articles. L. H. BAEKKELAND. U. S., 1,160,365, Nov. 16. Wet paper pulp is treated with a soln. of phenolic condensation product (transformable into insol. form by heating) containing alkali metal hydroxide and the condensation product is then pptd. on the fiber by the addition of a sol. salt of Al, Cu, Fe, Zn, Ni, or Co. China clay or other fillers may be added.

Gears, pulleys, etc., from phenol condensation products. L. H. BARKLAND. U. S., 1,160,364, Nov. 16. Perforated sheet metal reinforcing plates are united by a body material of hard, insol., infusible phenolic condensation product, mixed with wood fiber, asbestos or other fibrous filler, which penetrates the perforations of the sheet metal and forms the principle portion of the gear or wheel. 10% of graphite may be included in gears as a lubricant.

Heat insulating material. C. P. BYRNES. U. S., 1,162,450, Nov. 30. Air is injected into a mixt. of cork with a binder of asphalt, or other similar heat-insulating material, before it has hardened, to increase the porosity of the final mixt. by providing air cells in it additional to those naturally present in the cork or other porous filler.

Friction-lining for brakes, etc. E. F. KELLEY. U. S., 1,162,371, Nov. 30. A brake-lining fabric of asbestos is impregnated with a soln. formed by dissolving $MgSO_4$ and alum in a hot decoction of ground bone and beer vinegar.

Artificial gold leaf. J. A. C. FICHTMUELLER. U. S., 1,160,979, Nov. 16. Leaves are formed of a pyroxylin varnish carrying naphthalene yellow or auramine and Al powder, dried upon a sized paper backing so as to permit partial stratification of the yellow coloring at the face of the leaf.

Fuller's earth for decolorizing oils. M. J. WELSH. U. S., 1,159,450, Nov. 9. Raw fuller's earth is treated with hot acid, *e. g.*, HCl, to dissolve alk. earth compds. and other impurities tending to fuse or sinter during calcining, then washed to remove the sol. substances and calcined. Cf. C. A. 9, 1257.

Lubricant for packing stuffing boxes. A. J. BAILEY. U. S., 1,158,770, Nov. 2. Pulverized white metal 112 parts is mixed with talc 4, graphite 6, tallow or other fat 6, carded asbestos 4 and pulverized cork 2 parts.

Decarbonizing internal-combustion engines. W. E. AHERN. U. S., 1,160,682, Nov. 16. The C deposits in the engine, while hot, are treated with cold 20% NH_3 soln. which is further refrigerated by the resulting vaporization and effects cooling, contraction and disintegration of the C.

Depositing carbon in the pores of wood and other porous materials. W. A. BEATTY. U. S., 1,158,965, Nov. 2. Wood, paper or other porous substance to be impregnated and colored by deposition of C in its pores is impregnated with a soln. of sugar, H_2O , turpentine and H_2SO_4 and then heated with steam under a pressure of 75-100 lbs. per sq. in. to hasten the deposition of C. Leather may be treated similarly, using CrO_3 , $K_2Cr_2O_7$ or $ZnCl_2$ instead of H_2SO_4 .

Composition for filling cavities in trees. C. H. ERWIN. U. S., 1,160,701, Nov. 16. A mixt. is formed of ground asbestos 40, refined coal tar 50, pine oil 8 and a pigment (such as to match the bark of the tree to be filled) 2%.

Gramophone records. W. A. BEATTY. U. S., 1,158,964, Nov. 2. Fillers such as graphite, wood powder, steel dust, lampblack or Fe_2O_3 are mixed with a condensation product of acetone, PhOH and CH_2O and records are molded of this mixt.

Phonograph records. T. A. EDISON. U. S., 1,158,659, Nov. 2. A mixt. of diphenylamine 15, shellac 70 and acetanilide 2 parts is used for forming the records.

Phonograph records. T. A. EDISON. U. S., 1,158,660, Nov. 2. The records are formed of an emulsified mixt. of shellac with about 35% its wt. of stearic acid or an emulsion of shellac with $C_{10}H_8$ and benzoic acid. A camphor-shellac mixt. is too readily deformable by heat to give as durable a record.

"Artificial snow" for christmas trees, etc. B. W. HEYMAN. U. S., 1,162,060, Nov. 30. A mixt. of soap 2 and glycerol 1 part, with ground mica and H_2O is used.

Calcium hypochlorite. CHEM. FABRIK GRIESHEIM-ELEKTRON. Brit., 17,859, July 28, 1914. $\text{Ca}(\text{OCl})_2$ is obtained by treating a pulp of lime and H_2O containing comparatively little H_2O with Cl , the quantity of H_2O being preferably such that only the $\text{Ca}(\text{OCl})_2$ is pptd., the CaCl_2 remaining in soln.; the soln. is sepd., and the $\text{Ca}(\text{OCl})_2$ may be freed from H_2O of crystn. by drying *in vacuo*. In carrying out the process, the Cl is passed into a pressure vessel containing the lime pulp, which is kept stirred, and the temp. is chosen to avoid the production of basic intermediate products. Cf. C. A. 9, 2436.

Magnesium carbonate. A. HAMBLOCH. Brit., 17,311, July 21, 1914. Raw or roasted minerals containing Mg and Ca as carbonates or silicates, are treated with a soln. of alkali carbonate or bicarbonate and CO_2 under pressure at $60\text{--}70^\circ$. The liquor is filtered, CaCO_3 remaining behind, while from the soln. of Mg alkali carbonate, MgCO_3 is pptd. by heating to 100° , and the soln. of alkali carbonate and the evolved CO_2 may be used again. Cf. C. A. 9, 1536.

Double silicates. W. E. EVANS and E. L. LEBLANC. Brit., 17,663, July 25, 1914. In the production of base-exchanging bodies by the wet method from Na aluminate and Na silicate, the reaction is carried out under pressure in an autoclave. A hard granular ppt. is obtained which is suitable for use without further treatment. The autoclave may be provided with a filter-plate at the bottom. The reagents may be mixed before being placed in the autoclave, the concn. in this case being such as to render pptn. under ordinary conditions difficult or impossible. The proportions mentioned in 15,090, 1913, may be used, but the concns. may advantageously be reduced. Particles of an inert substance, such as coke or wood, may be maintained in suspension to serve as centers upon which pptn. may take place.

Removing iron from aluminium silicates, kaolin, clay, etc. F. SCHULZ, AKT.-GES. and H. GRUBER. Brit., 2,309, Jan. 28, 1914. These and other inert materials such as BaSO_4 , fluorspar, cryolite, Zr earth, and sand, are treated with a soln. of an aldehydesulfoxylic acid, or a ketone-sulfoxylic acid, or a deriv. thereof, in the presence of a mineral acid, the other inert materials above mentioned being treated with a soln. of hyposulfurous acid (hydrosulfurous acid) or a salt thereof in the presence of a mineral acid. Sand, fluorspar, and cryolite, thus purified, are suitable for making glass, Zr earth for making incandescent gas mantles, and BaSO_4 as a pigment.

Hydrogen. J. DEMPSTER. Brit., 16,893, July 16, 1914. In app. for the production of H by the alternate oxidation of Fe or the like by means of steam and reduction of the oxide by means of water gas or other reducing gas, leakage of water gas into the H connections is prevented by providing a liquid seal between the H outlet pipe and the H scrubber, the seal being also in connection with the water gas inlet main, so that increased pressure in the water gas inlet main increases the depth of seal of the H outlet pipe.

Iron oxide and like castings. SOC. ITALIANA DI ELETTROCHIMICA. Brit., 17,161, July 20, 1914. Fe oxide castings in which the ratio of Fe_2O_3 to FeO is greater than 3, and may reach pure Fe_2O_3 , are obtained by fusing an Fe oxide (which may be a crude oxide such as burnt pyrites) or metallic Fe in an elec. furnace and injecting into the mass in the furnace or in a converter, O or an oxidizing gas, or adding an oxidizing agent with stirring, the treatment being effected under pressure, and casting in an oxidizing atm. Mixts. of Fe oxide with other oxides, such as oxides of Mn , W , Ti , Cr , V , Co , Ni , Mo , and U , may be similarly treated. The castings may be vessels, pavements, coatings, etc., and articles for elec. use such as arc-lamp electrodes and anodes and cathodes for electro-chem. purposes.

Plastic compositions. K. HAGENDORF and A. BRESLAUER. Brit., 17,728, July 27, 1914. HCOOH and "trioxymethyl" or HCHO are added to bovine blood serum and the resulting mass heated with phenol and Na_2O_2 until it becomes hard. In an example, 100 parts of blood serum are mixed with 25 parts of HCOOH and 20-30 parts of "trioxymethyl," and 80-90 parts of phenol and Na_2O_2 in H_2O are then added until the mixt. becomes alk.; finally, 10 parts of Na_2SO_3 are added to the mass which is heated and poured into molds when it is again heated until it hardens. The use of albumins other than blood serum and of H_2O_2 instead of Na_2O_2 is mentioned.

Plastic compositions; linoleum; explosives. L. ZINSSER. Brit., 17,413, July 22, 1914. Ground earth-nut shells are used as an absorptive or filling material in the manuf. of linoleum, stone-wood flooring and the like, and dynamite.

Joint-making compositions. W. H. WALKER. Brit., 17,686, July 27, 1914. A compn. consisting of 60-80 parts of prepared chalk, 10-30 parts of vaseline, 1-5 parts of castor oil, and 1-5 parts of Fe_2O_3 paint, is employed for making water-tight the joints of covers of boxes for underground elec. mains and distributors and of other boxes in exposed positions.

Lubricant. S. H. BLICHFELDT. Brit., 15,463, June 27, 1914. It consists of an emulsion of relatively insol. liquids, 1 of which has comparatively low internal friction, the diam. of the suspended particles being 0.001 mm. or less. Emulsions of oil or fat in H_2O , in aq. solns. as of soap, or, where evapn. may be rapid, in glycerol or an aq. soln. of glycerol, are typical. Suitable emulsifying-app. is described in 7,498, 1912 (C. A. 7, 2999), 23,653, 1913 (C. A. 9, 943), 25,265, 1913 (C. A. 9, 1229) and 18,048, 1914.

Filtering colloidal solutions. J. VON KRUSZEWSKI. Brit., 17,503, July 23, 1914. Colloidal solns. are filtered by means of a number of superposed sieves, 1 or more of which is prevented from being wetted by the filtrate, by being smeared, as with a thin film of fat, oil, wax, paraffin, or the like. In the case of sludge containing fat, it is unnecessary to apply a special film to the sieves. Alternatively to greasing the sieves, two finely-meshed sieves may be secured together by soldering, riveting, or screwing, so as to cause them to be sepd. by capillary distances at as many points as possible. The greater part of the liquid passes through in a clear condition, and the less viscid part of the residue may be forced through by vacuum, or it may be sucked off from the top of the pptd. cake without filtration. The sieves are preferably arranged in the form of chambers to give the max. filtering surface in a given space.

Drying and superheating steam. G. RESTUCCI. Brit., 15,104, June 23, 1914. Steam is throttled in 1 or several sets of nozzles, each nozzle being formed with a convergent passage which merges into a slightly divergent passage at the small end; the axes of the nozzles are arranged approx. in the direction of flow of the steam.

Liquid for filling radiators. H. FRANK. Brit., 24,827, Oct. 31, 1913. A volatile liquid or solid of low sp. heat is mixed with a non-volatile liquid of high sp. heat to produce a mixt. of low sp. heat which can be heated without appreciable vaporization, the invention being thus distinguished from 20,241, 1911, 29,590, 1912, and 1,204, 1913. Mixts. of oil with trichloroethylene and hexachloroethane are described as suitable for the purpose of the invention.

Fire-extinguishing. J. STANZIG and R. KÖNIG. Brit., 16,967, July 17, 1914. In producing foam for fire-extinguishing by dissolving solid reagents, H_2O under pressure is conducted successively through 2 chambers, 1 containing the acid charge, in the form of powdered oxalic or tartaric acid, *e. g.*, and the other the alk. charge, consisting, *e. g.*, of powdered NaHCO_3 , quillaia bark, a saponin or other foam-forming substance, and in some cases an NH_4 or alk. alum.

Sensitized tracing cloth. R. A. RITSCHARD. Brit., 17,640, July 25, 1914. A transparent sensitized tracing-cloth is made by coating one side of ordinary tracing-cloth with an oil varnish or lacquer to render it waterproof and then applying to the other side of the cloth a sensitized coating of any known kind, such as Fe NH_4 citrate and $\text{K}_2\text{Fe}(\text{CN})_6$ with gelatin. The copies obtained are developed in H_2O mixed with chrome-alum, formalin, or other gelatin-hardening agent.

Drying the end lyes of the potash and soda manufacture. B. RINCK. Ger., 284,970, Sept. 7, 1912. An evapg. app. is used which comprizes a hollow cylinder into which the hot combustion gases and the end lyes are directed in the same direction.

Regulating the temperature of superheated steam. C. KOSE. Ger., 284,818, Apr. 5, 1914. The control is secured by both cooling and the addition of satd. steam.

Coloring stones with metal salt solutions. CANOVA-MARMOR-WERKSTATTEN. Ger., 284,689, Nov. 12, 1913. Polyhydric alcs., also phenols, aldehydes, ketones, or carbohydrates, are added to the alc. soln. of the metal salts, in amt. not over 50% of the solvent.

Stain removing composition. OCKELMANNSCHE SEIFEN-VERWERTUNGS G. M. B. H. Ger., 284,974, Oct. 11, 1913. Addition to 259,360 (C. A. 7, 3000). The principal process, according to which sugar is added to permit the use of a large amt. of alkali and thereby secure a more effective cleaning and detergent action, is applied in the production of a solid spot-removing, washing, or bleaching agent. The amt. of H_2O used is decreased, and the amt. of added sugar is greatly increased. The amt. of alc. added must be somewhat smaller in prepg. the solid form. E. g., 4% KOH, 80-83% sugar, 12-14% alc., or NaOH 3%, sugar 84-87%, and alc. 12%.

Impregnating belting with asphalt. AKTIESELSKABET ROULUNDS FABRIKER. Ger., 285,049, Nov. 4, 1913. After satn. with an asphalt soln., the material is treated with a soln. of balata, gutta percha, or like gum. The asphalt soln. may be used together with the soln. of balata or the like. The woven belting, or the like, is passed through a 10% benzene soln. of asphalt, and allowed to dry. This is repeated until the impregnated belting shows no further alteration in length. The material is then drawn through a soln. of balata or the like, and subjected to strong pressure.

Preventing oxidation of atomized liquid or vaporized metals. G. STOLLE. Ger., 284,911, Aug. 12, 1913.

19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

Relation of chemistry and mechanical manipulation to the evolution of the glass industry. R. L. FRINK. *Met. Chem. Eng.* 13, 800-2(1915).—Historical.

C. H. KERR.

Enamel and its use in the chemical industry. J. SCHAEFER. *Z. angew. Chem.* 28, I, 419-20(1915).—History of the industry and a general description of enamels and enamelling methods.

C. H. KERR.

The subdivision of stoneware glazes into fritted and raw parts and their relation to glaze rules. H. HARKORT. *Z. angew. Chem.* 28, I, 422-8(1915).—In stoneware glazes not only the total mol. formula but the subdivision into raw and fritted parts must be considered. It has been common practice to frit a large part and sometimes all of the glaze and usually the effect of fritting has been ignored. This is erroneous since fritting exerts a great influence, so great that in some cases 2 glazes of the same chem.

formula but of different fritted compn. may show one to be useless and the other commercial. Harkort exptd. with 11 glazes of widely differing compns. (4 without PbO). The range of compn. was: CaO 0.54 to 0.29, Na₂O 0.50 to 0.01, K₂O 0.20 to 0.08, PbO 0.33 to 0, Al₂O₃ 0.35 to 0.20, SiO₂ 2.65 to 2.08, B₂O₃ 0.43 to 0.36 equiv. Studying the glazes at temps. from cones 01 to 6 the temp. effect was very great. With leadless glazes, especially those high in CaO, bubbles were hard to avoid. In general 0.4 equiv. CaO is the max. permissible with glazes of 2.5 or over of SiO₂, and CaO must be decreased if acidity decreases. B₂O₃ volatilizes easily, especially under the influence of SO₂ from furnace gases. With glazes of less than 2.5 equivs. SiO₂ and with 0.4 to 0.5 CaO the surface was a dull mat and in some cases the glaze was entirely destroyed. With more SiO₂ and less CaO the effect diminished. The presence of CaCO₃ in the raw addition affords protection against the attack of H₂SO₄. With PbO used only in the frit a much higher temp. is required to produce the same effect than is required if part of PbO is used raw. PbO in the raw addition exerts no influence on the volatilizability of B₂O₃. (Note by abstractor: In Germany the term "stoneware" includes higher grades of ware than in the U. S.) C. H. KERR.

Report of Committee C-3 on standard specifications for brick. A. V. BLEININGER, *et al.* *Proc. Am. Soc. Testing Materials* 15, Pt. 1, 150-9; appendix 160-2 (1915); cf. C. A. 9, 958.—*Building Brick*: Tabulated reports are given from 12 cooperating labs. testing compressive and transverse strength and absorption of representative bricks in their districts. Wide fluctuations in absorption made classification by those data impossible. They were classified according to compressive strength as follows: A, having a compressive strength of 5000 lbs. per sq. in. or more; B, 3500-5000 lbs.; C, 2000-3500 lbs.; D, 1500-2000 lbs. The av. compressive strength (lbs. per sq. in.), modulus of rupture (lbs. per sq. in.) and % absorption, resp., for the 4 classes were: A 8493, 1482, 9.82; B 4171, 668, 15.76; C 2791, 621, 18.97; D 1762, 469, 19.17. Compressive testing of bricks on edge is much preferable. A freezing test or suitable substitute should be investigated. *Paving Brick*: Standard specifications have been adopted. See 1915 Year Book of the Society. C. H. KERR.

Magnesite deposits in British Columbia. ANON. *Brit. Clayworker* 24, 134 (1915).—The ore found in large quantities along Lake Atlin in N. E. British Columbia has been tried with success. It runs as high as 98% MgCO₃. C. H. KERR.

Diatomite from Nova Scotia. ANON. *Brit. Clayworker* 24, 134-5 (1915).—The Nova Scotia product has good sp. gr. and other properties except its grayish color. The analysis is given. C. H. KERR.

The influence of bituminous matter in brick clays. ANON. *Brit. Clayworker* 24, 143-4 (1915).—Details are given of methods of regulating the air supply during burning. C. H. KERR.

Vitreous enamels or glazes for pottery, etc. S. H. HULL. U. S., 1,158,922, Nov. 2. Metallic Pb is used as a substitute for white lead in making up the glazing compns. to effect a saving in wt. and cost of the Pb required. The Pb is used in about the same state of fine subdivision as that of white lead previously similarly employed.

Refractory furnace linings, crucibles, etc. A. PFAFF. U. S., 1,159,264, Nov. 2. A homogeneous, dense and tough material for manuf. of crucibles, furnace linings, etc., is prepd. by mixing zirconia with about an equal amt. of somewhat coarser-grained carborundum, molding and burning.

Lining for basic open hearth furnaces. A. P. MEYER. U. S., 1,160,085, Nov. 9. Granulated dolomitic limestone is calcined and then heated to its sintering temp.,

cooled and mixed with sufficient granulated basic open hearth slag to fill the voids in the sintered material and act as a binder.

Heat-insulation for steam pipes, etc. B. J. CHRISTIE. U. S., 1,161,289, Nov. 23. Flax straw 1 and fire clay 16 parts are mixed with H_2O and with a binder formed of H_2O impregnated with Fe rust, vinegar, borax, glue and linseed oil.

Bricks. G. HIMOUX and J. BERNHEIM. Brit., 17,876, July 28, 1914. Pulverized clay, etc., for the manuf. of floor and roofing tiles, bricks, etc., after being prepd. by disaggregation and artificially dried, is pulverized, then sifted, and subsequently moistened by a fine spray, the mass being then compressed at high pressure in greased and closed molds.

Glass blowing machines. TREUHAND-VEREINIGUNG, AKT.-GES. Ger., 284,517, Nov. 26, 1912.

Process and apparatus for manufacturing earthenware vessels. MEISSENER OFEN- UND PORZELLANFABRIK V. E. TEICHERT. Ger., 284,722, Mar. 10, 1914. Addition to 282,773 (C. A. 9, 2579).

Surface-combustion plates. O. KNÖFLER & Co. Ger., 284,395, Feb. 21, 1914. Porous refractory masses which do not sinter in use are manufactured with the employment of ZrO_2 or of substances containing this oxide. The desired shape can be given to the plates by pressing or molding according as a greater refractory character and less porosity, or less refractory and greater porous properties are desired. When casting the ZrO_2 mass a binder is used which is driven off upon ignition, thereby securing greater porosity. The presence of TiO_2 is advantageous.

Alkali-containing clouding agent for white enamel. VEREINIGTE CHEM. FABRIKEN LANDAU, KREIDL, HELLER & Co. Ger., 283,792, Aug. 24, 1912. Metal compds., other than those of Sn, which are suitable for the purpose, are used. Cf. C. A. 9, 363.

Automatic cutting device for brick bar presses. J. OTTERPOHL. Ger., 284,337, May 2, 1914.

Automatic brick cutting machine. H. WEIHE. Ger., 284,723, Apr. 11, 1913.

Operation of automatic brick cutting machine. H. WEIHE. Ger., 284,724, Nov. 9, 1913.

Discharging pressed bricks. C. LUCKE. Ger., 284,760, May 25, 1913.

Stacking fresh bricks for drying. P. DÖRING. Ger., 284,306, July 11, 1913.

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

The function of ferric oxide in the formation of portland cement clinker. E. D. CAMPBELL. *J. Ind. Eng. Chem.* 7, 835-7(1915).—A series of expts. indicates that " Fe_2O_3 is molecularly equiv. to Al_2O_3 so far as formation of celite goes."

C. N. WILEY.

Tests of Oregon fir piling. H. B. MACFARLAND, Eng. of tests, A. T. and S. F. Ry. System. *Am. Ry. Eng. Assoc.* 16, Part 2, 47-150(1915); cf. C. A. 9, 140.—Twenty pieces of Douglas fir piling were creosoted by the steaming process, using a max. steam pressure of about 90 lbs. Ten were steamed 3 hrs. and ten 9 hrs., followed by a long vacuum period and the injection of creosote under max. pressures of 114 lbs. and 125 lbs., resp. Twenty similar pieces were tested untreated. Details of treatments and methods used in subsequent strength tests are given together with numerous photographs, tables and diagrams. McF. concludes that the depth of penetration of

the oil was mainly dependent on the width of the sapwood; the treatments used decreased the strength approx. $\frac{1}{2}$; the injury to the fiber extended through both the heartwood and sapwood; and the more severe treatment caused the greater reduction in strength.

GEO. M. HUNT.

Application of the Davis spot test in preliminary examination of creosotes (CLOUKEY) 22. Concrete shoes 29.

Alkali and cement from feldspar and similar minerals. A. W. HEYMAN. U. S., 1,160,171, Nov. 16. The minerals, preferably feldspar, granite, mica or clay, are heated to about 900–1600° with CaCO_3 , CaSO_4 or marl in such proportions as to give a CaO content of 1.7–2.2 times the wt. of the argillaceous material in the product. The alkali hydroxide formed is recovered by lixiviation with H_2O and the residue is converted into cement by calcining and grinding.

Alkali and cement from feldspar or similar minerals. A. W. HEYMAN. U. S., 1,160,172, Nov. 16. After heating the minerals, *e. g.*, feldspar, clay, mica or slate, to about 900–1600° with marl or CaCO_3 (without addition of chlorides) the product is lixiviated with H_2O and CO_2 is passed through the soln. obtained. The residue is converted into cement by calcining and grinding.

Waterproofing cement or plaster articles. L. H. BAEKELAND. U. S., 1,160,363, Nov. 16. Hydrated cement or plaster tiles, etc., are coated with a phenolic condensation product and heated to 160–200° under 80 lbs. per sq. in. pressure. Elec. insulators may be made of plaster of Paris, asbestos, MgO and phenol condensation product.

Finishing plastered wall surfaces. C. M. GOULOCHER and J. N. STACY. U. S., 1,160,708, Nov. 16. The wall is first washed with a 25% soln. of KNO_3 , then treated with a soln. of alum and allowed to dry, sandpapered to a smooth finish, sized and finally dusted with sawdust, ground asbestos, mica or other finely powdered finishing material before the sizing has dried.

Coloring stone. L. SCHRATT. U. S., 1,158,730, Nov. 2. A mixt. for penetrating and coloring the surface of marble, granite, etc., is formed of tar 40, salicylic acid 10, Na_2CO_3 10, NaHCO_3 10, SCl_2 2, Mg 5 and MeOH 10 parts, heated to the b. p. with 100 parts of H_2O , filtered and mixed with a pigment.

Fire-resistant building board. R. A. PLUMB and C. R. WEGD. U. S., 1,159,866, Nov. 9. A layer of loose asbestos fibers mixed with H_2O is placed on one or both surfaces of a sheet of pasty mixt. of hydraulic cement and H_2O and the composite sheet thus formed is pressed and heated to 100° to effect a firm union between the fibers at the surface and the main body of the mass.

Composition for rendering wood resistant to water and fire. S. R. CHURCH. U. S., 1,162,453, Nov. 30. Hexachloronaphthalene or other waxy chlorinated naphthalene is mixed with about 25–40% its wt. of wax tailings and a volatile solvent such as coal-tar naphtha and the mixt. is used to impregnate shingles or other wood products.

Cement. E. LONGAN Y SENAN. Brit., 17,756, July 27, 1914. The free lime present in cements or hydraulic limes is caused to react with a suitable proportion of granite or diorite which has been heated for at least 2 hrs. at about 1000° and afterwards finely powdered. A concrete may be made from the cement thus produced by adding calcined fragments of granite or diorite of the same nature as that used in the prepn. of the cement or hydraulic lime. A suitable furnace is specified.

Cements. E. MÜLLER and E. EICHERT. Brit., 17,829, July 28, 1914. Magnesian cement is made by powdering together burnt magnesite and dry, unburnt clay

Determination of nitrogen in coal. A comparison of various modifications of the Kjeldahl method with the Dumas method. ARNO C. FIELDNER AND CARL A. TAYLOR. *Bur. of Mines, Tech. Paper 64*, 25 pp.(1915).—Of the several modifications of the Kjeldahl method applied to 8 coals with N contents ranging from 0.8 to 1.8%, the combined Kjeldahl-Gunning with the use of 0.7 g. Hg, 7.0 g. K_2SO_4 and 30 cc. H_2SO_4 proved the best, giving max. values for N with minimum digestion. The addition of $KMnO_4$ in the usual way shortened the time necessary for oxidation and in no case did it cause a loss of N; in all detns. it was necessary to continue the digestion 2 hrs. after the solns. became colorless. Modifications for nitrates or nitro compds. are unnecessary. Check detns. by the Dumas method to establish the accuracy of the Kjeldahl-Gunning showed max. variations in av. values of 0.10%, with mean differences of 0.05%. H. L. O.

A new method and furnace for the determination of the softening temperature of coal ash under fuel-bed conditions. A. C. FIELDNER AND A. L. FIELDS. *J. Ind. Eng. Chem.* 7, 829-35(1915).—The state of oxidation of the Fe in ash greatly influences the fusibility of the ash; hence the nature of the atm. in which the fusion tests are made is very important. Ashes fuse at a much higher temp. in an oxidizing atm. than in a reducing atm. A 50% mixt. of H_2 and H_2O leaves the iron in ashes in the same state of oxidation as the $CO-CO_2$ atm. actually present in a fire bed; F. and F. use the former atm. in the lab. fusion tests. An app. (furnace and saturator) is shown which involves electrical heating with Mo wire in a H_2-H_2O atm., which prevents oxidation of Mo at 1400° . The softening temps. of 19 ash samples in the H_2-H_2O atm. as detd. in the above app. are given. F. L. GROVER.

A new peat distillation process. ANON. *Elec. Rev. West. Elec.* 67, 994(1915).—The peat is broken up in a macerator, compressed into briquets, dried to reduce moisture to 25% and fed by means of a worm screw conveyer through a triple chamber retort in which the successive chambers have increasing temps. The gases are condensed and the condensate separated. Coke, fuel, oil, toluene, ammonia, paraffin wax and acetone are obtained. Z. SMILOVICI.

Wet distillation of fuels. E. H. STECK. *Feuerungstechnik* 3, 293-4(1915).—S. discusses a new method (distn. with steam) of distg. coal whereby the yield of by-products is greatly increased. Dry distn. of bituminous coal yields on an average 11 to 16% of the org. N as $(NH_4)_2SO_4$ and only 5% of the org. matter of the coal as tar; on the other hand, wet distn. of bituminous coal yields as much as 85% of the org. N as $(NH_4)_2SO_4$ and 10% tar. The most suitable temp. for the formation of NH_3 in dry distn. of coal lies between 350 and 800 and for lignite between 200 and 600°, while with the wet distn. the decompn. of the NH_3 does not take place until temps. above 1000° are reached. The chief importance of the new method lies in the fact that it cheapens the cost of distn. and increases the yield of by-products, making the value of the by-products much more valuable than the raw fuel. H. R. GUNDLACH.

Gaseous combustion. W. A. BONE. *Chem. News* 112, 211-7, 223-5(1915).—Presidential address. A review of the recent work of Dixon, Coward and Wheeler upon ignition phenomena, propagation of flames through inflammable mixts., and limits of inflammability. F. L. GROVER.

Examination of a condensate from carbureted water gas. E. T. STERNE. *J. Ind. Eng. Chem.* 7, 898-9.—An analysis of the condensate in the service pipes of a certain gas works showed 75.88% paraffins, 1.62% olefins and 22.5% aromatic. About 12% was commercial benzene distg. between 78 and 82°, while 10% was commercial toluene distg. between 108-112°. S. notes that the production of toluene during the manuf. of carbureted water gas is not unreasonable. F. L. GROVER.

Analysis of natural and illuminating gas by fractional distillation at low temperatures and pressures. G. A. BURRELL, F. M. SEIBERT AND I. W. ROBERTSON. Bureau of Mines, *Tech. Paper* 104, 38 pp.(1915).—This paper describes a method of sepn. the paraffin hydrocarbons in natural or illuminating gas, which depends upon the differences in b. ps. of the various constituents. With natural gas, CH_4 is removed at the temp. of liquid air; ethane is removed from propane and butane at -150° to -140° ; propane is pumped off at -135° to -120° . This is the only known method of sepn. of these gases. With illuminating gas, CH_4 , H_2 , CO , N_2 and O_2 are removed at the temp. of liquid air; ethane and ethylene below -140° ; and propane and propylene below -120° . Benzene is sepd. from the residue of benzene, butylene, and butane at -78° . Ethane and ethylene cannot be sepd. from each other because their b. ps. are too close together.

F. L. GROVER.

The maximum content of hydrocarbons in generator gas. F. HOFFMANN. *Feuerungstechnik* 3, 269-72, 285-8, 295-7(1915).—An attempt has been made to calc., on the basis of the compn. of gas obtained from the dry distn. of the same coal, the possible limits of the content of hydrocarbons in generator gas. The hydrocarbons considered are methane and the heavy hydrocarbons (ethylene, propylene, benzene, etc.). If the yield of hydrocarbons per unit of wt. of coal would be the same if distd. from a retort as from a generator, it can be calcd. that the yield of heavy hydrocarbons from a German gas coal must be approx. 0.25%, and the methane yield approx. 2.4%. Since the conditions for hydrocarbon formation are more unsuitable in a generator than in a retort the actual contents are approx. $\frac{1}{3}$ the above amts. Considered from a purely volumetric standpoint the hydrocarbon content remains the same whether steam is used in the generator or not. Introduction of steam, however, lowers the temp. of the reaction zone and the methane content probably becomes less with increased steam introduction, the content of heavy hydrocarbons also being decreased.

H. R. GUNDLACH.

Calorific value test in Canada. ANON. *Gas World* 63, 353-54(1915).—By a Canadian Act of 1910 the Governor in Council was given authority to make regulations for testing the calorific value of gas. This test has now been substituted for the illuminating power test throughout the whole of Canada. It is applicable to both artificial and natural gas. By the regulations made under the Act the B. t. u. is adopted. The standard cal. power of the gas supplied shall be 520 B. t. u. per cu. ft. of satd. gas when burned in satd. air and the vol. of gas corrected for a temp. of 60° F. and a pressure balanced by a column of 30 in. of Hg at the same temp. The Canadian authorities have adopted the Simmance & Abady total-heat calorimeter made by Messrs. Alexander Wright & Co., Ltd., of Westminster as the official instrument. This calorimeter insures automatically that constancy or balance of vols., temps. and humidity, the existence of which makes the use of any formula or correction quite unnecessary, and it, therefore, under all conditions, automatically indicates the total heat value. An illustration of the calorimeter is shown.

M. L. TROWBRIDGE.

Producer gas power plants in New York City and the Metropolitan district. C. M. RIPLEY. *Power* 42, 808(1915).—Operating data and costs are tabulated. The opinions of plant owners indicate that most of the plants, particularly the smaller ones, are giving satisfaction.

C. G. F.

Certain preliminary experiments on the utilization of peat tar. GILBERT T. MORGAN AND GODFREY E. SCHARFF. *Economic Proc. of the Royal Dublin Society* 2, No. 10, 161-7(1915).—This paper deals with the distn. of samples of peat tar obtained by the incomplete combustion of peat in a gas producer. The tar was collected in hydraulic scrubbers. Such tar can also be obtained by the destructive distn. of peat in a closed retort. On distn. this tar yields (1) neutral oils differing from aromatic

coal-tar oil and from the paraffins in having a highly unsatd. character, shown by rapid absorption of oxygen, (2) acidic oils consisting of higher homologs of phenol having great germicidal power, (3) higher boiling neutral oils similar to montan waxes, and (4) a typical soft pitch. Crude peat tar also contains small amounts of bases of the pyridine group.

F. L. GROVER.

Report of committee D-6 on standard specifications for coke. J. A. HOLMES, *et al.* *Proc. Am. Soc. Testing Materials* 15, Pt. I, 359-61(1915) and *Year Book* 1915, 55-62.—The committee has been working along 4 lines, *vis.*: (1) method of sampling coke; (2) standard methods of chem. analysis; (3) methods for physical testing; and (4) specifications for foundry coke. In this report they submit tentative specifications for foundry coke only. In sampling, a quantity of not less than 2 pecks shall be taken from each car by breaking walnut sizes from the exposed lumps at intervals of 18 in. along 3 lines, one running through the middle and the others 2 ft. from the respective sides. The gross sample is crushed (avoiding all rubbing action) to 4-mesh, mixed, and quartered to 5 lbs. At the option of the purchaser this may be used also for the approx. moisture detn. The methods of chem. analysis will not be available before the end of another year. The dry coke compn. shall not exceed the following values: volatile matter 2, ash 12, S 1%, while fixed C must reach 86%. They consider the compressive-strength test as detd. on 1-in. cubes worthless for purposes of comparison and other physical tests too indefinite to warrant their incorporation into standard specification at present.

H. L. OLIN.

Briquetting coke-fines with hard pitch. G. BEHR. *Z. Beleuchtungsw.* 21, 102 (1915).—Review of modern German methods.

C. G. F.

Technical bitumens (CHURCH) 22. Distillation of Douglas fir at high temperatures (TREMPPER) 22. **Philippine coal beds (PRATT) 8.**

Heat-treatment of peat. N. TÆSTRUP and T. RIGBY. U. S., 1,160,463-4, Nov. 16. The peat is heated to a "wet carbonizing" temp. while flowing through pipes with sufficient velocity to prevent deposition of the material in the pipes.

Intermittent production of gas from bituminous fuels. P. KOSTER. U. S., 1,160,908, Nov. 16. A bed of fuel is heated by a down blast, the blast is shut off and air and steam are passed upwardly through the fuel to support combustion and generate gas.

Continuous manufacture of coal and water gas. J. W. HORNSBY. U. S., 1,159,675, Nov. 9. Finely divided coal is heated successively in rotating retorts, first to form coal gas and then in another retort to form water gas, while being showered repeatedly in each of the retorts through the hot gases within them.

Removing hydrogen sulfide from coal gas and other gases. K. BURKHUISER. U. S., 1,160,375, Nov. 16. The gas is treated with an emulsion containing free S, Fe_2O_3 and NH_4OH to remove the H_2S . The resulting mixt. of sulfides and free S is then treated with $(\text{NH}_4)_2\text{S}$ or other alkali sulfide to remove free S, the remaining sulfides are oxidized by air to form oxides and free S and this mixt. is re-used for further gas-purification. Cf. C. A. 9, 1243.

Purifying gases from the dry distillation of coal and recovering by-products. K. BURKHUISER. U. S., 1,160,836, Nov. 16. The gas is treated with S and a soln. of NH_4OH (from the gas itself) or other alk. reagent to remove H_2S ; the alk. soln. is regenerated with Fe oxide. The S sepd. from the gas is converted into SO_2 or SO_3 and then employed to combine with the NH_3 in the gas.

Gas producer. W. B. CHAPMAN. U. S., 1,162,452, Nov. 30.

Gas producer. J. A. HERRICK. U. S., 1,162,357, Nov. 30.

Rotating gas producer. W. J. LINDSAY. U. S., 1,160,516, Nov. 16. The pat. relates principally to devices for rotating the producer and operating its stirring mechanism.

Gas producer. H. KOPPERS. Brit., 17,678, July 25, 1914. In a producer in which the slag is withdrawn in liquid form, a portion of the gas produced is discharged, with the slag, through the slag-discharge passage to prevent solidification of the slag.

Gas producers. H. J. GREEN. Brit., 17,687, July 27, 1914. In a gas-producer, the raw fuel is fed in small charges into the high-temp. zone in the lower part of the producer, and the body of fuel in such lower part is at the same time rotated, the raw fuel being thus evenly distributed in the high temp. zone. The rotation of the fuel is effected by means of a rotary ribbed fuel support assisted, if desired, by rotation of the upper part of the producer shell in the same direction. The lower part of the producer shell, which in either modification is stationary, is preferably a truncated cone, which may be fire-brick lined, or a water-cooled metal structure.

Gasifying peat. T. RIGBY and WETCARBONIZING, LTD. Brit., 16,918, July 16, 1914. In gasifying mixts. containing or consisting of peat in different conditions, the moisture content of the mixt. is maintained approx. const. by controlling the proportions of the constituents of the mixt.

Separation of tar from gas. BERLIN ANHALTISCHE-MASCHINENBAU AKT.-GES. Brit., 16,981, July 17, 1914. In a tar-separator of the kind comprizing 1 or more walls each consisting of 2 perforated casings, the outer casing of each pair is connected to the cover and inner casing so as to be readily detachable. Each outer casing may be divided vertically and held in place by clamping members or the like.

Peat; ammonia. B. F. HALVORSEN. Brit., 17,882, July 28, 1914. Acids or salts are added to peat before heating under pressure to a temp. of 160-300°, whereby a large proportion of the N present is converted into NH_3 and recovered from the liquid, which is subsequently sepd. from the peat fuel. Suitable chemicals mentioned are HCl , H_2SO_4 , and SO_2 , Fe chloride and sulfate, chloride of Ca, Mg, or Na, kainite and bisulfides. HNO_3 and nitrates are not suitable. MgCl_2 may be added as such, or may be heated to give HCl , which is added to the peat, and a basic chloride which replaces lime for use in distg. off the NH_3 . The crude peat may be dealt with directly, or being cut and dried on the moor. After heating in digesters or tubular app., the is pressed to sep. the ammoniacal liquid, which is distd. with lime, etc., in a column the NH_3 being absorbed by H_2O or acids. The solid residue is washed and made dried and briquetted for fuel. Slightly dried peat may be treated with an excess acid, the expressed liquid partially evapd. and used for the treatment of fresh peat.

Ammonia salts; purifying gas. F. DUVEIGUSART. Brit., 17,475, July 23, 1914. Gases are freed from NH_3 and H_2S by washing with a soln. of sulfited tar bases, which may be made by treating tar or tar oil with SO_2 and washing out the products with H_2O or salt solns., or by treating a mixt. of tar or tar oil and H_2O or salt soln. with SO_2 , or by treating crude tar oil with H_2SO_4 , displacing the tar bases with Na_2CO_3 and treating the bases with SO_2 and H_2O or salt soln. The liquor may be successively treated with SO_2 and crude gas until sufficiently concd., whereupon it may be removed for sepn. of $(\text{NH}_4)_2\text{SO}_4$. The mother liquor may be used again or mixed with fresh sulfited tar bases.

Coking. A. M. DUCKHAM. Brit., 17,502, July 23, 1914. Coal is coked in continuous vertical retorts while subjected to mechanical pressure uniformly applied over the cross-section of the charge and exerted constantly except during the short interval required for the admission of fuel.

Cooling coke. W. WALCH. Brit., 17,236, July 21, 1914. Incandescent coke is cooled by a current of inert gases, *e. g.*, waste combustion products, and the heat abstracted is utilized in a suitable heat-exchanging app. The coke may be cooled either in the oven itself, or after discharge into a sep. cooling chamber, and the gases from the heat-exchanger are preferably used over again for cooling. In one form described, the inert gases are passed in a circuit through the coke to be cooled, through the heating flues of another oven, and through a heat-exchanger back to the cooling coke. The supply of heat to the exchanger may be equalized by passing through it gases from chambers at different stages of the cooling process. When the heat abstracted from the coke is utilized for heating air, the temp. of the cooling gases may be first reduced in a water heater. The sep. cooling chambers employed may be transportable, so that the partially cooled coke may be transferred directly to the blast furnace.

Gas generator. H. KOPPERS. Ger., 285,112, July 4, 1914. Construction and operation of charging mechanism.

Firing furnaces with gaseous, liquid, or powdered fuel. APPARAT-VERTRIEBS-GES. M. B. H. Ger., 285,418, July 2, 1914. An automatic regulation of the fuel and air supplies is controlled by the combustion temp.

22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

Thermal reactions of petroleum hydrocarbons in the vapor phase. W. F. RITTMAN. *J. Ind. Eng. Chem.* 7, 945-53(1915).—The author discusses theoretically the cracking reactions of hydrocarbons under the influence of heat and pressure. He gives experimental results of cracking Penn. kerosene, Okla. fuel oil and Cal. crude oil under varying conditions of temp. and pressure. These results indicate that the products of cracking are independent of the chem. and phys. properties of the original oils, but are dependent on the conditions of temp. and pressure. C formation is a marked exception to this, its formation being proportional to the amt. originally contained in the oil. The formation of aromatic hydrocarbons occurs best at moderate to high temp. and under high pressure; that of gasoline is favored by moderate to low temp. and high pressure.

F. M. ROGERS.

Viscosity and rate of flow of hydrocarbon oils. R. T. GLAZEBROOK, W. F. HIGGINS AND J. R. PANNELL. *Engineering* 100, 522-4(1915); *Gas World* 63, 515(1915).—The authors report in detail expts. on oils from Borneo, Persia, Mexico, Texas, Trinidad, Scotch, and Kimmeridge shales. The object of the research was to investigate the laws of flow of the oil in drawn-steel pipes of 3, 4 and 5 in. diam., with a view to detg. how far the pressure difference required to produce a given flow could be calcd. from a knowledge of the pipe dimensions and the viscosity of the oil. The results indicate that the ordinary laws of viscous flow hold so long as the velocity of flow is less than the "critical velocity," which is given by the equation: $\rho Vd/\eta = 2500$, where V is the velocity of flow in ft. per sec., d the diam. of the pipe in ft., ρ the density, and η the viscosity coeff. of the oil expressed in ft.-lb.-sec. units. In this case $P/V = 2\eta/9gd^2$, P being the pressure difference in lbs. per sq. in. per ft. run, and g the gravity acceleration in ft.-sec. units. The d. of mixts. of oils at 15.5° was found to be in accordance with the calcns.; but there was apparently no simple law connecting the viscosity of a mixt. with the viscosity of the components, the addition of a low-viscosity oil to a high-viscosity oil producing in general a much greater decrease in the viscosity of the mixt. than would result from the law of proportion, *e. g.*, the addition of 10% of Scotch shale oil (of low viscosity) to Mexican oil reduced the viscosity from 72×10^{-2} to

15.3×10^{-3} ; 50% mixts. = 4.25×10^{-3} . The flash point of mixts. is likewise reduced, and in some cases is lower than that of either constituent. Thus it may happen that 2 oils which individually comply with a specification regarding flash point, may, when mixed in certain proportions, produce a mixt. which flashes below the specified limit. Expts. with mixts. of oils from different sources showed sepn. was very slight, and that the storage of mixts. would not appear to call for special precautions. F. W. S.

Petroleum and residual bitumens in Leyte. W. E. PRATT. *Philippine J. Sci.* 10A, 241-78(1915).—In Leyte, in the Philippine Islands, petroleum and residual bitumens occur in the Canguinsa sandstone and Malumbany limestone and calcareous sandstone. The crude oil is a light, fluid oil, olive-green color, sp. gr. 0.8597, contains 8.14% of paraffin scale, and yields 5.4% gasoline, 33.7% kerosene, 55.3% of heavy oils, and 5.6% of residual pitch. Several samples of the residual bitumens gave from 26 to 94.53% of bitumen sol. in CS_2 , from 36.78 to 2.88% of mineral matter, 7.68 to 26.62% of fixed carbon, 0.30 to 21.6% of paraffin scale, and had sp. grs. varying from 1.016 to 1.068. No large deposits of petroleum seem to exist. At some places the presence of very large deposits of residual bitumen or rock asphalt is indicated. The geology of the oil- and asphalt-bearing rocks and strata are described in detail. O. E. B.

The occurrence of petroleum in the province of Cebu. W. E. PRATT. *Philippine J. Sci.* 10A, 281-6(1915).—A sample of crude oil obtained from Toledo, Cebu, possessed a sp. gr. of 0.885, and yielded 6.2% of gasoline, 42.32% of kerosene, 38.3% of heavy oils, and 13.17% of residue. O. E. BRANSKY.

The utilization of aromatic hydrocarbons derived from cracked petroleum. W. F. RITTMAN. *J. Ind. Eng. Chem.* 7, 1014-9(1915).—"The aromatic hydrocarbons produced by the cracking of petroleum may be utilized for the prepn. of nitro products without being brought to a high state of purity. The foreign substances not easily removable are paraffins and these are not affected by reagents of sufficient vigor to transform the aromatics quantitatively into mononitro products. These compds. may be sepd. in a high degree of purity by a simple process of distn. The mononitrotoluene prepd. by the method indicated may be readily converted into trinitrotoluene, which, when washed with hot water, satisfies the ordinary commercial specification of a m. p. of 75° ."

CHESTER TISTIG.

Some experiments on technical bitumens. S. R. CHURCH AND J. M. WEISS. *Proc. Am. Soc. Testing Materials* 15, II, 274-96(1915).—The object of the investigation was to afford a comparison, by means of laboratory analyses, of 18 varieties of asphalts and tar pitches; and to subject test specimens of the same materials to exposure tests. The procedure and results of these exposure tests are fully described. It is shown that: (a) A moderate degree of overheating does not seriously affect the bitumens tested; (b) gas drip attacks all the bitumens tested, but some resist its action for a longer time than others; (c) in an atm. of illuminating gas, at 15.6° for 6 days, some of the bitumens are measurably softened; (d) after exposure to sunlight and air for one yr., while the exposed surfaces of the bitumens tested has manifestly undergone marked change as evidenced by photographs of these surfaces, analyses of the test specimens show only slight physical or chem. changes. Additional exposure tests, including effect of O and N gas at 100° , and effect of H_2O , dil. acid and dil. alkali solns., are described, but the results are not given because of incompleteness. Further investigation is contemplated. F. W. SMITHER.

Application of the Davis spot test in preliminary examination of creosotes. H. CLOUKY. *J. Ind. Eng. Chem.* 7, 923-4(1915).—Six drops of sample are dropped from buret on clean, white blotting paper. If tar, carbon or dirt is present, it is observed to segregate at the center. After several hours' standing in an atm. free from

dust, foreign matter will occupy a distinct zone in the center of the spot and the outer zone clearly indicates the character of the oil. Experience in application of this test and a large number of authentic samples for comparison are necessary, but it is possible to ascertain the constituents with a reasonable degree of accuracy.

C. N. WILEY.

Yield of by-products from the destructive distillation of some western conifers. H. K. BENSON AND M. DARRIN. *J. Ind. Eng. Chem.* 7, 916-8(1915).—The common run mill waste, the selected mill waste, and the common run stump wood of Douglas fir, western yellow pine, and western hemlock were distd. The turpentine and light oil are made to include oils of a turpentine character. Tar embraces the retort and still residues. In distg. these tars, wood creosote, fir oil, turpentine, and other wood oils are obtained. The Ca acetate in the table below was computed from the titration of the aq. distillate with KOH. The results of the distn. are given in the following table:

Douglas fir.	Lbs.	(Light oils. Turpentine.) Gal.	Tar. Gal.	Wood alcohol. Gal.	Calcium acetate. Lbs.	Char- coal. Lbs.
Common run mill waste...	3,330	3.40	27.80	3.9	75.0	977
Selected mill waste.....	4,250	10.86	46.37	3.71	74.3	900
Common run stump wood..	3,260	5.59	19.88	2.60	55.8	675
Western yellow pine.						
Common run mill waste...	2,840	4.91	24.80	3.25	73.4	478
Common run stump wood..	2,620	6.06	23.05	1.83	60.8	520
Western hemlock.						
Common run mill waste...	3,270	2.76	21.60	5.00	94.0	938

The wts. of the original material are the av. wts. of measured cords. From the Douglas fir stump wood distn. 6,270 cu. ft. of gas and from the western yellow pine stump wood 3,950 cu. ft. were obtained.

O. E. BRANSKY.

Distillation of Douglas fir at high temperatures. B. TREMPER. *J. Ind. Eng. Chem.* 7, 926-7(1915).—In the Pacific Northwest several plants for the manuf. of illuminating gas from saw-mill waste are in operation. Standard coal gas installations are employed, consisting of benches of four 9-ft. clay retorts, connected to a hydraulic main, condenser, exhauster, and dry scrubbers. The accumulation of tar in the pipes is overcome by water-jacketing the standpipes. The bench is maintained at 1400° to 1600° F., and holds a charge of 1/4 cord. Twelve changes can be made in 24 hrs., giving a gas output of 60,000 cu. ft. The by-products are chiefly tar and charcoal. The MeOH, acetic acid, acetone, and part of the tar are decompd. under the temp. of distn. From Douglas fir forest wood, 25,000 cu. ft. of gas with a B. t. u. of 482 are obtained per cord of 37,000 lbs. From the mill waste, 18,000 cu. ft. of gas are obtained with a heating value of 475 B. t. u. from a cord of 33,000 lbs. Enough tar is produced to pay for the cost of the wood. Charcoal is obtained at the rate of 700 to 800 lbs. per cord.

O. E. BRANSKY.

Acetone from pyroligneous acid. M. DARRIN. *J. Ind. Eng. Chem.* 7, 927-9 (1915).—The method of producing acetone from pyroligneous acid by means of a continuously operated elec. furnace, containing a catalyzer, which converts the acid directly to acetone, gives promising results. The acid is heated in a round-bottom flask, and the acid vapors are led into a quartz tube, heated electrically, and containing the catalyzer. The vapors leaving the furnace are then condensed. The % of acetone from pure acetic acid is about 85% of the theoretical. The yield from pyroligneous acid is also about 85%. The most suitable temp. in the furnace is 435°. Barium acetate was used as catalyzer; it showed only slight deterioration in 30 days. The advantages of this method are: higher yields of acetone, elimination of the large

consumption of lime, no drying of acetate (as in the lime process), continuous operation, low operating expense, low cost and easy control of conditions. O. E. B.

Waste pine wood utilization. J. E. TEEPLE. *J. Ind. Eng. Chem.* 7, 929-30 (1915).—A review is given of the processes for the utilization of waste pine wood. The use of a volatile solvent for the extrn. of turpentine, pine oil and rosin is the best of these processes. O. E. BRANSKY.

Discoloration of maple in the kiln. R. C. JUDD. *J. Ind. Eng. Chem.* 7, 920 (1915).—The brown stain that forms in kiln-drying green frozen maple lumber is not caused by an enzyme; it is of a physico-chem. nature. Boiling and steaming before drying or preliminary treatment with solns. of germicides did not prevent discoloration. No staining occurred when the humidity of the air in the immediate contact with the drying wood was kept low. Heated in an autoclave in an atm. of SO_2 , CO_2 , and in the presence of H_2O_2 and NH_4OH , fresh green maple does not stain. O. E. BRANSKY.

Manufacture of ethyl alcohol from wood waste. II. The hydrolysis of white spruce. III. Western larch as raw material. F. W. KRESSMANN. *J. Ind. Eng. Chem.* 7, 920-3 (1915).—The best conditions for the extrn. of the sugars in white spruce are the following: a ratio of water to dry wood of 125 to 100, of H_2SO_4 to dry wood of $2\frac{1}{2}$ to 100, a pressure of $7\frac{1}{2}$ atms., and 20 min. cooking. Under these conditions, a yield of 23.6% of sugar was obtained, of which 71.44% was fermentable, giving 8.54% of EtOH upon the basis of dry wood. A sample of sawdust from a butt log of the western larch was cooked with 125% of water, 1.8% of H_2SO_4 , at 7.5 atms., for 10 mins. From this ext. a yield of 29.72% of sugar was obtained, of which 37.9% was fermentable. The yield of EtOH, based upon the original dry wood, was 4.997%. O. E. BRANSKY.

The use of ammonium hydroxide for the extraction of rosin from wood. H. K. BENSON AND H. N. CRITES. *J. Ind. Eng. Chem.* 7, 918-20 (1915).—Expts. were made with fir wood. The rosin was extd. with NH_4OH , the soln. boiled to drive off NH_3 and evapd. to dryness, the rosin dissolved in gasoline and subsequently recovered. The effects of variation in strength of NH_4OH soln., temp., time, etc., were studied. The conclusions are as follows: (1) When resinous wood is treated with a 5% soln. of NH_4OH equal to 8 times the wt. of the wood at 70° for 5 hrs., nearly complete extrn. of rosin occurs. (2) From the general properties of NH_3 and its complete recovery in gas works, it is believed that nearly complete extrn. of rosin from wood may be made and complete recovery of NH_3 obtained. E. W. BOUGHTON.

A cylinder friction and lubrication testing apparatus (FLOWERS) 1. Composition of wood turpentine (ADAMS) 26.

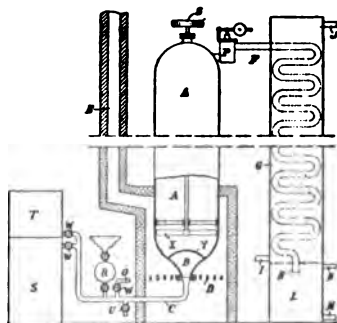
Apparatus for fractional distillation of petroleum. J. T. DAVIS. U. S., 1,159,186, Nov. 2.

Distilling heavy hydrocarbon oils. J. ROSEN. U. S., 1,162,654, Nov. 30. Heavy mixed hydrocarbons, e. g., petroleum residues, are fractionated by gradually increasing their temp. in a still and successively introducing, during the distn., lighter hydrocarbons, b. 30° to 150° lower than the distillate passing off at the time, to serve as carriers to facilitate the distn.

Refining crude petroleum. F. SEIDENSCHNUR and J. DEHNST. U. S., 1,162,729, Nov. 30. Crude petroleum is atomized at 380 – 400° into a vessel within which the pressure is reduced and superheated steam at a temp. of 450 – 500° is introduced into the heated atomized oil in amt. equal to 30–40% of the oil. The temp. of the latter

is raised to 420–430° and 90–95% of the vapors are sepd. and collected by fractional condensation.

Continuous process of cracking petroleum. W. P. THOMPSON. U. S., 1,160,670, Nov. 16. Petroleum, previously freed from any As and S by treatment with acid and alkali, is passed through the pipe C into the cracking still A, from the tank T, together with H from the tank S, and from time to time finely divided Ni is also supplied from the receptacle R and forced into the still with the oil and H (or water gas which may be used instead of pure H). Light hydrocarbons are produced which are collected in the tank L after passing through the condenser G and excess gases are returned from the outlet N (by a pipe not shown) to the inlet O for reuse.



Purifying crude wood tar and pitch. H. M. CHASE and J. L. GRAFFLIN. U. S., 1,161,844, Nov. 30. The tar or pitch is heated to about 260° or a somewhat lower temp. until all creosote oil and similar substances are driven off and then the temp. is raised to about 370° or slightly lower to distil off other wood tar oils free from any odor of creosote.

Purifying tarry residuums obtained from the distillation of resinous woods. H. M. CHASE and J. L. GRAFFLIN. U. S., 1,162,036, Nov. 30. Superheated steam is blown through the material in the still to heat it to about 200° or slightly lower, with the aid of heat applied externally to the containing vessel if desired, until all the oil having an odor similar to creosote is distd. and the temp. is then raised to about 260° or slightly lower to distil the remaining oil, which is free from creosote odor.

Cracking oils. P. SABATIER and A. MAILHE. Brit., 16,791, July 14, 1914. In cracking oils by passing their vapors over a catalyst at temps. between 400° and dark red heat, the catalyst is formed of finely divided metal or metals, or metallic oxides or salts that can be reduced to form divided metal, together with neutral refractory substances free from SiO_2 , and an agglutinant free from SiO_2 . Suitable refractory materials are MgO , Al_2O_3 , bauxite, lime, baryta, strontia, or the corresponding carbonate, or graphite. Suitable agglutinants are glue, dextrin, and starch. Examples of such compns. comprize: (1) Fe filings, MgO , and dextrin; (2) oxide of Fe, Mg, bauxite, and glue; (3) finely divided Fe, Al_2O_3 , and dextrin. The resulting compns. are molded and dried, and packed into cracking-tubes composed of metal or earthenware lined with a non-siliceous coating. When the catalyst loses its activity by reason of the deposition of C, it is revived by the passage of steam, a gaseous mixt. of H, CO, and CO_2 being produced. This gas can be utilized as a reducing agent or fuel, the CO_2 being removed by washing if necessary. The metallic oxide formed by the steam, and the oxide used in making the catalyst initially, are reduced to metal by means of hydrocarbon vapors. The volatile portion of the products of the cracking operation, namely that distg. below 150°, is treated for the removal of the malodorous unsatd. compds. by reduction with H in the presence of divided metals at 150–300°.

Distilling and cracking oils. A. F. G. C. P. J. VON GROELING. Brit., 16,713, July 13, 1914. Crude oil, oil residues, etc., are distd. or cracked in a still to which preheated oil is admitted by spray-producers and which is heated by pipes through which circulates oil heated in a boiler under a pressure greater than that obtaining in the still. A pump fills the boiler with crude oil at the beginning of the operation, and afterwards supplies sufficient residual oil from the base of the still to maintain

the requisite pressure in the boiler. The oil is circulated through the boiler and heating pipes by means of a pump, and a regulated quantity is allowed to escape through a pipe into the still, where it vaporizes. Superheated steam may also be admitted at the base of the still.

Motor spirit. W. A. HALL. Brit., 16,857, July 15, 1914. Oils suitable for cracking to yield motor spirit are obtained by heating a mixt. of bituminous coal or lignite with coke or the like in granular form gradually to a temp. of about 500° in an externally heated retort, and condensing the volatile matter evolved. The coal or lignite is preferably not coarser than pea size, and the coke may be replaced by breeze, charcoal, peat, or like carbonaceous material. The proportion of coke, etc., should be from 10 to 20% or higher. Cf. C. A. 9, 1994.

Mineral oil and wax emulsions. M. HAMBURG. Brit., 26,390, Nov. 17, 1913. Emulsions, suitable for use in medicine and as a nutrient, and also in the manuf. of sizes and finishes for fabrics and yarns, and of thickenings for color printing, are composed of a dry, pulverizable prepn. made from malt ext., or malto-dextrin sirup, emulsified with mineral oils, or mineral solids which when melted yield oils, instead of with fats and fatty oils as described in 29,481, 1912 (C. A. 8, 2033).

Compressed wood scrap. A. BEZNER. Ger., 284,763, July 15, 1913.

23. CELLULOSE AND PAPER.

A. D. LITTLE.

Characteristics of fibers. H. A. MADDOX. *Pulp Paper Mag. Can.* 13, 551-3 (1915). V. NUNEZ.

Vulcanized fiber. CHARLES ALMY, JR. *Met. Chem. Eng.* 13, 746-7 (1915).—A brief description of the manufacture is given. Valuable properties are emphasized. The great variation in fiber due to methods of manufacture requires that each user give careful study to find the most suitable fiber for his purpose. V. NUNEZ.

Normal papers 1914. W. HERZBERG. *Mitt. kgl. Materialprüfungsamt.* 31, 72-80 (1915).—Of 865 papers tested during 1914, 42.5% were above, 50.9% equal to and 6.6% below the normal specifications as to strength or compn. V. NUNEZ.

Design and equipment of a paper and pulp mill laboratory. ANON. *Pulp Paper Mag. Can.* 13, 503-10 (1915). V. NUNEZ.

Chestnut as a pulp wood. P. L. BUTTRICK. *Pulp Paper Mag. Can.* 13, 554-5 (1915).—Discussion from the standpoint of growth and yield. V. NUNEZ.

New fibers for paper making. W. H. ROBERTSON. *Commerce Reports* No. 250, 360-1 (1915).—The Argentine Bureau of Forestry has carried out successful expts. in the production of paper-pulp from the pines (*Araucaria imbricata*) of Neuquen territory. Other new sources of pulp are the Misiones pines, an Indian weed (*Hedy-chium coronarium*) and hop vines. E. H.

Diminishing fuzz in soda pulp by proper cooking conditions. S. D. WELLS. *Paper* 17, No. 4, 14-5 (1915).—To diminish fuzz in the sheet cooking with as low a percentage NaOH as practicable seems desirable. Thorough cooking is obtained under these conditions by using higher pressures, greater concn. of liquor, etc. V. NUNEZ.

Reducing losses in the ground wood mill. D. L. BILLINGER. *Paper* 17, No. 4, 11-3 (1915).—Factors in refining ground wood slivers. V. NUNEZ.

The use of ... *Paper Makers' Monthly* 53, 250-1 (1915).—Enumeration of ... E. J. KELLEY.

Calcium hydrogen sulfite liquor. H. O. V. BERGSTRÖM. U. S., 1,159,352, Nov. 9. In making sulfite cellulose, vapors from the sulfite boilers are passed to a condenser. The SO_2 remaining, uncondensed, is reused in the pulp-making process and the condensate is heated to drive off an additional quantity of SO_2 and organic compds. which are passed into a second condenser, whence the SO_2 is led back for further use in the process. The second condensate is heated to obtain more SO_2 which is led back through another condenser.

Preparing resinous materials for the manufacture of paper pulp. S. F. LAGERMARCK and W. Sverdrup. U. S., 1,161,696, Nov. 23. About 8% of talcum, kaolin, BaSO_4 or other filler is added to the material after it comes from the digester and has been washed in the hutches (but before diln. with H_2O) in order to envelop the particles of resin which are disseminated throughout the mass with the filler and thus destroy their adhesive property.

Bleaching paper pulp. K. MORCH. U. S., 1,160,942, Nov. 16. Pulp containing about 20–22% of dry material is kneaded with the required amt. of bleaching agent, and after thoroughly working the latter into the fibers, the mixt. is agitated until the bleaching is completed.

Waterproofing paper or cardboard for bottles, etc. A. WESTLAKE and P. Poetschke. U. S., 1,160,478, Nov. 16. An emulsion prepd. from H_2O 78.5, rosin 10, shellac 10, and Na_2CO_3 1.5% (with or without CaSO_4 or other filler) is incorporated in the pulp while making the paper and alum is subsequently added as a pptg. agent.

Waterproofing paper. E. S. COLEMAN. U. S., 1,158,897, Nov. 2. Gutta percha 1 (dissolved in CHCl_3) is mixed with olive oil 2 and alc. 2 parts.

Celluloid-substitute and moving-picture film composition. W. A. BEATTY. U. S., 1,158,960, Nov. 2. Cellulose acetate is combined with about 35% its wt. of dihydroxyphenyldimethylmethane by use of alc., CHCl_3 or other common solvent.

Celluloid substitute and moving-picture film composition. W. A. BEATTY. U. S., 1,158,961, Nov. 2. Nitrocellulose is combined with about 25% its wt. of dihydroxyphenyldimethylmethane, using amyl acetate and acetone or other common solvent.

Sizing and coloring paper. E. FURS. Brit., 13,970, June 9, 1914. Sizing paper and other absorbent material in one operation with a mixt. of solns. containing precipitable sizing agents, precipitants, and substances acting as protective colloids for preventing the pptn. of the sizing agents, the sizing being completed by drying the material. Dyestuffs may be added to the above mixt., giving simultaneous sizing and coloring. Examples of precipitable sizing agents are solns. of fatty acids, shellac, albumin, casein; of protective colloids, animal size, gum arabic, or the like; of precipitants, alum, $\text{Al}_2(\text{SO}_4)_3$, and other acid salts or acids, or the like. In the application of coloring matters, the presence of the protective colloids enables the simultaneous use of mutually pptg. dyestuffs, *e. g.*, a basic yellow and an acid blue to obtain a green sizing liquid.

24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE

Static electricity as a cause of explosions. H. ZSCHIEGNER. *J. Ind. Eng. Chem.* 7, 1083–4 (1915).—The theory held by Major Cooper-Key in regard to a recent explosion of cordite in Stowmarket factory as being caused by static electricity is considered not far-fetched in view of Z.'s experience. He recounts having drawn a spark from silk fabrics after they had been agitated in a closed vessel of anhydrous petroleum ether for 45 min. The absence of air in the vapors precluded the possibility of explosion. Cf. Munroe, *J. Am. Chem. Soc.* 21, 317 (1899). CHESTER TURTIG.

Utilization of aromatic hydrocarbons derived from cracked petroleum (RITTMAN)
22.

Explosives. I. B. T. VON TARNOW. Brit., 16,681, July 13, 1914. An explosive is obtained by mixing NH_4ClO_4 , Al powder, and a nitrohydrocarbon of the aromatic group, such as mono-, di-, and trinitrobenzene and -toluene, and tetranitroaniline and -methylaniline. To such mixt. the following substances may also be added: nitrocellulose or collodion, wood meal or cellulose, paraffin wax, and nitrates of Ba and K. One example contains 40% NH_4ClO_4 , 9% Al, 12% trinitrotoluene, 9% wood meal or cellulose, and 30% KNO_3 .

Explosives. W. RINTOUL, N. PICTON and D. H. PRACOCK. Brit., 16,692, July 13, 1914. Using nitrated furoxans, i. e., nitrated nitroso compds. of benzene, naphthalene, and other like compds., and their K, Na, and other salts as explosive ingredients in detonators, shells, and torpedoes. E. g., dinitrodinitrosobenzene may be used in detonators in the place of tetranitroaniline and other well known substances. Dinitrodinitrosobenzene is obtained by nitrating dinitrosobenzene, which is itself obtained by treating *o*-nitroaniline with alc. KOH and NaOCl or bleaching powder.

Trinitrotoluene. OBERSCHLESISCHE AKT.-GES. FÜR FABRIKATION VON LIGNOSE SCHIESSWOLFFABRIK FÜR ARMEE UND MARINE. Brit., 17,003, July 17, 1914. See Ger., 277,325 (C. A. 9, 526).

Stiffing mine explosions. R. CREMER. Ger., 284,396, Jan. 21, 1913. Incombustible dust, in readily breakable packages, is suitably disposed in the workings. (Cf. C. A. 9, 1845.)

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Dyestuff situation. E. E. PRATT, J. F. SCHOELLKOPF, T. H. NORTON, W. H. CHILDS, J. M. MATTHEWS, J. P. WOOD, JOHN ALDEN, W. H. NICHOLS, WM. BECKERS, H. A. METZ AND M. T. BOGERT. *Met. Chem. Eng.* 13, 779-82(1915); *J. Soc. Chem. Ind.* 34, 1182-95(1915).—Papers and discussion before the N. Y. Section of Soc. Chem. Ind. L. W. RIGGS.

The coal-tar industry in the U. S. A. K. PIETRUSKY. *Chem. Ind.* 38, 199-202 (1915).—A review of the reports of the U. S. Dept. of Commerce. F. W. S.

Reductions with sulfur-alkali sulfide solution. A. COBENZL. *Chem. Ztg.* 39, 859-60(1915).—As examples of reduction with the soln. directions are given for prep. *p*-aminodiphenylamine, 4-phenylaminoquinoline, *p*-aminodiphenylaminesulfonic acid, *o*-nitro-*p*-aminodiphenylamine, *p*-aminomethyldiphenylamine, 1,4-naphthylenediamine, 1,4-dimethyl- α -naphthylenediamine, 1,4-phenyl- α -naphthylenediamine, amino- α -dinaphthylamine, *p*-anisidine and *m*-phenetidine. J. H. MOORE.

Domestic plants and plant substances that may be used as possible substitutes for plant materials previously imported. HALLE. *Kunststoffe* 5, 253-6(1915).—A review and discussion, mainly of the patent literature, of possible substitutes for such materials as jute, ramie, etc., inaccessible on account of the war. SMITHER.

The durability of field-gray cloth. E. SELL. *Z. angew. Chem.* 28, I, 412-6, 428-31(1915).—S. gives a review of the literature of the subject and presents exptl. work carried out to determine conditions under which the material is most durable. A microscopic study (800 $\times$) of threads drawn from the cloth shows a greater stretching of the wool fibers than of the cotton fibers, however the wool is dyed with alkaline indigo than

when dyed with acid dye. NaOH has a more pronounced effect than NH_4OH . The manner of double dyeing wool in alk. and acid soln. can prove injurious to the fabric. Numerous illustrations of the microscopic appearance of the fibers are given.

L. T. FAIRHALL.

Difference in weight between raw and clean wools. WALTER S. LEWIS. *Chem. Eng.* 22, 197-8(1915).—Forty-nine fleeces were carefully sampled and detns. of shrinkage made in duplicate. Grease was extd. with warm water and pure olive oil soap, after which the soap was washed out and the slight amt. of fat remaining extd. with ether. Results show shrinkages varying from 19 to 54%, according to the breed of sheep. The greatest variations in shrinkage of samples from the same fleece was 3% for Australian and 6% for New Zealand wools. Two fleeces from the same breed may vary in their shrinkages from 1-9%, av. 4.5% in 13 breeds examd. As might be expected, fleeces from full-blooded or grade merinos gave the highest shrinkage, being often double that of fleeces from Lincoln, Leicester and Romney breeds.

L. W. RIGGS.

Waterproofing methods. K. MICKSCH. *Kunststoffe* 5, 229-32, 243-5, 257-8 (1915).—A brief review and discussion of the impregnation methods of waterproofing textiles.

SMITHER.

Azo dye. O. GÜNTHER. U. S., 1,159,375, Nov. 9. A dye is made by combining diazotized anthranilic acid with 2-amino-5-naphthol-7-sulfonic acid and 4-nitro-2-aminophenol. It is a dark powder sol. in H_2O with a red-violet color and in concd. H_2SO_4 with a blue-violet color and dyes Bordeaux-red on wool in acid baths changing to fast greenish black on chroming. Instead of anthranilic acid, its compds. may be used to form similar dyes, e. g., chloro- or nitroanthranilic acid, together with other *o*-aminophenol compds. such as picramic acid, 4-chloro-2-aminophenol, 2-amino-1-phenol-4-sulfonic acid, 2,3-aminonaphthol-6-sulfonic acid and phenyl-2,5-aminonaphthol-7-sulfonic acid and other aryl or alkyl derivs. may be used instead of 2,5-aminonaphthol-7-sulfonic acid.

Yellow azo dye. J. HUISMANN. U. S., 1,159,386, Nov. 9. A dye is made by combining diazotized Na dehydrothiotoluidinedisulfonate with acetoacetic *o*-anisidide. It is a yellow powder sol. in H_2O and in concd. H_2SO_4 with a yellow color and dyes cotton fast greenish yellow. Dehydrothiotoluidine heated *in vacuo* for 4-5 hrs. at 235-50° yields, with soda, Na dehydrothiotoluidinesulfonate, colorless leaflets yielding a difficultly sol. diazo compd. The disulfonic acid is made from it by heating with fuming H_2SO_4 .

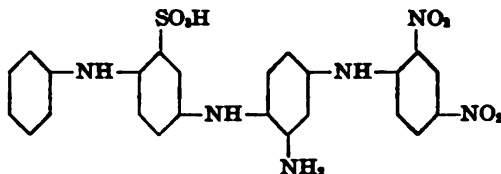
Disazo dyes. M. HERZBERG. U. S., 1,160,406, Nov. 16. A dye is made by combining an alk. soln. of the tetraazo compd. of dianisidine with *m*-aminophenyl-5-hydroxynaphthimidazole-7-sulfonic acid and coupling the reaction product with 2-amino-5-naphthol-7-sulfonic acid. Its Na salt is a dark blue powder sol. in H_2O with a blue color and dyes cotton blue. Substitution of other starting components such as benzidine, toluidine, diaminodiphenylamine or its sulfonic acids or 2-phenyl- or ethylamino-5-naphthol-7-sulfonic acids or 2-amino-5-naphthol-1,7-disulfonic acid yield similar dyes.

Yellow disazo dyes. H. WAGNER and J. ERBER. U. S., 1,160,471, Nov. 16. A dye is made by combining the tetraazo compd. of diaminotriphenylmethane, in alk. soln., with 1-[2-chloro-5-sulfophenyl]-3-methyl-5-pyrazolone. It dyes wool and silk greenish yellow fast to milling, light and S. Tetraazotized diaminotriphenylmethane, combined with either alk. or HOAc soln., gives a similar dye with 1-[2-chlorophenyl]-3-methyl-5-pyrazolone.

Vat dyes of the anthraquinone series. A. L. LASKA and E. J. RATH. U. S., 1,162,496, Nov. 30. Yellow, red and brown dyes of various shades are formed by condensing *o*-aminoazo dyes with anthraquinone-aldehydes, *e. g.*, benzeneazo- β -naphthylamine with 2-anthraquinone-aldehyde (yellow) or the *o*-aminoazo dye from α -diazoanthraquinone and β -naphthylamine with 2-anthraquinone-aldehyde (orange).

Dyeing raw cotton. J. SCHMITZ. U. S., 1,160,001, Nov. 9. The cotton is rolled into small bats which are placed on end in a vat and dye liquor is then circulated through them.

Brownish yellow wool dye. R. SCHMIDLIN. U. S., 1,162,109, Nov. 30. A dye of the formula



is formed by combining Na phenylaminodiaminodiphenylamine-*m*-sulfonate with 1-chloro-2,4-dinitrobenzene. Its Na salt is a dark brown powder difficultly sol. in cold H_2O and readily sol. in hot H_2O and alc. The dye gives a brownish yellow color on wool, fast to washing, light and alkalis.

Chromium mordant. W. BECKERS and I. DREYFUS. U. S., 1,162,210, Nov. 30. Glucose and neutral Na_2CrO_4 are heated together in soln. and form a compd. which is not pptd. by mordant colors or alkalis and the soln. thus obtained is evaporated to dryness. The compd. is used with the dye to penetrate the fiber throughout and form a lake upon and within it.

Waterproofing textile fabrics, etc. W. A. BRATTY. U. S., 1,158,963, Nov. 2. The material is impregnated with a condensation product formed from dihydroxyphenyldimethylmethane and CH_2O . This condensation product may also be used as a floor polish, for waterproofing leather, in insulating compns. or paints, or as a binder in various plastic mixts., *e. g.*, with leather dust in making dress suit casts.

Dyeing on the fiber with quinoneanilide- or anilidoquinone-like dyes. M. BECKE. Aust., 6,664, Aug. 3, 1913. Aromatic amines, their sulfonic and carboxylic acids, or quinones of the benzene and naphthalene series and their derivs. forming, or which have already formed, dyes with free amino groups, are allowed to act in the dye bath or on the fiber.

Dyes. CASSELLA & Co. Brit., 17,319, July 21, 1914. Vat dyes are obtained by heating with S mixts. of 1-amino-2-methylantraquinone with aromatic monoamines; according to examples, products dyeing bluish red shades are obtained from mixts. of 1-amino-2-methylantraquinone with aniline and β -naphthylamine, respectively.

Dyes. BADISCH. Brit., 17,363, July 24, 1914. Leuco compds. of dyes are obtained in dry condition by spraying a paste, soln., or suspension thereof into a current of hot air; other substances such as molasses, dextrin, etc., may be mixed with the leuco compd. treated. According to an example, a paste of indigo white and molasses is employed; indigo-white derivs. or thioindigo white are also specified.

Monoazo dyes. BAYER & Co. Brit., 26,236, Nov. 15, 1913. Monoazo dyes are obtained by combining the diazo compds. of mononitroarylacyl or monoacylamino arylacyldiaminosulfonic or -carboxylic acids with pyrazolones or sulfonic or carboxylic acids thereof derived from aromatic aminothiazoles, and reducing or saponifying the

products; the same dyes are obtained by combining the diazo compds. of aromatic nitroaminosulfonic or -carboxylic acids, such as *p*-nitroaniline-*o*-sulfonic or -*o*-carboxylic acid, or aromatic monoacyldiaminosulfonic or -carboxylic acids, such as monoacyl-*p*-phenylenediaminesulfonic or -carboxylic acid, with the above mentioned pyrazolones, reducing or saponifying, introducing a nitroarylacyl group into the amino group, and finally reducing. The pyrazolone derivs. are obtained by diazotizing the aminothiazoles, reducing to give the corresponding hydrazines, and condensing these with acetoacetic or oxalacetic ester. Nitroarylacyldiaminosulfonic and -carboxylic acids are obtained by condensing equi-mol. parts of nitrobenzoyl chloride, and an aromatic diamino-sulfonic or -carboxylic acid in alk. or HOAc soln.

Secondary diazo dyes. CASSELLA & Co. Brit., 28,925, Dec. 15, 1913. The dyes are obtained by combining diazo compds. of the benzene or naphthalene series with cresidine, α -naphthylamine or its 6- or 7-sulfonic acids, rediazotizing and combining with an aminoaryl-8-hydroxy-1,2-naphthiminazolesulfonic acid. *m*-Aminophenyl-8-hydroxy-1,2-naphthiminazole-5-sulfonic acid is obtained from 1,2-diamino-8-hydroxy-naphthalene-5-sulfonic acid.

Pigments, anthraquinone derivatives. BAYER & Co. Brit., 17,743, July 27, 1914. Al lakes are prepd. from quinizarinsulfonic acids. *E. g.*, the Na salt of 1,4-dihydroxyanthraquinone-2-sulfonic acid is boiled with $Al_2(SO_4)_3$ soln., and the lake is pptd. by Na_2CO_3 ; the Na salt of 1,4-dihydroxyanthraquinone-5-sulfonic acid is boiled with $Al(OH)_3$ paste; in either example $BaCl_2$ may be added. 1,4-Dihydroxyanthraquinone-2-sulfonic acid is obtained by sulfonating 1-hydroxyanthraquinone, nitrating, reducing and replacing the amino by the OH group.

Pigments; anthraquinone derivatives. BAYER & Co. Brit., 17,744, July 27, 1914. Al lakes are obtained from 1-amino-4-hydroxyanthraquinonesulfonic acids. *E. g.*, the Na salt of 1-amino-4-hydroxyanthraquinone-3-sulfonic acid is boiled with $Al_2(SO_4)_3$ soln., and the lake is pptd. by Na_2CO_3 ; the Na salt of 1-amino-4-hydroxyanthraquinone-2-sulfonic acid is boiled with $Al(OH)_3$ paste; $BaCl_2$ may be added. 1-Amino-4-hydroxyanthraquinone-3-sulfonic acid is obtained by sulfonating 1-hydroxyanthraquinone, nitrating, and reducing. 1-Amino-4-hydroxyanthraquinone-2-sulfonic acid is obtained by heating 1-amino-2-bromo-4-hydroxyanthraquinone with Na_2SO_3 soln.

Alizarin. CHEM. FABRIK GRIESHEIM-ELEKTRO. Brit., 16,859, July 15, 1914. Alizarin is obtained by heating mesonitro derivs. of anthracene with alkalis; oxidizing agent, Na_2SO_3 , and $Ca(OH)_2$, are advantageously added.

Aminothiazolesulfonic acids. BAYER & Co. Brit., 6,644, Mar. 16, 1914. Aminothiazolemonosulfonic acids are obtained by baking dehydrothiotoluidine or homologs, or substitution products thereof, or the corresponding primuline compds. with 1 mol. part or more of H_2SO_4 , preferably *in vacuo*. Aminothiazoledisulfonic acids are obtained by baking the above specified aminothiazoles with 2 mol. parts or more of H_2SO_4 , preferably *in vacuo*, or by sulfonating the monosulfonic acids described above with fuming H_2SO_4 , or by baking the known monosulfonic acids of the aminothiazoles with 1 mol. part or more of H_2SO_4 , preferably *in vacuo*. Monoazo dyes are obtained by combining the diazo compds. of the aminothiazoledisulfonic acids described above with acetoacetic arylamides. Products are specified from: dehydrothiotoluidinedisulfonic acid and acetoacetic *o*-aniside; dehydrothio-*m*-xylidinedisulfonic acid and acetoacetic *m*-xylylide; acetoacetic chloroanilide, *p*-aniside, and cresidine, and primulinedisulfonic acid, are also specified as components. The products dye cotton greenish yellow shades.

Dyeing. J. BRANDWOOD, T. BRANDWOOD and E. BRANDWOOD. Brit., 17,219,

July 21, 1914. Reversal of the liquid current in a liquid circulation app., for dyeing or similarly treating textile in cop, cheese, or other compact form, is secured by the use in series of a centrifugal or turbine pump, a dyeing chamber, and a second similar pump, operating oppositely to the first; these pumps are driven alternately, the still pump opposing little resistance to the passage of the liquid.

Dyeing. CHEM. FABRIK GRIESHEIM-ELEKTRON. Brit., 17,272, July 21, 1914. Artificial silk is dyed by first impregnating it with a soln. of an arylide of 2,3-hydroxynaphthoic acid and then treating with a non-sulfonated diazo, diazoazo, or tetrazo compd.; the silk need not be dried between the two treatments. According to examples: viscose, Elberfeld, or Tubize silk is impregnated with a padding bath containing 2,3-hydroxynaphthoic anilide, NaOH lye, Na ricinoleate or the Na compd. of Turkey-red oil, and is then developed in a bath of diazotized *p*-nitro-*o*-toluidine or 4-amino-3,3'-dimethylazobenzene; Tubize silk is impregnated with a padding bath containing 2,3-hydroxynaphthoic *m*-nitroanilide, NaOH lye, Na ricinoleate or the Na compd. of Turkey-red oil, and HCHO, and is then developed in a bath of diazotized *m*-nitro-*o*-anisidine containing $\text{Al}_2(\text{SO}_4)_3$; viscose silk is impregnated with the padding bath of 2,3-hydroxynaphthoic anilide described above, and developed with a bath of tetrazotized dianisidine containing CuCl_2 , H_2CrO_4 , and $\text{Al}_2(\text{SO}_4)_3$.

Dyeing and otherwise treating textiles. BRADFORD DYERS' ASSN. and E. J. WILKINSON. Brit., 17,215, July 21, 1914. After passage through a treating liquid, fabrics, yarns, etc., are retained wholly within an enclosed space while being kept in motion, so that the liquid becomes uniformly diffused through the material. The space may be heated and freed from air by injection of steam. The invention is applicable to dyeing, malting, leaching, and mordanting.

Dyeing apparatus. UNIFORM DYEING MACHINE CO. Brit., 17,296, July 21, 1914. A dye-vat through which the liquor is caused to circulate alternately in reverse directions is divided into chambers, one of which is fitted with removable perforated shelves and with a liquid distributor below them, while the bottom of the other chamber is also connected to the liquid supply.

Dyeing and like apparatus. J., T., and E. BRANDWOOD. Brit., 17,355, July 22, 1914. Perforated beams or the like, upon which warps are treated with dyes or other liquids, and which are constructed with those parts that make contact with the warps of a material which is unaffected by the liquids used, are made with strong supporting Fe flanges which back the protective flange of Ni, Ni alloy, hard rubber, ebonite, etc., and which extend to the full diam. of the Ni, etc., or preferably beyond it.

Finishing fabrics. CASSELLA & CO. Brit., 17,318, July 21, 1914. In order to prevent fabrics or yarns dyed with vat colors from bleeding when washed in strongly alk. baths, a compd. which prevents the reduction of the vat colors to sol. compds. is added to the usual dextrin or glucose finish. Sulfates, chlorides, and nitrates of the heavy metals may be used for this purpose, also monochromates, dichromates, and bromates, or certain nitro products of organic compds. *E. g.*, 1 g. CuSO_4 and 3 g. $\text{K}_2\text{Cr}_2\text{O}_7$ may be added to each liter of the finish.

Scouring yarns. G. BAILEY. Brit., 16,629, July 13, 1914. In app. for scouring or treating yarns, etc., the series of endless tapes carrying the hanks, etc., are arranged so as to extend beyond the vat only after passing between squeezing rollers, and to be at other parts entirely within the vat. By this arrangement, the tapes are kept clean and do not carry liquor away from the vat.

Condensation products of oxazine dyes or their derivatives with phenols, amine aminophenols, aldehydes, ketones, and their derivatives. KATTUNDRUCKEREI HEUMANN & CIE and M. BATTEGAY. Ger., 284,877, Nov. 21, 1913. The reaction

products of the specified compds. are produced directly on the fiber, without previous sepn. An oxazine dye, especially the reaction product of nitrosodialkylaniline hydrochlorides with gallic acid or its derivs., dissolved or suspended, is mixed with phenols, amines, aminophenols, aldehydes, ketones, and their derivs. with Cr acetate or neutral chromate or even with tannin, the resulting product is applied to the fiber, and developed by heating. Suitable additions, such as NH_4Cl , soda, HOAc , HCOOH , bisulfite, or rongalite, are preferred for the reaction.

Chroming aniline black dyeings. J. P. BEMBERG, *AKT.-GES. Ger.*, 284,887, Sept. 23, 1913. Cf. *C. A.* 9, 864.

Fast color printing. BADISCHE. *Ger.*, 284,856, Oct. 20, 1912. Addition to 281,859 (*C. A.* 9, 2154). The printing color used is made of 300 parts of the Cr compd. obtained according to 282,987, 500 parts HOAc -starch-tragacanth thickening, 40 parts HCOOH , and 160 parts H_2O . The print is then dried and steamed for 5 mins., then rinsed with H_2O and finished in the usual manner. A reddish yellow print is obtained which is quite fast to soap, Cl and light. Instead of steaming the print, it may be treated with NH_4OH soln. which contains 10 cc. of 20% NH_3 per liter, for about 2 mins. at 50° , or it may be exposed to the action of NH_3 vapors.

Production of polychrome designs on paper. F. A. BAYER. *Ger.*, 284,469, Jan. 30, 1914. Addition to 283,690 (*C. A.* 9, 2599).

Preventing yellowing of textiles containing soap. R. WISS. *Ger.*, 284,852, Nov. 4, 1913. The soap contained in washed goods treated by finishing agents containing soap decomposes gradually, under the influence of air and heat, and the decompn. products color the material yellow, often with the development of an unpleasant odor. This condition may be obviated by employing, instead of the usual K or Na soap dressings, tech. pure NH_4 stearate or palmitate, to which may be made additions which do not render the material waterproof, so that absorbed substances can be removed by washing. Boric and perboric acids, NH_4 borate, NH_4 perborate, and other NH_4 persalts or peroxides are specified as suitable. These compds. whiten the material. The flexibility of the material is increased by the addition of vaseline. A temp. of about 35° should not be exceeded during drying, in order to avoid a complete decompn. of the NH_4 salts.

Imparting a silk-like luster to mercerized or unmercerized cotton. H. DUTSCHKE. *Ger.*, 285,023, Apr. 20, 1913. The process is applicable before or after mercerization, preferably after dyeing. The dyed material, wet or dry, is impregnated once or more with solns. of NaCl or NH_4OH , or with mixts. of these salts, and passed several times through a calender heated to 100 – 200° or higher. After the last passage through the calender the material is wound upon the drying or stretching machine. The luster is improved by another passage through a finishing calender heated to 150° . After the specified treatment the material may be allowed to remain for a day in cold or warm H_2O , weakly acidified, or ironed wet, without loss of sheen. Cf. *C. A.* 9, 1997.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN. *

Minium. JAROSLAV MILBAUER. Prague. *Chem. Ztg.* 39, 858–9(1915).—Earlier work (*C. A.* 3, 2617; 4, 28, 1434; 5, 1716; 6, 795; 7, 1587; 8, 2955) was done on pure material. The object of the present investigation was to show the influence of impurities usually found in commercial Pb (Ag, Bi, Zn, Fe, Sb, and Cu). In each case parallel expts. were made with pure PbO . A mixt. containing 3.2% Ag_2O gave at 300° a product with 27% Pb_3O_4 against 9% with the pure PbO . At higher temps.

the results were the same as with pure PbO . 0.6% and 1.0% Ag_2O gave similar results. The presence of Ag_2O did not injure the color. Bi_2O_3 in amts. of 0.02, 1.2 and 2.4% did not appreciably reduce the amt. of Pb_2O_4 , but gave a brown tint. The presence of 0.1-1.3% ZnO reduced the % Pb_2O_4 but did not affect the color. The action of Sb was similar to that of Zn , and small amts. did not affect the color. Fe and Cu did not act as catalyzers, and the presence of large amts. injured the color.

J. H. MOORE.

Paint. G. B. HECKEL. *Met. Chem. Eng.* 13, 806-11(1915).—This is a general article describing raw materials.

E. W. BOUGHTON.

The determination of methyl and ethyl alcohol in spirit varnishes. G. W. KNIGHT AND C. T. LINCOLN. *J. Ind. Eng. Chem.* 7, 837-43(1915).—A review of the literature is given. It is shown that the refractometer method of Leach and Lythgoe (*J. Am. Chem. Soc.* 27, 964) requires a modified method of calcn., owing to the difference in d. of MeOH and EtOH . In the presence of acetone, it is necessary to convert MeOH and EtOH into iodides by means of I and red P . The vol. of the mixed iodides obtained is noted and by means of a formula the % of MeOH and EtOH in the varnish is calcd. Details of procedure are given. K. and L. also recommend this method for the detn. of either MeOH or EtOH , when only one of the two is present, in the presence of acetone. A different formula is used for each case. MeOH is detected by Schiff's reagent after oxidation, with $\text{KMnO}_4 + \text{H}_2\text{SO}_4$ and EtOH by Schiff's reagent after oxidation with $\text{Br-H}_2\text{O}$.

E. W. BOUGHTON.

Isolation of the Central Powers and its effect upon the lacquer and drier industry. W. ESCH. Hamburg-Uhlenhorst. *Chem. Rev. Fett-Harz Ind.* 22, 87-90(1915).—Cellulose-pitch, Swedish wood pitch and cumaron resin (from coal-tar pitch) are now used as substitutes for rosin in Germany. Lack of S hindered the working of the sulfite pulp process, and the soda pulp process has partially replaced it. With the exception of very small quantities of Java copals (*via* Holland) no copals are entering Germany, nor are dammar, dragon's blood, euphorbium, mastic, sandarac, shellac, acaroid, japan, copaiba, gurjun, Canada balsam, caoutchouc and gutta-percha. As a substitute for copals and shellac the condensation products, such as are made from phenol and formaldehyde, are considered. A new process by the Wenjact Gesellschaft in Hamburg (patent applied for) produces a condensation product which has the consistency of gutta-percha and which is sol. in alc.; this soln. gives an excellent hard coating after heating to 85° . Some expts. with this new lacquer are described. P. ESCHER.

Quantitative determination of adulteration in Chinese wood oil. J. C. BRIER. *J. Ind. Eng. Chem.* 7, 953-7(1915).—The effect of different oils on the spectrum of the Chinese wood oil was detd. and the point at which the spectrum changes is termed the turning point; this requires 14.5-17%. If the adulterating oil is known, very accurate results can be obtained. The addition of 15% of linseed oil is necessary to reach the turning point. To det. the % it is necessary to find out how much adulterant must be added before the turning point is reached, then by subtracting the amt. from 15.5 the amt. present in the oil is obtained.

E. SCHERUBEL.

Composition of wood turpentine. M. ADAMS. *J. Ind. Eng. Chem.* 7, 957-60(1915).—Wood turpentines from 3 sources were investigated. The wood was heated in a retort under diminished pressure and the distillate fractionated. The single leaf nut pine (*P. monophylla*) yielded a turpentine containing α -pinene, β -pinene and cadinene. The results indicated that the wood turpentine is almost identical with the pure "gum" spirits. The volatile oil from Jeffrey pine (*P. jeffreyi*) contained 95% of normal heptane. The presence of citronellol was indicated but not confirmed. Yellow pine (*P. ponderosa*) yielded the oil containing α -pinene, β -pinene and

limonene. This oil contained more of the low-boiling and less of the high-boiling fractions than that obtained from the oleoresin. A. concludes that with each variety of wood the volatile oil obtained by distg. the wood under diminished pressure is similar to that obtained from the oleoresin.

E. W. BOUGHTON.

Autooxidation of rosin. W. FAHRION. *Chem. Rev. Fett.-Harz. Ind.* 22, 97-8 (1915).—Paul's work on rosin (*C. A.* 8, 2626, 3379; 9, 972, 2715, 3135) is severely criticized as being mere hypotheses built on scanty expts.

P. ESCHER.

Experiments with "venturpech" in experimental acetic acid manufacture. H. WÜSTENFELD. *Deut. Essigind.* 18, 491-3.—"Ventur" is a new acid-resistant material consisting of pitch, paraffin and linseed oil for impregnating tubs, vats and also for painting walls. It has been successfully used for impregnating vats in vinegar manuf.

H. A. PIPER.

The use of ammonium hydroxide for the extraction of rosin from wood (BENSON)

22.

Pigment from blast furnace dust. F. ORTH. U. S., 1,161,790, Nov. 23. Blast furnace flue dust which has accumulated during several hrs. run of the furnace is collected and thoroughly mixed to secure uniformity of color and is ground to form a fine pigment for use in brick, etc. About 70% of Fe oxide is usually present in the dust.

Coating iron or steel to prevent rusting. D. F. COMSTOCK. U. S., 1,159,748, Nov. 9. The surface of the metal is treated with an alc. soln. of caustic alkali, exposed to the air until the alkali is converted into carbonate and then covered with a layer of shellac.

Rendering pyroxylin colloidal. H. W. MATHERSON. U. S., 1,161,063, Nov. 23. Phenyl benzoate is used with about 3 times its wt. of cellulose nitrate, a homogeneous product being formed by use of a volatile solvent such as EtOH, acetone and C₆H₆, with or without camphor.

Varnish-reviving and polishing composition. G. S. A. CASSIMUS. U. S., 1,161,187, Nov. 23. SiO₂ free from grit 48, is mixed with soap 6, MgO 3, boiled linseed oil 44 and H₂O 120 parts.

Paint- and varnish-remover. C. ELLIS. U. S., 1,160,394, Nov. 16. The mixt. is formed of PhOH 20 gals., C₆H₆ 13 gals., denatured alc. 20 gals., wood flour 10 lbs., ceresin wax 5 lbs., and NaOH 2-6 lbs. Pine oil, MgO and Turkey-red oil may also be included in similar mixts.

Marking ink for transfer of embroidery designs. J. MOSSMAN. U. S., 1,159,857, Nov. 9. Turpentine 1, beeswax 8, linseed oil 6 and coloring material 4 parts are used in making up the ink.

Resin size for paper manufacture. B. KNIFFLER and W. A. OPPEN. U. S., 1,160,906, Nov. 16. The size is treated with steam under pressure in a closed vessel and when thoroughly heated is discharged in a thin stream into a body of H₂O in a vat. A homogeneous liquor is thus produced which retains the size in suspension.

White lead. F. H. SHARPE. *Brit.*, 17,579, July 24, 1914. In carbonating a mixt. of PbO.H₂O and an assisting agent such as HOAc, the carbonating gas is delivered against the bottom of the carbonating vessel so as to sweep the PbO upwards to bring it within the field of action of other streams of the gas issuing from pipes so curved that the gas imparts an upwardly whirling motion to the oxide.

Japanning. K. MIYAZAKI. *Brit.*, 16,743, July 14, 1914. Sn plate for canning purposes is coated with a lacquer obtained from *Rhus vernicifera* mixed with shellac,

the coated sheets being allowed to dry in a damp atm. and then heated to 120-180°. The raw lacquer is first refined, as by heating with stirring and finally filtering, and a small quantity of shellac dissolved, as in vegetable oil, is added. The mixt. is applied while the plate is hot. The plate is preferably first cleaned by treatment with dild. alk. soln. and then with acid, each soaked into a piece of cloth, and is finally dried by alc.

Metal lithographic plates. J. GRASS. Brit., 1,769, Jan. 22, 1914. In mfg. plates for direct or offset printing of the kind in which an intaglio printing surface is produced by printing photographically through a positive transparency on a sensitized colloid film, coating the plate, and etching the plate through the exposed film, a mat varnish, which is insol. in H₂O or lithographic ink, such as celluloid varnish, is applied to the intaglio recesses to enable the plate to carry more ink.

Anti-rust paint. H. HOWARD. Ger., 284,637, Sept. 4, 1913. See Fr., 462,148 (C. A. 8, 2498).

27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

New method for determining the melting point of fats. R. ROMARNELLI. *Pharmaceutisk Revy* 1915, No. 28; through *Seifensieder-Ztg.* 42, 830(1915).—The app. consists of a wide-neck 250 cc. flask having a cork contg. a thermometer to which a Pt wire is attached, having its free end in the form of an 8 to 9 mm. loop in a vertical position at the same height as the Hg bulb. To make a detn. the fat is melted and when nearly ready to solidify the Pt loop is introduced parallel to the surface and quickly withdrawn. After cooling 1 hr. the wire is fastened to the thermometer and the flask heated over an asbestos plate. When the m. p. is neared the periphery of the fat layer becomes transparent and the film drops. The temp. is read at this moment.

E. SCHERUBEL.

The coloring materials of fatty substances. H. DUBOVITZ. *Mat. grasses* 8, 4326-7(1915).—The coloring matters resemble fatty acids chemically; they dissolve in the same solvents and are saponified by alkalies. However, they can not be pptd. as easily as fats in general by an alkaline salt soln. containing glycerol. Their b. ps. are higher than those of the fatty acids, which appears to be the reason why colored fatty acids give a colorless distillate.

E. J. KELLEY.

Lubrication of bearings and cylinders. F. L. FAIRBANKS. *Power* 42, 805-8 (1915).—An address delivered at Worcester Polytechn. Inst.

C. G. F.

Studies on the hydrogenation of fats and oils. JAMES DEWAR AND ADOLPH LIEBMANN. *Mat. grasses* 8, 4377-9(1915).—The authors describe methods by which hydrogenation may be accomplished. These methods consist generally in treating the liquid fats and oils with H in the presence of mixts. of hydroxides, oxides, or carbonates of two or more catalytic metals such as Ni, Co, Cu, Pd, Pt and Au.

E. J. KELLEY.

Utilization of fatty acids. BERGO. *Seifensieder-Ztg.* 42, 865-7(1915).—Discussion of the handling and sapon. of fatty acids.

E. SCHERUBEL.

Sunflower seed oil. ANON. *Seifensieder-Ztg.* 42, 886(1915).—Constants and uses are given.

E. SCHERUBEL.

Effect of free fatty acids upon flash and fire points of animal fats and oils. A. LOWENSTEIN AND J. J. VOLLERTSEN. *J. Ind. Eng. Chem.* 7, 850(1915).—The presence of free fatty acids depresses the flash and fire point of animal fats owing to the fact that these points are lower for the fatty acids than for the glycerides. E. SCHERUBEL.

Recovery and purification of by-product fats and oils. A. LÖB. *Seifensieder-Ztg.* 42, 907-9(1915).—Discussion of well known processes. E. SCHERUBEL.

Bleaching and refining of dark fats and oils. C. H. KEUTGEN. *Seifenfabr.* 35, 893-4, 909-12(1915).—Discussion of common methods. E. SCHERUBEL.

Hydrocarbons in fish-liver oils. HUGO MASTBAUM. Lisbon. *Chem. Ztg.* 39, 889(1915).—A shipment of oil to London was condemned as adulterated with mineral oil. Part of the lot remaining in Lisbon was tested by M. and showed: d_{15}^4 0.869, sapon. number 24.15, acid number 1.46, unsaponifiable oil by direct detn. 83%. Another cargo gave 0.863, 18.1 and 1.62, resp. Two species of fresh fish from the Moroccan coast were then opened and the oil from the livers tested. Consts. for oil from *Centrophorus granulosus* and *Scymnus lichia*, resp., were d_{15}^4 0.8637, 0.8711, butyro-refractometer at 25° 102, 93, polarization in 200 mm. tube -0.3° , -2.33° , solidifying point still fluid at -7° , became turbid at -7° , sapon. number 15.4, 36.7, acid calcd. as oil acid 0.097, 0.165. The unsapon. portion of the oil from *Scymnus lichia* began to boil at 205°, and about 70% had distd. at 330°. The residue was a dark, paraffin-like mass. Thus, liver oils from certain fish contain 80-90% of oil with the characteristics of mineral oil, a fact which seems to support the theory of the animal origin of petroleum.

J. H. MOORE.

Determination of ricinic acid in oil preparations. F. ERBAN. Vienna. *Seifenfabr.* 35, 846-8, 861-4(1915); cf. C. A. 8, 2818; 9, 1255, 1400.—A complete analysis of a highly sulfonated Turkey red oil made from 50 g. of castor oil and 17.5 g. concd. H_2SO_4 is described in detail, including detns. of neutral fat, org. and inorg. S, total fat, sol. fatty acids and their titration, and glycerol. Calcns. are given showing in tabulated form; neutral fat, ricinic and diricinic acid, lactide, diglyceride, org. S and distribution of the KOH. E. SCHERUBEL.

Oils extracted by carbon disulfide. G. BOUCHARD. *Mat. grasses* 8, 4371-3, 4387-9, 4403-5(1915).—B. shows the superiority of CS_2 over other solvents and gives a description of various oils and their properties. EDWARD J. KELLEY.

Significance of Barretrapps reaction for the fat and soap industry. W. SCHRAUTH. *Seifenfabr.* 35, 877-9(1915).—According to Barretrapp's reaction, oleic acid is easily changed to palmitic by melting at about 300° with excess KOH, as follows: $C_{17}H_{33}COOH + 2 KOH = C_{16}H_{31}COOK + CH_3COOK + H_2$. Owing to high cost and danger from H_2 the process was never taken up to any extent. S. contends that at the present time these objections should have no weight as the danger can be overcome and oleic acid can be replaced by cheaper fatty acids. Palmitic acid, produced by the acidification of the final product in this process, requires distn. to improve the color. If fish oil is used the yield is 85%, the loss consists of 10-12% as acetic acid and 3-5% distn. residue. The technical operation of the process can be effected with NaOH in a 50% soln. in autoclaves holding 5000 liters. The temp. necessary is 200° which is increased to 260° during the course of 6 hrs. The pressure is not allowed to go over 10 atm. The production can be worked up as a salable soap or decompd. with acid and distd. The working of this process would lessen the demand for coconut and palm kernel oils. E. SCHERUBEL.

Recovery of fat for the soap industry from waters carrying waste greases. P. M. GREMPF. *Seifensieder-Ztg.* 42, 846-67-8(1915).—Discussion of recovery of fats from catch basins and sewage waters. This recovery only pays where the vol. handled is large. E. SCHERUBEL.

Determination of the fatty acids in soaps. A. A. BESSON. *Mat. grasses* 8, 4315-16(1915).—The author finds that: (1) ethyl ether is preferable to petroleum ether; (2) the fatty acids need not be changed into salts; they may be weighed themselves, even in the presence of volatile fatty acids. EDWARD J. KELLEY.

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42, 585-6:1915).—Formulas and
E. SCHERCHER.

42, 905-7:1915).—There
substitutes for soaps contg. coconut
oil and Na_2CO_3 2, Sapon. with equal
parts of NaOH and graining out with K_2CO_3
but the product was not
satisfactory soap with a yield of
about 20%. In a base for milled
oil the amount is 20% of the total alkali.
In these amts. is used the milling is
E. SCHERCHER.

42, 927-8:1915).—Owing to the
suggested to stimulate home consumption
the increased cost is said to be more
than the coconut and palm kernel oil need
the method of manuf. is described.

E. SCHERCHER.

1. Selecting
12. Apparatus for fat
of phytosterol (WAGNER)
Agricultural Chemists on fats and

U. S., 1,162,623, Nov.
hydrogenated, and the soln. is
about 200-240°. The CO evolved
reduced Ni to form additional

S. 1,158,664, Nov. 2. Colloidal
carrier such as fine pumice,

U. S., 1,159,480, Nov.
value dry until a compn. of about
collected in oil or other sealing
Co and Ni oxides are es-



and fats are then sepd. from the aq. soln. and the latter is heated to ppt. CaCO_3 (or CaSO_3) and the remaining aq. soln. is evapd. to recover NiCl_2 , glycerol, etc.

Washing and bleaching composition. J. BARRINGTON. U. S., 1,160,563, Nov. 16. The compn. is formed of Na perborate 20, borax 40 and NaH_2PO_4 40 parts. Cotton is bleached by boiling in H_2O containing small amts. of this mixt. and of soap.

The hydrogenation or dehydrogenation of compounds containing carbon. BADISCHE. Brit., 2,306, Jan. 28, 1914. The process is effected in the presence of a catalyst consisting of Fe, Ni, Co, or Cu, intimately mixed with 1 or more of the following "promoters:" oxides or O-containing salts of earth metals, rare-earth metals, Be, Mg, Mn, U, V, Nb, Ta, Cr, Ti, or B; difficultly sol. phosphates, molybdates, tungstates, or selenates, of the alk. earths or of Li, or O-containing reduction products of these compds. The intimate mixt. of the catalytic metal with the promoter may be obtained by pptg. mixts. of the hydroxides, oxides, or carbonates, from solns. of the salts, or by fusing mixts. of salts such as the nitrites, or by mechanical operations, such as grinding or kneading the components together; the catalytic metal compd. is reduced to the metallic state, preferably by means of H at as low a temp. as possible, any excess of H being removed after the reduction by means of an indifferent gas, such as CO_2 . The catalytic metal may be prepd. from carbonaceous salts, such as carbonates or formates, or the metal may be employed in a state of fine division, or in the form of netting, wool, sheets, etc. There may be added to the catalytic mixts., alkali compds., such as NaOH, or inorganic or organic substances which act as carriers or binding agents, or increase the porosity of the mass, *e. g.*, asbestos, charcoal, or pumice. The presence of contact poisons, such as Cl, S, As, and Pb, should be avoided, although in some cases O salts containing these elements, *e. g.*, basic Al-sulfate, may be used. The proportion of the promoter in the catalytic mixt. may be as small as 1% or less. The catalytic mixts. may be employed, *e. g.*, in the hydrogenation of fats or fatty acids, the conversion of phenol into cyclohexanol, the reduction of nitrobenzene to aniline, and the conversion of C oxides into hydrocarbons; these processes may be effected under ordinary or increased pressure. According to examples, a soln. containing Ni and Be nitrates is pptd. with NaOH, the NiO is reduced by means of a mixt. of CO and H, or H alone, and the product is employed for the conversion of a mixt. of CO and H into CH_4 ; solns. containing $\text{Ni}(\text{NO}_3)_2$ and Zr or Th nitrate may be similarly treated; Ni oxalate is mixed with $\text{Al}(\text{NO}_3)_3$ soln., and the mixt. is dried and reduced by H and employed in the hydrogenation of fish oil; Ce nitrate or Ce NH_4 nitrate may replace the $\text{Al}(\text{NO}_3)_3$; a soln. containing Ni and Al nitrates is pptd. by K_2CO_3 , and the product is reduced by H and employed in the hydrogenation of soy-bean oil in an autoclave under pressure; $\text{Fe}(\text{NO}_3)_3$ may be employed instead of $\text{Ni}(\text{NO}_3)_2$; a mixt. of Ni and Mg hydroxides or carbonates is converted into formates by treatment with HCOOH , and the product is reduced by H and employed in the hydrogenation of olive oil; carriers, such as pieces of clay, may be soaked in a melt or soln. of Ni salts, such as ammoniacal Ni formate, or carbonate, together with the salt of the promoter, and treated similarly; spheres, rolls, etc., of Ni wire netting are moistened with $\text{Al}(\text{NO}_3)_3$ soln., dried, treated with H, and employed in the hydrogenation of linseed oil; a soln. of $\text{Ni}(\text{NO}_3)_2$ and Ti lactate is pptd. by NaOH, and the product is reduced by H and employed in the hydrogenation of cotton-seed oil, the hydrogenation being effected if desired under a pressure of, say, 100 atms.; NiCO_3 is mixed with NH_4 or K borate soln., and the mass is suitably shaped, dried, reduced, and employed in the hydrogenation of oils or fats; Cr_2O_3 may be obtained for use as a promoter by pptn. from $\text{Cr}(\text{NO}_3)_3$ or sol. chromates; the oxide or carbonate of the catalytic metal may be mixed with solid or dissolved H_3BO_3 , and the product be heated and reduced; a salt of the catalytic metal, *e. g.*, the nitrate, may be

mixed with a borate of the same or another metal, and the mixt. be calcined and reduced; solns. of K aluminate, $\text{Ni}(\text{NO}_3)_2$, $\text{Ca}(\text{NO}_3)_2$, and Na_2CO_3 are mixed, the ppt. is dried and reduced; NiCO_3 is mixed with solns. of $\text{Mg}(\text{NO}_3)_2$, $(\text{NH}_4)_2\text{HPO}_4$, and NaOH , the ppt. is dried and reduced; the 2 mixts. last described may be used in the hydrogenation of oil resulting from cracking petroleum residues, the hydrogenation being effected at 100° under a pressure of 80 atms.; Ca vanadate, BaCrO_4 , Al borate, Ba tungstate, or Li_2HPO_4 , or the reduction products of these compds., may also be used as promoters; a soln. of Ni and Mn or Cr nitrates is pptd. by Na_2CO_3 , and the product is reduced by H and may be employed in the hydrogenation of pig-nut oil or soy-bean oil, resp.; NiCO_3 , NH_4 tungstate soln., and $\text{Ba}(\text{NO}_3)_2$ soln. are mixed, and the product is reduced and may be employed for hydrogenizing sesame oil; NiCO_3 is mixed with $\text{Ca}(\text{NO}_3)_2$ and $(\text{NH}_4)_2\text{HPO}_4$ solns., and the product is reduced and may be used for hydrogenizing fish oil; NiCO_3 is mixed with $\text{Sr}(\text{NO}_3)_2$ and NH_4 selenite solns., and the product is reduced and used for hydrogenizing cotton-seed oil; when Al_2O_3 is used as the promoter, it may be obtained by heating the acetate in the presence of the catalytic metal or compd. thereof.

Decomposing fats into fatty acids and glycerol. AKT.-GES. ZUR ERZEUG & ANWEND V. NAPHTHA-SULFOSAUREN, "KONTAKT." Brit., 17,148, July 20, 1914. Fats are hydrolyzed by means of sulfonic acids produced from paraffin or mineral oils, such as solar, paraffin, and anthracene oils, obtained from the tar of lignite, coal, peat, or bituminous minerals. The oil is treated with fuming H_2SO_4 , and the sulfonic acid is dissolved out from the upper layer by dil. alc.

Sulfonated fats or oils. I. LEVINSTEIN and LEVINSTEIN, LTD. Brit., 16,890, July 16, 1914. Hydrogenated saponifiable fats or oils are sulfonated by melting, cooling, and treating with H_2SO_4 until a sample gives an emulsion with hot H_2O , or a washed sample practically dissolves in ammoniacal H_2O ; the products are poured into warm salt soln., and purified by washing with salt H_2O or by neutralization of the H_2SO_4 with alkali. According to an example, hardened linseed oil is treated; hardened fish oil is also specified. The products, when mixed with waxes, oils, fats, etc., give compns. sol., miscible, or emulsifiable in H_2O ; according to an example, sulfonated hardened linseed oil is mixed with paraffin wax. Mixts. of hardened oils with oils or greases may also be sulfonated.

Lubricants. S. H. Blichfeldt. Brit., 17,411, July 22, 1914. A lubricant consists of such an emulsion of 5-25% H_2O or aq. soln. in 95-75% of oil or fat that the aq. particles have a diam. of 0.001 mm. or less. In an example, 15 parts of a 10% soln. of soap are emulsified in 85 parts of engine oil.

Soaps. I. LEISER. Brit., 17,461, July 23, 1914. Amber, as powder or in soln., as in alc. or CHCl_3 , or in both forms, is added to soap.

Perforations in straining walls of oil presses. HARBURGER EISEN-UND BRONZE-WERKE AKT.-GES. Ger., 284,522, Dec. 30, 1913. Each group of finely perforated sections is mounted in a larger opening.

Composite bars of soap. H. SCHWARZKOPF. Ger., 284,622, Feb. 18, 1914. App. for forming a hollow bar of soap and imbedding therein a soap core.

28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

The Belgian sugar industry before and during the war. ANON. *Chem. Ztg.* 39, 865-6(1915).—Statistics for the years 1893-1915 are given. J. H. MOORE.

Plant colloids. V. The soluble starches. M. SAMRČ AND S. JENCIC. *Kolloid-chem. Beihefte* 7, 137-71(1915); cf. *C. A.* 9, 468.—Previous expts. on the prepn. of soluble starches and the methods used to investigate starch solns. are reviewed. Soluble starch was prepd. by the methods suggested by different authors and the physico-chem. properties studied. It was found that in most of the cases the size of the mol. was reduced but that in some cases the mol. was not broken down. Most of the forms of soluble starch did not contain P. Detns. of the osmotic pressure and the elec. cond. of solns. of soluble starches which had stood for some time showed that in aging the changes which take place in the starch are a continuation of the changes which took place in converting the starch from insoluble to soluble. The decidedly different results obtained in the physico-chem. investigations of different soluble starches show that the term "soluble starch" is indefinite and does not adequately define the substance.
W. F. ZIMMERLI.

Purifying starch. L. P. BAUER. U. S., 1,161,826, Nov. 30. A deep body of starch in aq. suspension containing impurities lighter than starch is gently agitated below the surface to permit settling from the upper portion but maintain suspension of the solids in the lower portion of the body and permit the lighter impurities gradually to rise to the upper part from which they are led off, the denser suspension of purified starch being withdrawn from the bottom.

Apparatus for dextrinizing starch by treatment with steam and acid. A. W. H. LENDERS. U. S., 1,159,591, Nov. 9.

Dextrinizing starch. A. W. H. LENDERS. U. S., 1,159,592, Nov. 9. A batch of pulverized starch is fed gradually into a dextrinizing vessel while acid is added to it, forming a uniform mixt. Then the mixt. is agitated and heated in the vessel until the desired degree of conversion is effected. The heating is then discontinued and a cooling material brought into contact with the vessel, to stop the conversion and insure uniformity of the product.

Sugar. J. F. P. KESTNER. Brit., 17,010, July 17, 1914. "Aréado" or finely cryst. sugar is produced by causing melted sugar containing about 5% of H_2O to flow in a thin layer on an approx. horizontal vibrating surface, such as a table, endless band, or Kreiss jerking conveyer.

Treating sugar cane. T. LEE. Brit., 17,834, July 28, 1914. The prepn. of paper stock from the moist woody residues from the milling of sugar cane is made possible by eliminating the outer skin or rind. The bagasse is partly dried, preferably by agitation in a current of heated gases, then reduced by a shredding or picking process, preferably in a Williams' pulverizer. The product is then screened by vibrating screens of varying mesh; the granular pith passes through a fine screen while a coarser screen retains the strips of rind or outer skin and allows the fiber to be used for paper stock to pass through. This material is washed and then digested in alkali. The washings of the fiber are used for the maceration between the mills, and the sugar is thus conserved. The granular pith and the strips or pieces of rind or outer skin are used for fuel.

Starching preparations. E. M. NEWBERRY and E. A. SIMPSON. Brit., 16,774, July 14, 1914. A substitute for laundry starch consists of gelatin, borax, white wax, and formalin, substitutes for the wax being spermaceti or Castile soap. In an example, gelatin is soaked in cold H_2O , boiling H_2O is poured over the softened product, and the whole gently boiled. Borax, white wax, and $HCHO$ are then added in succession, and the product poured into molds, where it cools to a stiff jelly. Coloring matters may be added. The product is dissolved in H_2O for use on linen, muslins, etc.

29. LEATHER AND GLUE.

LLOYD BALDERSTON.

The influence of the method of subdivision of leather on the results of analysis. R. LAUFFMANN. *Collegium* 1915, 366-72; see C. A. 9, 2722. E. H.

The relation between the price and analysis of tanning materials. JOHN R. BLOCKEY. *Shoe and Leather Rep.* 120, No. 3, 25-7; No. 4, 105(1915).—Two materials costing the same amt. per unit of tan per ton, by analysis, may give quite different values in practice. These differences arise from the fact that analysis is made under conditions quite different from those which obtain in practice. The av. liquor in practical sole leather tanning is more than ten times as strong as the liquor used for analysis by the official methods of both the I. A. L. T. C. and the A. L. C. A. At the low concn. of the analysis there will be a great proportion of sol. matter which is not sol. at the relatively high concn. of the tanning liquor. In lab. analysis the ext. is dissolved with boiling water whereas in tannery practice it is common to add the cold ext. to the cold liquor, thus throwing out of soln. a considerable amt. of material which would otherwise be sol. and capable of being utilized. However, recent research points to the fact that such semi-sol. or insol. products have actual tanning value, especially in the case of quebracho ext. or gambier. Sommerhoff has shown that leather may be produced by using only materials usually reckoned as insol. The amt. of matter which can be extd. by water in analysis but which cannot be so extd. in practice may be considerable, due to the fineness of division of the material and also to the question of color. A clear liquor made from almost any tanning material will gradually deposit insol. matter known as "bloom." Much of this is deposited in the liquor or on the surface of the leather and is lost. In analysis, there is always an excess of hide, while in practice the tannin is always in excess. The leather produced in analysis consists of a large excess of hide powder, a small proportion of tannin matter, and no free sol. matter. Real leather consists of about equal proportions of hide substance and combined tannin, together with much uncombined matter, both tannins and nontannins. The analysis of a heavily tanned sole leather shows that nearly half of the "matters sol. in water" are non-tannins. These may not improve the quality of the leather, but they give weight and should be taken into account when considering the price of the material. In analysis the liquors are used before fermentation sets in, but in practice acids are formed in the fermentation of the tan liquors which may make possible the absorption of some of the nontannins, but, on the other hand, may cause the loss of tannin. This loss varies with the different materials and should be considered in dealing with the price of a raw material. In analysis, although the material is dissolved at a boiling temp., the liquor is cooled to atmospheric temp. before analysis. This is not universal in practical tanning, for some liquors are often used at a much higher temp., which would have an appreciable influence on the amt. of insol. matter. In analysis, materials are analyzed separately, while in practice they are almost invariably blended. This may make tannins of nontannins, or the reverse. It is known to render some insol. matter sol. in the blending of neradol with quebracho. J. S. ROGERS.

Oils used in leather manufacture. Simple tests to determine purity. F. I. C. *Leather World* 7, 370-1, 551(1915).—A general article describing the manuf. and purifications of oils for this purpose and tests for detg. their purity. J. S. ROGERS.

The presence of alkali in fat liquors. *Shoe and Leather Rep.* 120, No. 4, 105 (1915).—Most fat liquors are a mixt. of fat and oil. The soap emulsifies the oil so that it penetrates the leather thoroughly. It also helps lubricate and nourish the fibers, and it gives a feeling of fulness to the leather. The addition of alkali renders the emulsification of the oil easier, and, in the case of chrome-tanned leather, neutralizes

any free acid which may be present. This acid would decompose the fat liquor by curdling the soap, which would either prevent the penetration of the fat liquor, or cause a sticky surface which could not be glazed. If too much alkali is present, it will saponify the oil, particularly if boiled.

J. S. ROGERS.

What loosens the hair in liming hides? An unsettled question. HUGH G. BENNETT. *Shoe and Leather Rep.* 119, No. 13, 31-3(1915); *J. Am. Leather Chem. Assoc.* 10, 569-73(1915).—The author's opinion is that in liming hides the hair is loosened almost entirely by the chem. action of enzymes which are secreted by bacteria which feed on organic matter obtained from the gelatinous and albuminous matters of the hide. These enzymes dissolve the softer keratins and hair roots. This enzyme action is probably facilitated by the chem. action of lime which softens but has very little solvent effect. If the keratinous matters yield any S to the liquor, sulphhydrate of lime will be formed; this will have a very slight but direct chem. solvent effect.

J. S. ROGERS.

Tanning hair skins. Full description of processes including alum, chrome, neradol, combination and seal oil. ANON. *Shoe and Leather Rep.* 119, No. 13, 42-3, 120, No. 1, 65-7(1915).—Skins to be tanned with the hair on should be sent to the tanner immediately, or should be cured by washing and thoroughly salting the flesh side, or by washing and stretching to dry in the shade. The tanner washes off the salt if the skin has been salted, or soaks it if it has been dried. A weak alkali or acid soln. is better than clear water for soaking as the skin will then soften without decompn. A good soln. may be made with 1 lb. NaOH, or 2 lbs. borax, or 1 to 2 lbs. formic acid in 100 gals. water. Sodium sulfide would loosen the hair. When the skin is soft and clean, the lumps of fat and flesh must be removed with a sharp knife. Then the hair and skin should be freed from grease by rubbing with a warm, strong soln. of soft soap. After being well washed with clean water, the skin is ready for tanning. For alum tanning, the skins are moved up and down in a soln. of 5 lbs. alum and 6 lbs. common salt to 12 gals. hot water ($\frac{1}{2}$ lb. borax may be added to cut grease if necessary). After 24 hrs. the skins are removed and the flesh side covered with a paste. For 100 lbs. of skins, sufficient paste may be made from 4 lbs. alum, 3 lbs. salt, 4 lbs. flour, 1 lb. egg yolk, and 1 lb. olive oil. This should remain for a long time to make the tannage permanent. The leather will be white and flexible and the color of the hair unaltered. The one-bath chrome process may be used. For 100 lbs. skins, dissolve 10 lbs. chrome alum in 8 gals. cold water (some use hot water), and 3 lbs. washing soda in 1 gal. warm water. The soda soln. should be poured into the chrome alum soln. gradually while stirring. The concn. of the liquor should be such that it will be completely expended in the method of working. After being tanned the skins should be well washed and the free acid neutralized by borax (2 or 3% borax reckoned on the wet wt. of skins). A fat liquor should be applied to allow the skin to dry soft and flexible. A good fat liquor sufficient for 300 to 400 lbs. skins may be made from 1 gal. castor oil, $3\frac{1}{2}$ lbs. soft soap, and $\frac{1}{2}$ lb. egg yolk. Neradol tannage is rapid and permanent and produces a white leather which is soft and mellow and very resistant to water. It is less durable and less resistant to water than chrome leather. H. Brumwell in the *Leather Trades Year Book* for 1915 gives details for neradol tannage for furs. Professional fur dressers combine mineral and vegetable tannages. The resulting leather is soft, flexible and durable. M. Lamb's paste formula is: 5 lbs. $Al_2(SO_4)_3$, 5 lbs. common salt, $\frac{1}{2}$ lb. rye flour, and 10 gals. water. Glycerol or oil may be added. The flesh side of the skin is covered with $\frac{1}{8}$ in. of this paste, allowed to remain wet for some time by placing the flesh sides together, and then slowly dried. In the Furrier's Dress Process the goods is first freed from superfluous moisture and the flesh side is then rubbed with a good quality of seal oil. The skins are folded,

flesh inside, and placed in a wooden tub where they are tramped upon by a workman with bare feet, left for several hours, and the process repeated. The temp. should not exceed 38° to 40°. When thoroughly tanned, the skins are given a weak alk. bath and subsequently dried.

J. S. ROGERS.

Tanning materials in South Africa. EUGENE M. LAMB. *Commerce Reports* No. 254, 428-9(1915).—Wattle, sumac, "elandsboontjes" (*Elephantorrhiza burchellii*, leguminosae), bastard sumac and mangrove can all be produced on a commercial scale in S. Africa. A new extn. process in use there consists in crushing the bark and then passing it through a series of heavy-pressure bronze rollers after moistening it with warm water or with water and alc.

E. H.

Oriental manufacture of gambier. ALEXANDER T. HOUGH. *Leather Trades Rev.* 48, 512-4, 580-1(1915).—The author visited a gambier plantation in the Malay States operated by Chinese. The gambier branches are chopped at the factory into pieces about 5 in. long and are boiled twice. The liquor from the second boiling is used on fresh cuttings which are boiled until sufficiently concd. (about 10 hrs.). The leaves are then forked out and the liquor dipped out and strained into 6 tubs holding about 3 gals. each. The 18 gals. are claimed to yield 88 lbs. gambier. To each tub is added 1.25 lbs. rice meal to thicken the liquor. When cool and pasty, the 6 tubs are emptied into a bottomless box fitted over a perforated board covered with sacking. Considerable tannin filters through and is lost. The firm block consists of coagulated rice dust, crystd. catechol, and as much tannin as it can hold. This is cut into cubes about 1.5 in. square which are spread out for 7 to 9 days on the beams in the roof of the factory, the heat and smoke from the boilers facilitating the drying. The product is not exported to Europe from Borneo because greater profit can be made by selling it to the East Indian natives for chewing. The author collected samples for analysis and presents the results in tabulated form. The tannin content of true gambier leaf is 5.5%, of spent gambier leaf 2.6%, of wild gambier leaf 5.7%, of liquor before adding rice 13.7%, of liquor straining through mold 7.5% and of the final product, cube gambier, 35%. It is evident that over 50% of the total available tannin is lost. However, the Chinese product, "liquor before adding rice," if calcd. on the same moisture basis, is almost identical with that of the European manufacturer's plantation gambier as produced in Sumatra. The fat and a considerable proportion of the N are introduced in the rice dust. The insolubles in cube gambier are practically all due to the albuminoids present in the added rice meal. The mellowing properties of gambier are probably also due to the rice meal, as fermentation is caused by the amyloids, and the farinaceous matters are in current use in the production of the softer leathers. Several different plants are called "wild gambier." The sample analyzed was identified as *Uncaria*.

J. S. ROGERS.

The use of mimosa or wattle bark. F. T. EDWARDS. *Leather World* 6, 776(1914); 7, 15-6, 491-2, 550(1915).—The use of mimosa bark in the United Kingdom has been gradually extended. A special advantage is that it is suitable for both light and heavy leathers. The black wattle (*Acacia binervata*) is indigenous to Australia but has been grown in Africa. The green wattle (*Acacia mollissima*) is the most important. The golden wattle in S. Australia is very strong in tannin but is not hardy. Golden wattle in N. S. Wales contains less tannin. Varieties of mimosa in S. America are mostly inferior in tannin strength. The black and green varieties contain about equal percentages of tannin, but the black is said to yield more bark to the acre, while the green is hardier and will withstand frost. Mimosa bark is one of the cheapest tanning materials, the av. strength being 32% tannin and the av. price \$45 per ton. The cheapness is accentuated when the questions of practical extn. and utilization of available tannin are considered. (1) The tanning matters are sol. not only at the low concn.

of analysis but also at the high concn. of practice. (2) At a temp. of 30°, more than 90% of the total available tannin is extd. This is an exception to the rule that a higher temp. signifies a higher extn. (3) Shredded mimosa bark as put on the market is so finely divided that there need be little difference in analytical and practical results in this respect. (4) Mimosa bark contains no pyrogallol tannin and has been found by Paessler to lose less by deposition than any other material. Mimosa bark is easily one of the strongest raw materials and it is possible to obtain strong liquors from it, but the nontannin content is low. There are 3 parts tanning matters to 1 part nontannins. Hence the barkometer reading (measurement of sp. gr.) is apt to be misleading. The tannin of mimosa bark is astringent. Of the non-tannins present there is only a small proportion of sugary matters, or acid-forming substances. Myrobalans give a mellow tannage and are rich in glucosides, producing abundant acidity under suitable conditions. The use of myrobalans along with mimosa bark will counteract the astringency of the latter and make up for the deficiency in acidity. On account of the astringency of mimosa bark it is advisable not to use it in the early stages, but rather later, when the grain has become set and therefore is no longer liable to become drawn, and when the pelt is partially struck through. The leather produced by mimosa bark alone would have harshness and short fiber. Hence it should be used with mellow materials and not in the earlier stages of tanning. If the extn. is carried to the extreme limit, a red coloring matter is extd. However, the bark can be expended to contain only 3 to 4% tannin without the removal of too much coloring matter. If used with valonia or myrobalans, the slight pinkness helps to brighten the color produced by these materials. Since the tannin is a catechol, the leather darkens on exposure to light. Mimosa bark has been used much in Germany for the manuf. of heavy leather, and is very suitable for the purpose when used in conjunction with materials such as valonia. Mimosa bark tanned leather is particularly suitable for currying. The fibers are well sepd., so large quantities of grease can be incorporated. J. S. R.

Concrete shoes. ANON. *Concrete-Cement Age* 7, 110(1915).—Cement is used for weighting, waterproofing and strengthening sole leather. Ordinary sole leather is soaked in water until pliant, allowed to become half dry and given a coat of boiled linseed oil on the grain side. A bath is prepared of cement 8 oz., borax 2 oz., and cold H₂O to consistency of milk. To each lb. of leather is allowed 1½ lb. of the above mixt. The soaking lasts until satn. is reached (24 hrs.). The leather is then dried and oiled with linseed oil. The durability is increased 100 to 200%. A. A. KLEIN.

Analysis of nitrogen in leather waste (ROSE) 15.

Composite leather belts for minimizing slippage and stretch. C. E. CARPENTER. U. S., 1,160,040-1, Nov. 9. Layers of mineral-tanned and vegetable-tanned leathers are cemented to each other with the flesh sides in contact, by a cement formed of celluloid and acetone.

Synthetic tanning agents. BADISCHE. Brit., 17,172, July 20, 1914. Sol. condensation products are obtained by heating sulfonic acids of aromatic hydrocarbons, free from OH groups, in the presence or not of a condensing agent and under ordinary or reduced pressure; sulfonic acids of naphthalene, anthracene, etc., are suitable parent materials. According to examples, naphthalene-2-sulfonic acid is heated alone or with P₂O₅. The products ppt. glue and other colloids from soln. and can be used as tanning agents.

Tanning agents—azo dyes. BADISCHE. Brit., 3,382, Feb. 9, 1914. The tanning agents are obtained by treating, under pressure and at a temp. above 100°, hydroxy

compds. of the benzene or naphthalene series, or salts thereof, with HCHO, or a compd. yielding HCHO, and a neutral or acid sulfite; the reaction mass is preferably kept alk. throughout the process. According to examples, products are obtained from the following parent materials: phenol, HCHO, and Na_2SO_3 ; Na phenolate and Na HCHO-bisulfite; *m*-hydroxybenzoic acid, HCHO, and NaHSO_3 ; cresolmonosulfonic acid, HCHO, and NaHSO_3 . Such of the acids described above as contain a free *o*- or *p*-position to the OH group combine with diazo compds. to form azo dyes.

Condensation products from formaldehyde and naphthol- or naphthylamine-sulfonic acids. DEUTSCH-KOLONIALE GERB- UND FARBSTOFF GES. Brit., 8,818, Apr. 7, 1914. HCHO is condensed with 1- or 2-naphtholsulfonic acids or heteronuclear 1- or 2-naphthylaminesulfonic acids in neutral or slightly acid aq. soln. The process can be effected by using 1 mol. of HCHO to 2 mols. of sulfonic acid, or using 1 mol. of HCHO to 1 mol. of sulfonic acid; in the first case the reaction is effected at ordinary temp., in the second case heat may be applied. Products are specified from 2,6-, 2,7-, 1,4-, and 1,5-naphtholsulfonic acids, 1,5-, 1,6-, 1,7-, 1,8-, 2,5-, 2,6-, 2,7-, and 2,8-naphthylaminesulfonic acids. In place of HCHO, substances yielding it, such as trioxymethylene or methylal, may be used. The products ppt. glue from its solns. and combine with diazo compds. to yield azo dyes. They can be employed in tanning; a tanning liquor may be made by dissolving the condensation product in H_2O and adding alkali nearly to neutralize the soln., or the reaction mixt. can be dild. and used directly.

Tanning extracts. H. FRANK. Brit., 17,273, July 21, 1914. The difficultly sol. substances in crude quebracho liquors are rendered sol. in the cold by treating the hot liquor with an oxide, hydroxide, or salt of an alk.-earth metal, with the optional exclusion of air under pressure, the liquor being subsequently neutralized with acid. The acid may be such as to form with the alk.-earth metal a salt which is insol. or sol. with difficulty, so that the resulting tannic liquor contains very little salt in soln. As an example of carrying out the process, caustic lime is stirred into the hot liquor in the proportion of 10-15 g. to the liter, and the mixt. is heated for a long time in an autoclave at about 130° with the exclusion of air. HOAc, HCl, or other acid is then added to neutralize the lime, or where it is desired to obtain a liquor poor in salts, an acid is employed which forms a ppt. with the alk.-earth, this being removed by hot filtering. The insol. substances may be sepd. by cooling and clarifying, and the tannin content may be rendered sol. by further treatment as above described. The substances that resist the treatment may be dissolved by the known sulfiting process, giving a material having tanning properties inferior to those of the main portion which has been rendered sol. in the cold.

Gelatin sheets. R. A. MCQUARRY. Brit., 15,465, June 27, 1914. Sheets, which may be transparent, colored, or opaque, are made by distributing gelatin soln., to which a suitable antiseptic has been added, upon a glazed, enamelled, japanned, or varnished strip of flexible material, which is then beat round a curved surface such as a drying-wheel, and the gelatin, after drying, is stripped off and cut up or wound upon a reel.

Compositions of glue materials. W. PLINATUS. Brit., 12,143, May 24, 1913. Compns. of materials such as gelatin, glue, agar-agar, albumin and casein, and filling materials are mixed in a vacuum. Hardening substances such as aldehydes, chrome compds., or tanning substances may be added; or the hardening may be effected by gaseous or liquid HCHO, or by heating with steam and subsequently pressing.

Elastic or plastic masses from glycerol-gelatin. J. STOCKHAUSEN. Ger., 284,708, June 2, 1911. Addition to 277,653 (C. A. 9, 1136). Cf. C. A. 9, 2163.

30. RUBBER AND ALLIED SUBSTANCES.

R. T. STOKES.

Tetrachloroethane and its toxic properties. G. NOYER. *Caoutchouc et gutta-percha* 12, 8686(1915).—A general discussion. E. J. KELLEY.

Polymerization of isoprene under the influence of an aluminium-mercury couple (BÖRSCHEN) 10.

Isoprene. A. HEINEMANN. U. S., 1,159,380, Nov. 9. Vapors of turpentine oil are passed over Ag heated to about 450°, giving a yield of isoprene equal to 25% of the turpentine oil used, together with about an equal amt. of other depolymerization products. About 2000 cc. of vapor per hr. may be passed through a Ag tube of 6 mm. diam., 4 m. long, wound closely into a coil.

Synthetic caoutchouc. D. SPENCE and A. P. CLARK. U. S., 1,161,904, Nov. 30. Pinacol is heated with Ac_2O or KHSO_4 at 150° for 60 days to convert it partially into a caoutchouc-like product without intermediate isolation of the hydrocarbons formed, which may be polymerized in the latter stage of the process. The yield of caoutchouc is not stated.

Vulcanizing rubber articles. R. B. PRICE. U. S., 1,161,967, Nov. 30. A form around which the articles are molded is alternately dipped in a soln. of rubber and exposed to less than atm. pressure after each dipping to evap. the solvent in a closed chamber. Cf. C. A. 9, 2823.

Vulcanizing rubber. R. B. PRICE. U. S., 1,161,965, Nov. 30. The articles are heated to a low temp. before vulcanization and subjected to reduced pressure to withdraw all entrapped volatilizable materials from the rubber, which is then heated and vulcanized in the usual manner.

Apparatus for vulcanizing hollow rubber articles on forms. E. W. RUTHERFORD. U. S., 1,161,892, Nov. 30.

Apparatus for vulcanizing rubber tires. C. A. WILLEY. U. S., 1,162,535, Nov. 30.

Vulcanizing rubber tires, etc. R. B. PRICE. U. S., 1,161,966, Nov. 30. The tire is built up to substantially its final form while unconfined and then vulcanized by heating with glycerol or other liquid (in direct contact with the unconfined article) to the vulcanizing temp.

Apparatus for vulcanizing rubber tires. R. B. PRICE. U. S., 1,162,397, Nov. 30. Elec. heating is utilized.

Preparing rubber for vulcanization. R. B. PRICE. U. S., 1,158,843, Nov. 2. The rubber is compacted with rolls *in vacuo* after adding the vulcanizing agent.

Purifying sulfur monochloride. P. I. MURRILL. U. S., 1,159,327, Nov. 2. S_2Cl_4 which has been partially decompd. by contact with moist air is freed from impurities such as HCl and H_2O by allowing it to stand in contact with metallic Na or other alkali or alkaline earth metal, preferably for 20 hrs.

Obtaining rubber from rubber-bearing plants. D. VECCHINI. U. S., 1,159,137, Nov. 2. Rubber-bearing shrubs or barks are triturated at such speed and with material of regulated fineness such that the rubber is heated to an agglomerating temp. The material is then sepd. by screening.

Drying rubber. G. B. BRADSHAW. U. S., 1,161,603, Nov. 23. Wet rubber is heated throughout to about 100° and then subjected to a vacuum to effect evapn. of the contained moisture and produce a porous spongy mass.

Rubber substitute. G. NÜTH. U. S., 1,159,257, Nov. 2. A "factice" prepd. from S_2Cl_2 and a fatty oil is hardened and vulcanized by heating to 120-135° after mixt. with S and an aromatic amino compd., *e. g.*, aniline, α -naphthylamine, *m*-aminobenzoic acid, toluylenediamine, *o*-, *p*-, or *m*-toluidine, *m*- or *p*-xylydine.

Rubber substitute. G. NÜTH. U. S., 1,159,258, Nov. 2. A "factice" prepd. from a fatty oil and S_2Cl_2 is heated to 120-155° for 5-30 hrs. with NH_4OH , urea, $(NH_4)_2CO_3$ or aromatic amines to harden it and then vulcanized with S.

Synthetic caoutchouc substances. A. HEINEMANN. Brit., 17,253, July 21, 1914. The polymerization of butadiene, isoprene, dimethylbutadiene, and other hydrocarbons having conjugated double bonds, is effected by dissolving them in acetone or a homolog thereof and passing SO_2 into the soln., the product being purified from oily impurities by subjecting it to high pressure in a mold; it may be vulcanized or mixed with metal oxides or other fillers.

Coagulating India rubber. C. DE C. PINTO. Brit., 16,840, July 15, 1914. A coagulating prepn. consists of a soln. in alc. of preferably 2 kg. of creosote, 1 kg. of quinine-HCl, and 1 g. of Na_2CO_3 , which is dild. with H_2O or the whey or rubber milk. 10 g. of the soln. with 200 g. of whey may be used for coagulating 2 kg. of latex.

India rubber articles. R. B. PRICE. Brit., 17,193, July 20, 1914. As a modification of 10,695, 1913 (*C. A.* 8, 3507) treating articles formed of rubber or the like combined with fibrous materials or textiles, so as to withdraw air, gases, moisture, or other fluids from the article during or preceding vulcanization and after it has been formed substantially to its final shape. The article is subjected to a compacting pressure from the outside while the interior of the substance of the article is subjected to a lesser pressure. The exterior pressure may be produced by a rigid mold, by a flexible yielding element such as a diaphragm or flexible receptacles containing fluids or comminuted materials, or by fluids such as air, vapor of alc., NH_3 , etc., and the article may also be supported on the outside of a support or mold. The process may be applied to tires, hose, boots, shoes, etc.

Impregnating fabrics with rubber solution. G. W. BELDAM and A. M. B. RYALL. Brit., 19,097, July 18, 1914. Fabrics are impregnated with rubber soln. by passing the fabric, submerged in the liquid, over perforated surfaces, through which the liquid is forced on to and into the fabric, which, during the treatment is, caused to vibrate or "dither" by the action of the liquor or by mechanical means.

Special attention is called to the first page inside.

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PATENTS

Abstracts of patents are included under the appropriate divisions of the journal: those on organic compounds, unless they pertain especially to some other division, are under Pharmaceutical Chemistry. The abstracts of U. S. patents are prepared by Earl T. Ragan, those of Canadian patents by Russell S. Smart, of Fetherstonhaugh & Smart, Ottawa (50 Queen St.), and all others by O. D. Swett. Most German patents are prepared, with permission, from the abstracts in *Chemiker-Zeitung* and Italian patents from those in *Annali di chimica applicata*. All other patents are obtained direct from the specifications.

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CHEMICAL ABSTRACTS

Vol. 10.

FEBRUARY 10, 1916.

No. 3

I. APPARATUS.

L. C. JONES.

The evolution of evaporating apparatus. HUGO SCHRÖDER. *Grimma. Chem. App.* 2, 89-91, 101-4, 116-8, 128-31, 139-41, 187-9, 199-202, 209-13(1915).—A review, with 40 cuts and mathematical data, of the development of app. "for boiling liquids in order to remove more or less—to any desired degree, or as much as possible—of the solvent (usually H_2O); to evap. them and recover the distd. substances in concd. form, or to use the evolved steam in a series of suitable app. as a medium of energy (heat carrier)."

J. H. MOORE.

Absolute viscosimeter. ANON. *Engineering* 100, 554(1915).—The time required for an observation is the chief objection to the usual type of instrument, the principle of which is the flow of fluid through a capillary tube. This is overcome in the viscosimeter here described by increasing the pressure which causes the flow. An additional improvement is a device by means of which the pressure is maintained const., resulting in a simplification of calcns. The app. consists essentially of 3 parts: the viscosimeter buret, the const. pressure app., and the pressure gage. The viscosimeter buret consists of 2 cylindrical glass vessels, one storage and the other measuring, connected by a U-tube, one leg of which is large bore and the other capillary, all water-jacketed. The capillary has ground glass ends of standard size and taper so that it is replaceable. The measuring vessel has 2 Pt wires sealed into its side. The vol. of the vessel between the Pt points is detd. by weighing with Hg. The storage vessel is connected to the pressure app. and gage by a 3-way tube and cock. The pressure app. consists of 2 vessels of Hg, adjustable at different levels. The upper Hg vessel is supported by a spring adjusted so that the vessel is raised as the Hg flows out, thus maintaining a const. head. The pressure is transmitted by air. The pressure gage is an ordinary Hg manometer. In use the time required for the fluid to fill the buret, between the 2 Pt points, and the pressure are measured. Formulas and tables are given. The app. was invented by W. Stone, chief elec. engr. Victorian Railways, Australia, and has been successfully used in testing lubricating oils.

F. A. HARVEY.

A hydrogen electrode vessel. WM. MANSFIELD CLARK. U. S. Dept. Agric. *J. Biol. Chem.* 23, 475-86(1915).—Description of an app. that can be mechanically shaken, so as to ensure prompt satn. of the system with H. Details are given.

I. GREENWALD.

Some improved electrical laboratory apparatus. C. M. JOHNSON. *J. Ind. Eng. Chem.* 7, 960-1(1915); cf. *C. A.* 2, 1800.—Descriptions of: (I) A quick heating elec. furnace for the detn. of C in steel, etc., with train. The train is a simplification of the type previously described, while the furnace is of a new split muffle type with replaceable heating elements of nichrome wire imbedded in alundum cement. (II) A new type of portable lab. rheostat. The resistance elements of nichrome wire are mounted upon a framework of asbestos board. (III) A new rectangular lab. elec. muffle furnace with solid heat insulation case. The heating element is similar to that of the combustion furnace. A white solid case of kieselguhr surrounds the working muffle and heating element. The furnace is supported and enclosed by a stout soft-steel frame.

F. A. STRAUSS.

[Automatic regulator.] Tungsten-lamp shunt valuable for preventing arcing at contacts. ANON. *Elec. World* 66, 1435(1915).—To do away with excessive pitting of the contacts of an automatic feeder regulator due to the large current taken by the secondary relays, two 15-watt W lamps were shunted across the contact points. These lamps were selected on account of their desirable temp. coeff. The current passing through the lighted lamp is not sufficient to hold the relay. C. G. F.

The use of water meters in steam boiler practice. H. WINKELMANN. *Chem. App.* 2, 213-5(1915).—Brief descriptions of the Steinmüller, Kenedy, and Siemens-Halske meters, the first and last guaranteed accurate to 0.1% and 1.0%, resp., and of the Cref equalizer, for regulating the feed to each boiler in a battery. J. H. MOORE.

Development of nephelometers (KOBBER) 7.

Acetylene generator. A. MESSER. U. S., 1,163,939, Dec. 14.

Apparatus for automatically testing urine or other liquids. B. SAGI and E. SAGI. U. S., 1,163,693, Dec. 14.

Filters. E. A. ANDREWS and A. E. OWEN. *Brit.*, 18,096, July 31, 1914. A filter of the kind in which a layer of filtering medium is cleansed by a back-wash of liquid is fitted with means for revolving the whole body of the filtering medium over a number of stationary jets of liquid.

Oil presses. C. BENSON. *Brit.*, 18,270, Aug. 7, 1914.

Testing gases. W. GAUDIE and G. WILKINSON. *Brit.*, 18,280, Aug. 7, 1914. Gas-testing app. of the diffusion type is provided with a system of levers for amplifying and transmitting the movements of the diaphragm to elec. contacts controlling the alarm or signal.

De-pericarping fruit. H. W. GABBETT-FAIRFAX. *Brit.*, 18,050, July 30, 1914. Constructional details of a machine for removing the pericarp from oil-bearing and other fruits, comprizing a rotary table carrying curved blades to which the fruit is guided from a hopper by oppositely curved blades carried by a casing. The casing may rotate oppositely to the table. The table may be either flat or conical and may be turned up at the periphery, or the casing may be turned downwards to surround the table. The pericarp is thrown by centrifugal action against a screen through which oil passes, the residue falling into a chamber arranged in a steam-chamber. The kernels are discharged through apertures in the surrounding frame.

Gas producers, blast furnaces. T. BAIRDOW. *Brit.*, 18,381, Aug. 7, 1914. To prevent the passing of flames and hot gases from the poking-holes of gas-producers, blast furnaces, etc., steam, air, H₂O, or other fluid is injected into the poking-hole from a number of horizontal slits in a pipe surrounding the hole.

Steam chambers for superheaters. F. WERLE. *Ger.*, 285,142, Mar. 3, 1914.

2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS.

Assistants: E. B. MILLARD and A. B. CARTER.

Introduction to the theory of relativity. F. H. LORING. *Chem. News* 112, 226-7, 236-7, 248-50, 260-2(1915).—The work of the various investigators in this field has been brought together and simplified for beginners. E. B. MILLARD.

An elementary account of the quantum theory. J. RICE. *Trans. Faraday Soc.* 11, 1-18(1915). E. J. C.

Recent researches in the Wolcott Gibbs Memorial Laboratory of Harvard University. T. W. RICHARDS. *Science* 42, 845-51(1915).—An address. E. J. C.

History of the development of hydrometry. HERMANN SCHELENZ. Cassel. *Chem. Ztg.* 39, 913-5(1915).—A brief bibliography is appended. Cf. *Chem. Ztg.* 27, 88(1903); C. A. 6, 1693. J. H. MOORE.

The calibration of thermometer tubes and the function equation. GIULIO AND RSOLI. *Atti reale ist. Veneto, sci. lettere ed arti* 74, 319-25(1915).—A mathematical paper. E. J. WITZEMANN.

Role of pressure in chemical phenomena. E. BRINER. *Rev. gén. sci.* 26, 551-7(1915); cf. C. A. 7, 2360, 2523, 3888; 8, 1530; 9, 880, 2479.—Discussion and review of the previous papers. E. B. MILLARD.

Theory of the rise and fall of particles with Brownian movement. ERWIN SCHRÖDINGER. *Physik. Z.* 16, 289-95(1915).—Mathematical. E. B. MILLARD.

Mobility of the positive and negative ion at different temperatures and at constant gas density. H. A. ERIKSON. *Phys. Rev.* 6, 345-53(1915).—Mobilities have been detd. between the temps. -184 and $+63^{\circ}$ at const. gas d. in dry and moist air which had been ionized by a polonium tube, by means of an alternating field method similar to Rutherford's. The mobility of the positive ion is a max. at about 0° ; that of the negative ion also shows a max., but is more erratic in behavior. No definite conclusion has been reached, but it seems that the variation of the positive mobility is not due to clustering. Variations in the negative mobility seem to be due to clustering combined with an effect similar to that causing the variation of positive mobility. E. B. MILLARD.

Electron optics of the hydrogen molecule. II. A. HEYDWEILLER. *Verh. deut. physik. Ges.* 17, 359-62(1915); cf. C. A. 9, 2347.—The H_2 mol. consists of a H cation and a H anion with 1 loosely bound valence electron and a certain number of bound and rapidly vibrating electrons of nearly equal frequency. The number of these latter electrons is not definitely known, but is almost surely greater than 1, from considerations of the electron-optics of the H-cation in H_2O . The ion refraction of the H-cation is nearly equal to the difference between its equiv. refraction and that of the Mg^{++} ion. Both Mg^{++} and Al^{+++} have smaller equiv. refractions than the H ion. If there is only 1 electron in the neutral H_2 mol., there could be no electron in the H^+ ion, and it should have the smallest equiv. refraction of any ion. Two pairs of salts of H and Al with common anions, and 4 pairs for Mg and H, have been used to det. the equiv. refraction, and in every case the values for H were larger than those for the salts. E. B. MILLARD.

Conduction of electricity through metals. J. J. THOMSON. *Electrician* 76, 13-5(1915).—The exptl. work of Onnes with superconductors is briefly reviewed. The effects discovered by O. are in accordance with the theory of metallic conduction in the "Corpuscular Theory of Matter" (p. 86). The atoms of some substances, including the metals, contain electrical doublets—i. e., pairs of equal and opposite elec. charges at a small distance apart. In the normal state of a substance the axes of these doublets are distributed in all directions; when an elec. force acts on the substance, the axes tend to point in the direction of the force, and the moments of the doublets have a finite resultant in this direction. If the atoms were perfectly free to move, the smallest force would be able to direct all of the axes in the same direction, but influences are at work which prevent this. In gases, there are collisions which tend to knock the axes out of line as fast as they are brought into line by the elec. force. In the case of solids and liquids, though there may not be collisions between the mols., the rotation of the mols. endows them with a quasi-rigidity, making each mol. behave as if its axis were

acted upon by a restoring couple proportional to the angle through which the axis has been displaced. The value of the resultant of the moments will be a function of the ratio of the deflecting couple acting on the doublet to the restoring couple brought into play when the axis is deflected through unit angle. The nature of the function is discussed in a math. form not suitable for brief review. From the point of view of this paper the part played by the electric force in metallic conduction is to polarize the metal, *i. e.*, to form chains. When once they are formed, the electricity is transmitted along them by the forces exerted by the atoms on the electrons in their neighborhood. If the polarization remains after the elec. force is removed, the current will remain, as it did in Onnes' expt. with the Pb ring. Equations are given for the temp. at which the metal passes into the superconducting state. The persistence of the chains after the elec. force is removed is due to the disturbances of thermal agitation being too weak to break up the chains once they are formed. The chains are held together by the forces of the elec. doublets in the chain itself as well as by the external elec. forces. If the sp. heat of a metal becomes zero at abs. zero the metal will always become a superconductor unless there are directive forces (similar to those of crystals) which pull the doublets out of line in the chains.

E. B. MILLARD.

Transference of electricity by colloidal particles. FRANK POWIS. *Trans. Faraday Soc.* 1915 (advance copy).—The method of calcn. assumes that the increase in cond. of H_2O when electrodes of a noble metal are sparked under H_2O is due entirely to the cond. of the colloid formed (positive or negative) and to the ion balancing it. From existing data the charge on a coarse Ag sol was calcd. as 2385×10^{-10} electrostatic units per particle, or 795 times the charge on a univalent ion. Other calcns. are given, in which the order of magnitude of the charge has about this value. P. thinks that the colloids do not adsorb ions in the way usually assumed, but in such a way that the concn. of cations and anions gradually decreases with increasing distance from the particle until it finally becomes equal to that in the bulk of the surrounding medium. The ions near the particle will be bound to it with such force that the particle cannot move without taking the ions with it, and the ions far from the particle will be only weakly held; the resultant of the charges determines the direction of motion of the colloid. A larger proportion of the divalent ions adsorbed would probably be close to the particle, thus accounting for the predominating influence of ions of higher valency. On this view the charge cannot be calcd. from Stokes' law, or from the increase of cond., since there is no charge in the usual sense of the term, and it would only be possible to calc. the minimum number of ions which would be required to give the extra conductivity.

E. B. MILLARD.

Molecular attraction. XII. J. E. MILLS. *J. Phys. Chem.* 19, 650-9(1915); cf. *C. A.* 9, 1561.—The relation $dP/P = dT/T$ is either exactly or approx. true for a large number of cases. P is the total pressure, *i. e.*, the numerical sum of the external and internal pressures. There follows a discussion of thermodynamic formulas in general. M. is unable to understand how such a relationship as the Clausius-Clapeyron equation can be applied to fusion, vaporization and other phase change phenomena. Several of the relations previously derived in this series of papers are discussed. The amt. of energy retained by a system of n particles forming a stable system under the action of mol. attractive force is equal to the amt. of energy given out by these n particles in coming into the system from an infinite distance apart. Temp. affects this relation in a manner not yet understood.

E. B. MILLARD.

Baly's theory of chemical reaction and reactivity. WM. H. DEHN. *J. Am. Chem. Soc.* 38, 1-15(1916); cf. *C. A.* 9, 1411.—Polemical. The theory is said to be based entirely on light absorption phenomena, the nature of which is unknown. "Baly's exptl. methods have often been modified during the past decade, but give little confi-

dence of value for the establishment of his theory. As 'proofs' of his theory the expts. are too limited and almost entirely unconvincing. Drawing definite structural or dynamic conclusions from absorption phenomena is unwise; grounding a comprehensive chemical theory on the same is too speculative to serve any useful purpose."

E. B. MILLARD.

Baly's theory of chemical reaction and reactivity. Reply to Dr. Dehn. E. C. C. BALY. *J. Am. Chem. Soc.* 38, 15-20(1916); cf. preceding abstr.—In reply, B. has "tried to show that he (D.) does not quite understand and that the gift of sympathy is not his."

E. B. MILLARD.

Relation between boiling point and constitution. L. CASALE. *Atti accad. sci. Torino* 50, 809-23(1915).—In 1842, Kopp stated that equal differences in chem. compn. of org. compds. produce equal differences in the b. p. This statement was variously modified and Walker (*J. Chem. Soc.* 65, 193(1894)) proposed his formula $T = aM^b$ in which T = abs. temp. and M the mol. wt. and a and b are arbitrary const. E. Boggio-Lera (*Gazz. chim. ital.* 39, I, 441) proposed $T = K\sqrt{M+C}$, in which K and C are const. chosen for each series of compds. Ramage (*Camb. Philos. Soc. Proc.* 12, 445(1904)) modified W.'s formula by introducing n , the number of C atoms; thus $T = a\sqrt{M(1-2^{-n})}$, which gives good values for the lower members of a series. B.-L.'s formula was later modified by Sugden (*C. A.* 9, 10) thus: $T = a\sqrt{M} + (b/\sqrt{M}) + (a/bM)$. The 4 above formulas give defective results because they only consider the b. p. as a function of mol. wt. Young (*J. chim. phys.* 3, 250(1905)) proposed the formula $\Delta = 144.86/T^{0.0148}\sqrt{T}$, which gave good results for the paraffin series, but failed for the other series. C. proposes $\Delta = 109.2/n^a$, where Δ is the difference in the b. p. of 2 adjacent terms arising from the substitution of H with CH_3 as a function of the abs. b. p. of CH_4 and of n the number of C atoms. a is an arbitrary const. The series CH_4 , C_2H_6 , $\text{CH}_3(\text{Me})_2$, $\text{CH}(\text{Me})_3$, $\text{C}(\text{Me})_4$, is a continuous series in which an H is successively substituted in CH_4 with Me. In the series MeCH_2Me , $\text{Me}(\text{CH}_2)_2\text{Me}$, $\text{Me}(\text{CH}_2)_3\text{Me}$ each term differs from the preceding by a $-\text{CH}_2-$ group and propane which is one of the 1st series is the 1st member of this series. It is permissible to suppose that the increase in the b. p. in a higher homolog is in some way proportional to the force with which the added group is attached. And this force would be nearly const. for the 2nd series but would vary in a continuous way for the 1st series beginning with C_2H_6 . In this series the substituting Me is bound successively to a CH_3- , a $-\text{CH}_2-$, a $-\text{CH}-$ and a $-\text{C}-$ group. In the above formula a is proportional to this force and the values are 0.61, 0.675, 0.74 and 0.805, resp. The value $a = 0.675$ for CH_3Me in the 1st series holds for all members in the 2nd. and so the b. p. of any term in the $\text{C}_n\text{H}_{2n+2}$ series is given by the formula $\Sigma 109.2/n^{0.675}$. The b. p. of CMe, will be obtained from $\Sigma 109.2/n^{0.805}$, where $n = 5$. If the hydrocarbon partakes of 2 series, as $\text{MeCH}_2\text{CH}_2\text{CH}(\text{Me})_2$, the b. p. is calcd. from that of the fundamental hydrocarbon, namely butane in which 2 Me's are substituted: thus $109.2/1^{0.675} + 109.2/2^{0.675} + 109.2/3^{0.675} + 109.2/4^{0.675} + 109.2/6^{0.74} + 109.2/8^{0.74}$, in which the sum of the 1st 4 is the b. p. of butane and the last 2 represent the increase due to 2 Me groups bound to $-\text{C}-$. C. calcd. the b. ps. for the paraffin series up to $\text{C}_{15}\text{H}_{32}$ and found an average difference of 0.55° between the calcd. and observed values. In the last term the difference was $+3.7^\circ$. C. calcs. the b. p. of $\text{C}_{15}\text{H}_{32}$ for 760 mm. pressure from the value for 15 mm. and finds that the value agrees closely with the value calcd. from this formula; he considers that this throws doubt on the correctness of the observed value. In another table the calcd. and observed b. ps. of 22 branched-chain aliphatic hydrocarbons are given. The av. difference between the observed and calcd. value is 0.75° . This formula which takes into consideration the constitutive properties of compds. was next applied to the ethylene hydrocarbons. When a H atom in

$\text{CH}_2\text{:CH}_2$ is substituted with Me it is attracted by the $-\text{CH}=\text{}$ group with a greater force than in the absence of the double bond. The value for a in this case is 0.615. If a 2nd H atom is substituted by Me then a will be 0.675 just as in the case of the satd. hydrocarbons. Thus the b. p. of propylene, MeCH:CH_2 , will be the b. p. of $\text{CH}_2\text{:CH}_2$ or $(170.5 + 109.2/3)^{0.615}$. For $\text{Me}_2\text{C:CH}_2$ the b. p. is $(170.5 + 109.2/3)^{0.675} + 109.2/4^{0.675}$. The calcd. values for 25 branched and straight chain members of the ethylene series are given and differ on the av. 1.6° from the observed values. C. assumed that the b. p. of CH_4 (109.2) is incorrect and that the mean (114°) of the values observed by Wroblewski, Olszewsky, Ladenburg and Krugel is correct. The values thus obtained for the straight and branched-chain paraffins differ very little except in the case of CH_4 and isobutane. The b. ps. of the normal paraffins at 15 mm. were also calcd. and compared with the values observed by Kraft. The av. difference is 1.18° . The b. p. of a hydrocarbon $\text{C}_n\text{H}_{2n+2}$ is the sum of the effect of the central groups (CH_2CH , C) which contributes the same value, while the terminal CH_3 groups contribute different amts. according as they are attached to 1 or to several C atoms. If in $\text{C}_n\text{H}_{2n+2}$ the number of central C groups is indicated by a , the number of isolated Me groups by b , the number of pairs of Me groups united with the same C atom by c , the number with 3 Me groups by d and the number with 4 by e then its abs. b. p. will be $T = 114/1^{0.7} + 114/2^{0.7} + \dots + 114/a^{0.7} + 114/(a+1)^{0.77} + 114/(a+2)^{0.77} \dots 114/(a+b)^{0.77} + 114/(a+b+1)^{0.8033} + 114/(a+b+2)^{0.8033} + \dots + 114/(a+b+c)^{0.8033} + 114/(a+b+c+1)^{0.8366} + \dots + 114/(n-e)^{0.8366} + 114/(n-e+1)^{0.87} + 114/(n-e+2)^{0.87} + \dots + 114/n^{0.87}$. The value of the arbitrary const. 0.77 increases by 0.0333 through the presence of 1 Me group; another raises it 0.0666 more; 2 others 0.0999. The general form for the type $\text{C}_n\text{H}_{2n+2}$ is $T = \sum_{i=1}^{(n-2)} 114/(n-i)^{0.7} + 114/(n-1)^{0.77} + 114/n^{0.77}$. Also in *Gazz. chim. ital.* 45, I, 567-79(1915).

E. J. WITZEMANN.

Oxidation and reduction without the use of acid. II. Reaction between stannous chloride and potassium dichromate. A contribution to colloidal chemistry. MARKS NEEDLE AND J. C. WIRT. *J. Am. Chem. Soc.* 38, 47-52(1915); cf. *C. A.* 9, 2826.—Samples of 0.4 g. SnCl_2 were dissolved in 50 cc. H_2O and rapidly titrated with $\text{K}_2\text{Cr}_2\text{O}_7$, in some cases after adding HCl and in others without acid. After adjusting the indicator, the stoichiometrical relations between the two substances were identical, whether acid were present or not. In its absence, the turbidity due to the hydrolysis of SnCl_2 was rapidly discharged by dichromate, and the end-solution had a distinct (faint) fruity odor. After titration, the solns. were evapd. to dryness and extd. with alc. The material sol. in alc. consisted of a mixt. of hydrous oxides of Sn and Cr, and hydrated CrCl_3 . Both extn. with CS_2 and dialysis of the product showed that SnCl_4 was not present. KCl was shown to be one of the products of the reaction. The hydrosol obtained by dialysis and evapn. contained practically half of the Cr, all of the Sn, and a negligible amt. of Cl.

E. B. MILLARD.

Dual theory of acid catalysis. Catalytic activity of monochloroacetic acid in the presence of its salts. H. M. DAWSON AND C. K. REIMAN. *J. Chem. Soc.* 107, 1426-37(1915); cf. *C. A.* 7, 334; 8, 1373, 2293.—Expts. on the cond. and viscosity of 16 solns. of CH_2ClCOOH and 9 of its Na salt at 25° are reported. The "Ostwald app." was used for viscosities. The rate of isomeric change of acetone in the presence of CH_2ClCOOH and varying amts. of its Na salt was determined as previously described, with 20 cc. of acetone, 0.005 mol I, and approx. 0.01 mol. KI. Further support was obtained for the view that acid catalysis involves 2 simultaneous changes in which the active agents are the H ion and the non-ionized acid. Results of the expts. with mixts. of acid and salt are in excellent agreement with reaction velocities calcd. from the equa-

tion $v = k_m\alpha + k_{m'}(1 - \alpha)$, where k_m and $k_{m'}$ are the activity coeffs. derived from expts. with varying amts. of CH_3ClCOOH in the absence of salt. With increasing quantities of the Na salt the velocity of the reaction approximates the lower limiting value which represents the effect of the un-ionized acid. The influence of added salt is quite different from that found by Arrhenius in his expts. on the inverting action of HCOOH and HOAc in the presence of the corresponding salts. E. B. MILLARD.

Activation of chlorate solutions by osmium. III. Separation of hydrogen and methane, catalysis of oxygen-hydrogen mixtures. K. A. HOFMANN AND O. SCHNEIDER. *Ber.* 48, 1585-93(1915); cf. *C. A.* 7, 3088.—Quantities of the salts of the Pt metals corresponding to about 1 g. of K_2OsO_4 were evapd. to dryness with HCOOH , and taken up with 15 g. NaClO_3 , 2 g. NaHCO_3 and 100 cc. H_2O . These mixts. were little active toward H, and in the decreasing order Pt, Rh, Ru, Pd, Au, Os, Ir, Ag, and somewhat less active toward CO, in the order Rh, Au, Pt, Ru, Pd, Ir, Ag. Mixts. contg. Os were often made more active by the addition of OsO_3 . Clay tubes were dipped in 5% PtCl_4 soln., ignited, and put into a Hempel pipet with solns. of 35 g. NaClO_3 , 5 g. NaHCO_3 , 0.05 g. PdCl_2 and 0.02 g. OsO_3 . With this app. it is possible to sep. H from CH_4 or N much more easily than with the usual burning over asbestos. The speed of oxidation of the H by NaClO_3 depends on the surface of platinized tubes exposed, and may be as great as 100 cc. per hour without shaking the pipet. After the pipet has been filled with H twice, a film (probably $\text{PdO}_2\text{-OsO}_3$) is formed which aids the Pt in oxidizing the H at the expense of the chlorate, after which the pipet will absorb large quantities of H for months. Gases contg. S, P vapor, PH_3 and NH_3 act as contact poisons, but are usually removed early in the course of a gas analysis. In the presence of much CH_4 or N the accuracy of the results is somewhat less than when pure H was used. Oxidation of H by gaseous O in the absence of chlorate took place with a max. speed at a concn. of H somewhat greater than $\text{H}_2 + \text{O}$, and the velocity of absorption fell off rapidly with increasing % of O in a manner indicating the possible formation of a less active Pt oxide. Better results were obtained with H-air mixts. CO could be detd. by oxidation with NaClO_3 in a soln. contg. H_3PO_4 in place of NaHCO_3 as above. After use in this detn., the pipet's power to oxidize H was unchanged, so that CO cannot act as a contact poison E. B. MILLARD.

Theory of solutions. Influence of change of volume on specific refraction in mixtures of liquids. JOHN HOLMES. *J. Chem. Soc.* 107, 1471-7(1915); cf. *C. A.* 8, 1371. —New values of $n_D^{16.5}$ for mixts. of MeOH and H_2O , and of $d_4^{16.5}$ have been detd., and the same quantities for $n\text{-C}_3\text{H}_7\text{OH}$ have been recalcd. The deviation from theoretical n follows closely the change in vol. on mixing. Change of vol. followed change in n also for the following mixts. in which an increase in vol. occurs: EtI and EtOAc , C_6H_6 and HOAc , acetone and CS_2 . The relative complexities of the liquids are the same as those deduced from the solubilities and d. detns. CH_3OH , $\text{C}_2\text{H}_5\text{OH}$ and $\text{HC}_2\text{H}_3\text{O}_2$ represent the true formulas of MeOH , alc., and acetic acid, but those for Et iodide, benzene, and CS_2 should be $(\text{C}_2\text{H}_5\text{I})_2$, $(\text{C}_6\text{H}_6)_2$, $(\text{CS}_2)_2$. These values support the miscibility theory of the first paper, one of the requirements of which was that the mol. complexity of a liquid shall be independent of the liquid with which it is mixed. The max. absorption of heat on mixing CS_2 and acetone occurs at CS_2 , 0.45 $\text{C}_2\text{H}_6\text{O}$, which is close to the concn. at which max. vol. and n were found for the same mixt. E. B. M.

Changes in volume upon solution in water of the halogen salts of the alkali metals. II. G. P. BAXTER AND C. C. WALLACE. *J. Am. Chem. Soc.* 38, 70-105(1916); cf. *C. A.* 5, 2455.—New data are presented for the halogen salts (except fluorides) of all 5 alkali metals, covering nearly all concns. from satn. down for temps. between 0° and either 50 , 70 , or 100° . A weighed amt. of salt was dissolved in nearly a minimum quantity of H_2O and the vol. of the soln. was adjusted to a mark in a 50 cc. flask at the

highest temp. employed. The flask was then cooled to room temp. and weighed; after this the adjusting of the vol. and weighing were carried out at several lower temps. Next the soln. was transferred quantitatively to a 100 cc. flask and the operations repeated at the same temps., beginning with the highest. Then 250, 500 and 1000 cc. flasks were used. From the vols. of the flasks, and the vols. of salt and H_2O employed, the change of vol. was calcd. for each salt at each temp. Great care was taken to have the salts pure and dry when weighed, and the usual vacuum corrections have been applied. Following the tables, which show wt. of salt and wt. of H_2O , wt. of soln., vol. of each, d. of soln., mol. concn. of salt, change in vol., change per g. and change per mol., are shown curves in which the change in vol. per gram of salt is plotted vertically against concn. in mols per l. horizontally. From these curves the d. of any soln. of any of the 15 salts at any temp. may be calcd. from the ratio: $(wt. soln.)/(vol. soln.) = (wt. H_2O + wt. salt)/(vol. H_2O + vol. salt = change in vol. during soln.)$. Tables are shown of the contraction on soln., and on formation from the elements, of the salts. The algebraic sum of these vol. changes is negative for all 15 salts. This quantity, which represents the contraction produced in the formation of the soln. from 1 g.-atom each of free metal and halogen and the H_2O , was previously shown to be additive for Li, Na and K salts up to molar concn. New values for all 15 salts at concns. up to 5 molar, at 25°, show that the additive relation holds for all of the salts, and for higher concns. The explanation of the vol. changes, previously advanced on the Richards hypothesis of compressible atoms, is further supported by the new data. The following changes are assumed to take place during soln. and dissociation: (a) when the mols. dissociate, they are freed in large part from the compression due to chem. affinity, with considerable expansion (from 15 to 56% of the original vols. of the uncombined elements). (b) when the ions (and probably the mols.) are combined with H_2O , both the hydrated substance and H_2O undergo compression. The latter effect varied regularly with the compressibilities of the substances involved, as well as with their affinities for each other. The effect of rising temp. is found in general to diminish contraction, owing to lessened hydration of all the substances concerned. Exceptions are LiCl and LiBr at ordinary temps., and KCl at higher temps. No simple method exists for sepg. the effects due to ionized and un-ionized material, because of the varying magnitude of the change for each ion or mol. with changing concn. E. B. M.

Reciprocal solubility of copper and lead. B. BOGITCH. *Compt. rend.* 161, 416-9 (1915).—Melts of Cu and Pb form 2 layers when the % Cu is over 34.5 and less than 87. If the temp. is above 940° the double layer disappears, and no difference is found between the top and bottom of the melt. E. B. MILLARD.

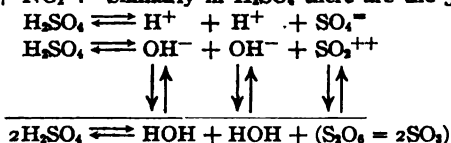
Heats of solution of substances in dilute and concentrated solutions. Heat of solution of sea salt. A. COLSON. *Compt. rend.* 161, 414-6 (1915).—Heats of soln. per mol. of NaCl were: in 2.4 l. H_2O —1500 cal. at 8°, —1100 at 22°; in 4.5 l. H_2O —1510 and —1546 cal., resp. From these data and heats of diln. of satd. solns. to these concns., the heats of soln. to satn. have been detd. In the neighborhood of 15° the mol. heat of satn. was —460 cal., and the variations with temp. were small. For NaCl there does not exist a region of const. heat of soln. independent of the concn. E. B. M.

Heats of saturation of some alkali salts. A. COLSON. *Compt. rend.* 161, 458-61 (1915).—Molar heats of satn. of aq. solns. have been detd. from heats of soln. in 4 to 8 l. per mol. and the heats of diln. of satd. soln. to this concn. for KNO_3 , KCl and NH_4Cl . The heats of mol. satn. for KNO_3 are —7145 cal. at 13.5° and —6950 cal. at 18.5°. For KCl these values were —4082 at 5.5°, —4001 at 12.5°, —3890 at 17.9°; for NH_4Cl —3851 at 14.9°, —3714 at 22.3°. The heats of satn. vary about 7% from the mean between 5 and 21°, and are in every case less than the heats of soln. in such amts. of solvent that the heat effect is independent of the concn. E. B. MILLARD.

Conductivity and viscosity of solutions of electrolytes in formamide. P. B. DAVIS, W. S. PUTNAM AND HARRY C. JONES. *J. Franklin Inst.* 180, 567-601(1915).—Four distns. *in vacuo* at low pressures were required to purify the solvent. Conductivities and viscosities of solns. of 18 inorg. electrolytes of simple type and 2 organic electrolytes have been measured at (usually) 5 concns., and temp. coeffs. of cond. and degrees of dissociation have been calcd. The most dil. soln. measured is assumed to be completely dissociated, or in some cases one more concd. This last concn. is 0.01 *N* in some cases, 0.025 *N* in some, and 0.00062 in some. HCONH_2 has a higher dielectric const. than H_2O , (94) and should show great dissociating power according to the Nernst-Thomson rule, and this was found to be the case. In every case the viscosity of the solns. in formamide was greater than that of the solvent. The association factor of HCONH_2 is 6.18, the largest molecule of any solvent used in the series of papers from Jones' laboratory. Conds. of Cs, Rb, and K salts are about the same, those of Na and Li salts are less. HgCl_2 is more dissociated in HCONH_2 than in H_2O . Salts which form hydrates were found to form solvates with HCONH_2 , and the temp. coeffs. of cond. of these solutes were greater than those of salts which were not solvated. The % temp. coeffs. are approx. proportional to the viscosities of the solns.

E. B. MILLARD.

A theory of multiple ionization. A modification of the electrolytic dissociation theory. I. Introductory and qualitative statement of the theory, with applications. F. F. HEYROTH. *J. Am. Chem. Soc.* 38, 57-65(1916).—After a statement of 5 objections to the ionic theory, H. asks: "may not amphoterism be a property common to all electrolytes?" This leads to the statement: when substances undergo electrolytic dissociation in soln. they tend to dissociate into ions in at least 2 ways, the ratio between the different ionization consts. varying from nearly 1:1 to very nearly 1:infinity, depending on the nature of the solvent, the concn. of the soln., and the av. structure of the mols. dissociating. HNO_3 may dissociate as follows: $\text{HNO}_3 \rightleftharpoons \text{H}^+ + \text{NO}_3^-$ and $\text{HNO}_3 \rightleftharpoons \text{OH}^- + \text{NO}_2^+$; and equil. exists between $\text{H}^+ + \text{OH}^- \rightleftharpoons \text{H}_2\text{O}$, and $\text{N}_2\text{O}_4 \rightleftharpoons \text{NO}_2^- + \text{NO}_2^+$. Similarly in H_2SO_4 there are the 5 sets of equilibria:



Equil. consts. are then formulated for these reactions, and the theory applied to neutralization and hydrolysis.

E. B. MILLARD.

Electrolysis of concentrated hydrochloric acid using a copper anode. F. H. JEFFERY. *Trans. Faraday Soc.* 1916(Advance copy).—The app. was similar to that employed with the Au anode, except that the app. was enclosed in a bell jar over H_2O and the electrolysis performed in an atm. of N. No Cu was deposited on the cathode, nor was there any trace of Cu in the catholyte after 6 hrs. steady current of 0.5 amp. The anolyte became slightly yellow, and there was a black deposit on the bottom of the beaker in which the expt. was carried out, also a white deposit of CuCl . The black powder was Cu from the disintegration of the anode. No Cl was formed during the electrolysis; the anolyte gave a white ppt. of CuCl on addition of H_2O . Probably the Cu was in soln. as the complex ion of H_2CuCl_3 . As the CuCl was formed toward the end of the electrolysis, the reaction may be $\text{CuCl}_2 \rightleftharpoons \text{CuCl} + 2\text{Cl}'$, or the CuCl may be formed and dissolved in the HCl without dissociating. No Cu passed to the cathode while the current was on, but if the current was off for 6 hrs., then turned on again, Cu was deposited, showing that the Cu was really in a complex anion during the first electrolysis.

E. B. MILLARD.

Influence of the metallic ion in electrolytic solutions upon the potential differences between the solutions and a metallic electrode. FLORELLA K. FINNEY. *Phys. Rev.* 6, 400-3(1915).—The base of a U-tube was filled with fresh gelatin, then the arms with the solns. to be tested, electrodes of similar pieces of the same metal were dipped into the 2 solns., and the direction of the current detd. with a galvanometer. Solns. of the nitrates, chlorides and sulfates of Na, K, NH_4 , Ba, Ca, Zn, H, Cu, Fe^{+++} , and KOH, NaOH, KBr, NaBr, Ki, NiSO_4 were used in 0.1 *N* solns. (satd. solns. of BaSO_4 and CaSO_4 were used). Electrodes of Cu, Zn, Ag, Ni, Cd, Sn, Pt and Bi were used, and the results obtained were independent of the material of the electrodes. The ions could be arranged in a series in the order in which their presence in a soln. affects the soln. tension of a metal in that soln. This series is the same as the e. m. f. series. Some irregularities were found, such as disagreement between results with KNO_3 and K_2SO_4 . No data are given.

E. B. MILLARD.

Electromotive forces in alcohol. VII. Concentration cells with calomel electrodes. EDGAR NEWBERRY. *J. Chem. Soc.* 107, 1520-6(1915); cf. *C. A.* 9, 1000, 2476.—Expts. were carried out with concn. cells in which the potentials of Hg in the H_2O and alc. solns. of NaCl which were employed in the previous work were directly compared with each other, and the results obtained were corrected for boundary potentials. The e. m. f. of the cell $\text{Hg} \mid \text{Hg}_2\text{Cl}_2 \cdot \text{NaCl}(\text{satd.}) \mid \text{NaCl}(N), \text{Hg}_2\text{Cl}_2 \mid \text{Hg}$ at $25^\circ = 0.05^\circ$ was 0.0413 v., a mean of 20 measurements between 0.0408 and 0.419; of the cell $\text{Hg} \mid \text{Hg}_2\text{Cl}_2 \cdot \text{NaCl}(\text{satd.}) \mid \text{NaCl}(0.1 N), \text{Hg}_2\text{Cl}_2 \mid \text{Hg}$ was 0.0831 v. Similar cells in EtOH with satd. NaCl and 0.004 *N* NaCl gave 0.0163 v., and with satd. NaCl against 0.002 *N* 0.0293 v. Cells of satd. NaCl in alc. against satd. NaCl in H_2O could not be measured, since diffusion caused pptn. of salt. The e. m. f. of 0.1 *N* NaCl against 0.1 *N* KCl was too small to measure, but appeared to be about 0.002 v. Corrections for boundary potentials were calcd. and applied. The transport numbers of ions other than H are the same in alc. as in H_2O , that of Cl^- in alc. HCl is about 0.30, as compared with 0.16 in H_2O . Addition of small quantities of H_2O to one side of an alc. concn. cell has a marked effect on the e. m. f. Calomel electrodes in acid alc. are not satisfactory, but serve well in alc. NaCl. The dropping electrode is untrustworthy in concd. aq. solns., and in alc. solns.; the capillary electrometer is trustworthy in both solvents for the abs. potential of Hg. The abs. potential of Hg in a satd. soln. of a salt is independent of the nature of the solvent if the ions have the same affinity for that solvent. The abs. potential of the 0.1 *N* H electrode in dry alc. HCl at 25° is 0.299 v.

E. B. MILLARD.

Potentials of the calomel and hydrogen electrodes. N. E. LOOMIS. *J. Phys. Chem.* 19, 660-4(1915); cf. *C. A.* 6, 823, 824.—Recalcn. of the results of the 1911 paper, using 0.336 in place of 0.339 as the potential of the electrode 0.1 KCl-HgCl-Hg. The degree of hydrolysis of $\text{C}_6\text{H}_5\text{NH}_2 \cdot \text{HCl}$ is 2.05% at *N*/16 and 2.81% at *N*/32; the degree of ionization of 0.25 *N* HOAc is 0.88%. In reply to McBain and Coleman (*C. A.* 8, 3141), L. states that McB. and C. have misunderstood the purpose of the investigation. Attention is called to corrections for barometric pressure which were omitted from the first paper (1911).

E. B. MILLARD.

Calomel standard cell. G. F. LIPSCOMB AND G. A. HULETT. *J. Am. Chem. Soc.* 38, 20-7(1916).—Calomel was prepd. by electrolyzing *N* HCl with a Hg anode and a c. d. of 0.02 amp. per sq. cm., in the app. previously used for Hg_2SO_4 (*Phys. Rev.* 22, 334(1906)). It was gray in color, due to the presence of finely divided Hg, and it was to the reducing action of this Hg that the improved HgCl electrode was thought to be due. A vessel of the H type was used for the cell: $\text{Cd-Hg}(10\%\text{Cd}) \mid \text{Cd-Cl}_2, 2.5 \text{ H}_2\text{O} \text{ Hg}_2\text{Cl}_2 \mid \text{Hg}$. Measurements were made by the Poggendorf compensation method, using a Broca galvanometer as zero instrument in connection with a Wolff

potentiometer. The voltage could be directly detd. to 0.00001 v. Detns. of the e. m. f. taken at 25° over a period of several months gave closely agreeing values, 0.67079 ± 0.00001 . Similar detns. at 15 and 30° were made in order to study the temp. coeff. The combination is reproducible to the 5th place, it rapidly attained a const. e. m. f. which was then steadily maintained, and no gradual decrease in e. m. f. has been noticed in any of the cells as is frequently the case with Weston cells. The total heat change accompanying the reaction which takes place in the cell was calcd. to be $Q = 30036$ cal. Other cells contg. solns. of CdCl_2 which were not satd. were also made, and it was found that the voltages were much higher, but the temp. coeff. of e. m. f. changes very little with the concn.

E. B. MILLARD.

Persistence of current in photoelectric cells after suppression of exciting light. O. M. CORBINO AND G. C. TRABACCHI. Rome. *Nuovo cimento* 10, 47-67(1915).—After the interruption of the light that strikes a photoelectric cell subject to tension, there subsists a residual current, still measurable after periods of time of the order of hundredths of a sec., and which decreases with time the more rapidly as the tension applied is higher. With tensions of about 50 volts this residual current, measured 0.05 sec. after the interruption of the light, still has a value of about 0.0035 of the normal value. The residual current is due, not to subsequent emission of ions by the metal, but to persisting presence in the cell of ions formed by impact. These, before being transferred to the electrodes, create other ions, and thus set up a retardation in the process of elimination.

S. LEVY.

Entropy in condensed substances and variation of this in change of state. S. PAGLIANI. *Nuovo cimento* 10, 5-33(1915); see C. A. 9, 3016.

S. LEVY.

Invariant, monovariant and divariant equilibria. II. F. A. H. SCHREINEMAKERS. Leiden. *Proc. Akad. Wetenschappen* 18, 531-42(1915); cf. C. A. 9, 2728.—A continuation of the discussion of the position of the curves and regions representing the mono- and divariant equil. which may proceed from an invariant point in a P - T diagram, the present discussion being confined to ternary systems. The generalizations obtained are the same as those previously obtained by S. in "Die Heterogenen Gleichgewicht," Vol. III (1), p. 218, but the manner of derivation is more simple.

GEORGE W. MOREY.

Isothermals of monoatomic gases and their binary mixtures. XVII. Isothermals of neon, and preliminary determinations concerning the liquid condition of neon. H. K. ONNES AND C. A. CROMMELIN. Leiden. *Proc. Akad. Wetenschappen* 18, 515-20(1915).—Isothermals of Ne at 0° and at 20° from 20 to 93 atm. and from 20 to 84 atm., resp., were detd., as well as parts of isothermals at temps. between -182.6° and -217.5°. The virial coeffs. at 0° and at 20° are, resp., $1: A_A, +1.0731$ and 0.99986 ; $B_A \times 10^6, +0.51578$ and 0.41334 ; $C_A \times 10^6, +0.82778$ and 1.1538 . The following vapor pressures and liquid ds. were detd.: -245.68°, p 81.62 cm.; -245.88°, 76.71 cm., d 1.204; -245.92°, 76.0 cm.; -246.66°, 60.52 cm.; 247.49°, 45.16 cm.; -248.51°, 32.50 cm., d 1.248; -248.67° (triple point), 32.35 cm. T_h was estimated by comparison with H, O, and Ar in corresponding states to be between 39.9 and 45.2° K. Cf. C. A. 8, 2515.

GEORGE W. MOREY.

Isothermals of di-atomic substances and their binary mixtures. XVII. Preliminary measurements concerning the isothermal of hydrogen at twenty degrees Centigrade from sixty to ninety atmospheres. H. K. ONNES, C. DORSMANN AND G. HOLST. Leiden. *Proc. Akad. Wetenschappen* 18, 458-64(1915); cf. C. A. 9, 988.—Preliminary measurement of the 20° isothermal of H were made with a new manometer intended to be used up to 120 atms., which was standardized at 60 atms. by comparison with a previously standardized manometer. XVIII. The isothermal of hydrogen from sixty to ninety

atmospheres. H. K. ONNES, C. A. CROMMELIN AND E. I. SMID. *Ibid* 465-72.—In this detn. the above manometer was standardized directly, and the isothermal detd. accurately from 65-100 atm. Because the results lay on a curve divergent from that represented by the formula of Schalkwijk, which represented the values of p_0 from 4 to 60 atm., the following new formula was calcd. to fit the entire range: $PV_A = 1.07621 - 0.65712 \times 10^{-3} d_A - 1.2926 \times 10^{-5} d_A^2$. Amagat's value for p_0 at 100 atm. differs from that detd. by the authors by only 0.1%. The coeff. C_A in the above equation is twice as large as is to be expected from analogy with results obtained under different conditions.

GEORGE W. MORSEY.

Further experiments with liquid helium. O. On the measurement of very low temperatures. XXV. The determination of the temperatures which are obtained with liquid helium, especially in connection with the measurement of the vapor pressure of helium. H. K. ONNES AND S. WEBER. Leiden. *Proc. Akad. Wetenschappen* 18, 493-507(1915).—In the study of the v. p. of He at very low temp. difficulty is met with in the temp. measurement. The (const. vol.) He thermometer must be filled with He under very low pressure and to the measurement of its pressure the very difficult correction for the thermal mol. pressure must be applied. This correction becomes the greatest uncertainty in the measurement at very low temp. (17° K). The correction for the thermal mol. pressure is discussed, and a semi-empirical equation for its calcn. derived. Pressures were measured both with a Hg manometer and with a hot wire manometer, otherwise the app. is the same as was previously used (C. A. 6, 6). and the results obtained are essentially the same except for the correction for thermal mol. pressure. The v. p. curve of He cannot be expressed by the Nernst formula nor adequately by the Bose-Rankin formula, even when 4 consts. are used. G. W. M.

The specific heat at low temperatures. II. Measurements on the specific heat of copper between fourteen and ninety degrees Kelvin. W. H. KESSOM AND H. K. ONNES. Leiden. *Proc. Akad. Wetenschappen* 18, 484-93(1915); cf. C. A. 9, 405.—Temp. measurements were made with a Au resistance thermometer, the app. used being similar to that of the previous communications. The sp. heat decreases more rapidly than corresponds to Debye's formula, $C_v = 464.1(T/\theta)^3$; in the liquid H region and up to 40° K. θ decreases with increasing temp., falling from 330 to 312, while with Pb θ increases up to 30° K., then decreases. Incidentally, the effect of mechanical treatment on the temp. coeff. of resistance of Cu and Pb was detd. With Cu, rolling greatly diminishes the decrease in resistance between room temp. and the b. p. of H, but annealing completely annuls the effect of previous mechanical treatment. Pb is but little affected by mechanical treatment.

GEORGE W. MORSEY.

Variation of the specific heat of solids with the temperature. A. H. COMPTON. *Phys. Rev.* 6, 377-89(1915).—An equation representing the change of sp. heat with temp. which does not involve the conception of quanta of energy has been derived with the aid of the following assumption: If the relative energy between two neighboring atoms in a solid falls below a certain critical value, the 2 atoms become "agglomerated" so that the degree of freedom between them vanishes; but as soon as the energy increases again above the critical value, the degree of freedom reappears. The term "agglomeration," suggested by Benedicks, is used to indicate any state of association of the atoms on account of which degrees of freedom for thermal motion disappear. The formula is $C_v = dU/dT = 3NR\epsilon^{-1/T} + (3NR\tau/T)\epsilon^{-\tau/T} - (3N\gamma\tau/T^2)\epsilon^{-\tau/T}$, where $3N$ is the greatest possible number of degrees of freedom, γ is the potential energy of each agglomerated degree of freedom, $\tau = \epsilon/2R$ and ϵ is the critical value of the energy below which a degree of freedom remains agglomerated, T is the abs. temp., R is the gas const. for a single mol., and e the base of natural logs. Comparison with exptl. data shows a satisfactory agreement between the equation and values

detd. by expt. The strong support of the exptl. values seems to indicate that the agglomeration hypothesis represents more accurately the condition of the atoms in a solid than does the quantum hypothesis. Debye's expression for the variation of sp. heat with the temp. was found to be largely empirical, and the present comparison was made with the equation of Einstein. The defence of the assumption on which the derivation is based is reserved for a future paper.

E. B. MILLARD.

Some sources of error in viscosity measurement. E. C. BINGHAM, H. I. SCHLESINGER AND A. B. COLEMAN. *J. Am. Chem. Soc.* 38, 27-41(1916).—Viscosities detd. in the viscosimeter of Bingham (*C. A.* 8, 1525) when calcd. from the formula $\eta = Ctp - C'p/t$ were not const., but varied when the applied pressure (p) was varied. In the formula t is the time of flow, η the viscosity, ρ the density, and C and C' are consts. A math. discussion showed that the av. pressure may be substituted in the viscosity formula, provided this is correctly calcd., and that deviations from the Ostwald formula $\eta = \eta' \rho t / \rho' t'$ are due to not taking into account the loss in kinetic energy, and not to any failure to recognize the true value of the av. pressure. Values of viscosity calcd. from the equation derived were in agreement with observed values for H_2O , $HCOOH$, and sugar solns. It was of no consequence whether the capillary was horizontal or vertical. There is a definite loss of kinetic energy when a liquid flows from a capillary with a trumpet-shaped end, but whether this kinetic energy correction is the same as in the case of a capillary with uniform bore is not proved. The capillaries should have ends as nearly square as possible (so the kinetic energy correction may be calculable) and the bulbs should be as short as possible and approx. the shape of 2 cones placed base to base.

E. B. MILLARD.

Viscosity and density of molten metals and alloys. M. PLÜSS. Basel. *Z. anorg. allgem. Chem.* 93, 1-45(1915).—Expts. on the viscosity of some metals and alloys were made, using the capillary tube method. The app. used was a long capillary tube, to which was sealed a bulb and a tube leading to an air pump. The capillary tube was dipped into the liquid metal, the bulb and part of the upper tube filled with metal by suction, and the time of outflow between 2 marks on either side of the bulb detd., either optically or by an electrical method. At high temp. the entire tube and melt were held in an electrically heated furnace; at lower temp. a vapor bath was used. When easily oxidizable metals were studied the furnace was filled with H. The abs. vol. of the tubes and bulb were detd. by weighing, and the app. was calibrated by expts. at 18° with Hg. The accuracy of the result for abs. viscosity, which was calcd. from the time of flow and the dimensions of the app., is believed to be $\pm 0.14\%$; the relative detns. should have a higher accuracy. Emphasis is laid on the correction for the change in level of the metal in the crucible, due to the metal flowing out of the tube. The viscosity of Hg was detd. from 0 to 299° ; the results obtained are 1-1.5% lower than those of Koch below 80° ; above this temp. P.'s results are higher, the difference increasing to 4% at the highest temp. Neither the fluidity nor the viscosity curves are linear with temp. Measurements were made on Sn from 280 to 389° , and on Bi from 280 to 365° ; in both cases both the fluidity and viscosity curves are linear. Viscosity and density detns. were made on several alloys, the latter by a displacement method. The viscosity of molten Pb at 280° is about 0.03, and that of all the Pb-Sn alloys is higher. The viscosity-compn. curve rises to a max., then falls to a min. at the eutectic compn., then rises to that of pure Sn. The Pb-Sb system was only studied over the interval 7.6-17.0% Sb; the viscosity curve shows a strong min. at the eutectic compn. In the Sn-Bi system 2 max. were found on the viscosity curve, corresponding to the compds. $BiSn_2$ and Bi_2Sn , and a min. at the eutectic compn. In none of the above alloys was there any relation between the viscosity and the density, and the viscosity does not even approx. follow the mixt. rule. The results of Arpi

(C. A. 8, 1406) are discussed, and the difference between his results and those of P. are ascribed primarily to neglect of the above correction for the change in level of the metal height in the reservoir.

GEORGE W. MORREY.

Coexistence of phases subjected to different pressures. RUD. WEGSCHEIDER. Vienna. *Z. anorg. allgem. Chem.* 93, 95-6(1915).—W. points out that the formula derived by Niggli (C. A. 9, 1863) showing the influence of differential pressure on a heterogeneous equil. can be derived in a less general manner from relations previously derived by W. (C. A. 6, 1874.)

GEORGE W. MORREY.

Comparative method for determining vapor densities. PHILIP BLACKMAN. *J. Chem. Soc.* 107, 1500-3(1915).—A drop of Hg placed in the middle of a capillary tube about 100 cm. in length separates the 2 substances, the vapor d. of one of which must be known. A small column of each of the liquids is placed in the tube, one each side of the Hg, and both ends are sealed off. The quantity of each liquid present is detd. by measuring the length of the capillary column. From these lengths, and those of the air columns at room temp., the lengths of the vapor spaces when the tube has been heated to a high enough temp. to vaporize both liquids, and the known ds. of the substances, the vapor densities were calcd. by a complicated formula. A simplified formula gave nearly as good agreement. Observed densities agreed with calcd. ones to within better than 9% in the cases given, and was quite close for some liquids.

E. B. MILLARD.

Effective resistance and inductance of iron and bimetallic wires. J. M. MILLER. Bur. Standards, *Bull.* 12, No. 2, 207-67(1915).—A formula has been derived which permits the exact permeability curve of a homogeneous Fe wire for circular magnetization to be obtained from measurements of the self-inductance of the wire with direct current. Detns. and comparisons of axial and circular permeability curves were made for a number of wires, in some of which there was fair agreement with the calcd. values, and in others considerable variations which were possibly due to non-homogeneity or non-isotropy of the material. The effective resistances of several samples of Fe telegraph and telephone wires were detd. for 0.5 to 10 amp. in the range of frequencies 50 to 3000 cycles per sec., and the exptl. results extrapolated to zero current. Formulas for the resistance of bimetallic wires are given, together with some exptl. material on Cu-steel wires.

E. B. MILLARD.

The blue color of the sky and the constant of Avogadro. D. PACINI. *Nuovo cimento* 10, 131-67(1915).—In studying the deviations of the law of Rayleigh relating to the absorption of solar radiation by the air, numerous expts. were made looking to spectrophotometrical comparisons between the light of the sky and that of the sun at an altitude of 1090 m. No indications were obtained that at this altitude the air shows a condition of greater purity. Rayleigh's law connecting the ratio c/s (c being the intensity of the light of the sky and s that of the sun) with Avogadro's const. N (the number of molecules per gram-mol. at 0° and 760 mm.) is: $c/s = 22390 \times 13.6 H \pi^3 (k - 1)^2 t^2 \varphi (1 + \cos^2 \beta) / 2 \times 0.00129 \cos s \lambda^4 N$; k = dielec. const. of the air, φ = the apparent diam. of the sun, β = angle which the direction of the sun makes with that of the region of the sky under observation, s = the zenithal distance of the latter direction, H = the barometric height at 0° . In order to compare the results with those obtained by preceding observers, there was calcd. for every observation the mean value of the exponent n , using the factor $1/\lambda^n$ instead of $1/\lambda^4$ in the formula. Curves were plotted from the data of each observation based on individual wave lengths, and were divided into different types when compared with the theoretical curve. P. discusses at length the conditions and probable causes detg. the deviations of the state of the atm. from what would be an ideal turbid mean. The calcn. of Avogadro's const. N from the data obtained showed that with the purest sky, the values of N were always

lower than those deduced from other methods; a mean value of 57×10^{22} was found, which may be considered as the minimum value of N , but which indicates that the blue color of the sky is due to the mol. structure of the atm. S. LEVY.

Fluorescence of solutions. G. LÉPINE. *Ann. phys.* 4, 207-28(1915).—Expts. on the influence of concn. on the fluorescence of rhodamine and fluorescent blue in H_2O , and phenosafranine in alc. have been made, and diagrams drawn showing the change in fluorescence with the concn. Other solvents were used with 5 fluorescent substances; the solvents were alcohols, HOAc, acetone, ether, $CHCl_3$, C_2H_5Br , glycerol, etc. For very small concns. in H_2O the fluorescence was proportional to the concn., but the intensity increases more rapidly than the concn. above 10^{-4} . The same substance in different solvents may show a variation of intensity of fluorescence of 1:15. Fluorescent solns. absorb the radiations which excite them. E. B. MILLARD.

The fluorescence of sulfur, selenium and tellurium vapor. D. DIESTELMEIER. *Z. wiss. Phot.* 15, 18-55(1915).—Tables and figures are given, S, Se and Te heated to vapor in hard glass or quartz containers and excited by various arcs and sparks, etc., fluoresce with selective absorption. Impurities in the vapors show marked effects. The fluorescence consists of band spectra shaded to the red, and depends upon the kind of exciting light used. The absorption spectra (bands shaded to red) were measured for different vapor densities. The fluorescence spectra in general overlap or coincide with the absorption spectra. The double at. mols. are regarded as the emission centers of fluorescent light. Thus for S the max. fluorescence occurs at 500 to 550° at which $S_8 \rightarrow 4S_2$. At 650 to 700° further dissociation $S_2 \rightarrow 2S$ takes place and the intensity of the fluorescence diminishes. PAUL D. FOOTE.

New fluorescence spectrum of ammonium uranyl chloride. E. L. NICHOLS AND E. MERRITT. *Phys. Rev.* 6, 358-76(1915); cf. *C. A.* 6, 1397; 9, 3020.—Triclinic plates of $UO_2Cl_2 \cdot 2NH_4Cl \cdot 2H_2O$ were strongly fluorescent, and the fluorescence spectrum, unlike that of other uranyl salts, is resolved at room temp. into at least 8 groups of narrow bands. Each group, which corresponds to a single band of the usual uranyl fluorescence spectrum, consists of 5 nearly equidistant bands. The bands, while not so narrow as some of the line-like bands of the uranyl spectra at the temp. of liquid air, are well sepd. from their neighbors, and about 18Å in width. A detn. of the distribution of intensities within the visually brightest group (5302 5114) was made with the spectrophotometer as follows: 5302 intensity = 18, 5253 = 33, 5203 = 24, 5157 = 11, 5114 visible but too faint for measurement. Tables are given of the positions of bands at 20°, of shifts between this temp. and -185°, av. intervals between homologous bands, calcd. and observed frequencies of the various series of bands, and of the absorption spectrum at 20°; also tables showing the fluorescence and absorption bands arranged in series at -185°. E. B. MILLARD.

The structure of the ultraviolet absorption spectra of benzene derivatives. RUDOLF WITTE. *Bonn. Z. wiss. Phot.* 14, 347-92(1915).—Using a quartz spectrograph, and as a light source an Al spark under H_2O , the absorption spectra were measured in the region about $\lambda 2200$ to $\lambda 3000$ for vapors of benzene, toluene, chlorobenzene, bromobenzene, aniline, phenol, anisole. No selective absorption was found for iodobenzene, nitrobenzene, and benzoic acid. The wave lengths are tabulated together with intensities, and the bearing of the data upon series grouping is discussed at length. PAUL D. FOOTE.

The passage of light through the slit of a spectroscope. P. ZEEMAN. *Leiden. Proc. Akad. Wetenschappen* 18, 412-30(1915).—Errors in spectroscopic measurements are caused by polarization of light passing through a narrow slit (*C. A.* 7, 1839). Z. has detd. that at the following widths of slit the 1st extinction of the horizontal vibra-

tions becomes apparent: Hilger const. deviation spectroscope, green light, 0.010 mm.; eschelon spectroscope, red light, 0.0017 mm.; green light, 0.0015 mm. With white light the image formed by the horizontal vibrations becomes fainter and of a bluish tinge as the slit is narrowed.

GEORGE W. MOREY.

Magneton. A. PICCARD. *Arch. sci. phys. nat.* 40, 278-83(1915).—Reply to Kunz (*C. A.* 9, 2732).

E. B. MILLARD.

Magnetochemistry of copper salts and the theory of the magneton. B. CABRERA AND E. MOLES. *Arch. sci. phys. nat.* 40, 284-90(1915); see *C. A.* 9, 3167. E. B. M.

Variation of resistance in magnetic field and Hall effect in bismuth. G. C. TRABACCHI. *Nuovo cimento* 10, 68-71(1915); see *C. A.* 9, 2835.

S. LEVY.

Saturation values of the intensity of magnetization and the theory of the hysteresis loop. E. H. WILLIAMS. *Phys. Rev.* 6, 404-9(1915).—Expts. on an alloy Fe₂Co which had been melted *in vacuo* have been made to test the theory of J. Kunz (*C. A.* 6, 3053). The theory was confirmed.

E. B. MILLARD.

Dispersion law of the magneto-optic effect in ultra-red for iron and cobalt. W. VOIGT. *Physik. Z.* 16, 298-306(1915).—Theoretical.

E. B. MILLARD.

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KUESTER, F. W.: *Logarithmische Rechentafeln für Chemiker, Pharmazeuten, u. s. w.* 15 Aufl. Leipzig: Veit & Co.

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McFARLAND, B. W.: *A Practical Elementary Chemistry*. New York: C. Scribner's Sons. 462 pp. \$1.25.

OSTWALD, W.: *A Handbook of Colloid-Chemistry*. Trans. by M. H. Fisher. Philadelphia: Blakiston. \$3.00.

OSTWALD, W.: *Die Welt der vernachlässigten Dimensionen*. Dresden: T. Steinkopff.

PHILLIPS, F. C.: *Chemical German*. 2nd ed. Easton, Pa.: Chem. Pub. Co. 252 pp. \$2.00.

RAMSAY, WM.: *The Gases of the Atmosphere, the History of their Discovery*. 4th ed. London: Macmillan & Co. 6 s.

SMOULUCHOWSKI, M.: *Studien über Molekularstatistik von Emulsionen und deren Zusammenhang mit der Brownschen Bewegung*. Wien: A. Hölder.

TDNCK, A.: *Modern Colloidal Chemistry*. (In Russian.) Petrograd.

TRAUTZ, M.: *Die Theorie der chemischen Reaktionsgeschwindigkeit und eine neue Grenzgesetz für ideale Gase*. 44 ss. 1.50 M.

VITORIA, P. E.: *Prácticas químicas para cátedras y laboratorios*. Barcelona. 1915.

WOKER, G.: *Die Katalyse. Die Rolle der Katalyse in analytische Chemie*. Stuttgart: F. Enke. 793 ss. 29.20 M.

3. RADIOACTIVITY.

WILLIAM H. ROSS.

The life of radium. ELLEN GLEDITSCH. Univ. Kristiania. *Am. J. Sci.* 41, 112-24(1916).—An exptl. detn. was made of the life of Ra by Boltwood's method (*C. A.* 2, 3193) which consisted in sepg. the Io from known quantities of U minerals and comparing the amts. of Ra produced by the sepd. Io in known periods of time with the amts. of Ra associated with it in the minerals. That the life of Io is sufficiently long to give an accurate value for the const. of Ra as detd. by this method was shown by the fact that the rate of growth of Ra in an Io soln., prepd. nearly 7 yrs. ago, was found to have remained const. throughout the entire interval. In carrying out the method all the rare earths contained in the mineral soln. were pptd. and removed by filtration. To the soln. was added a soln. of a small quantity of rare earths containing no Ra nor Io, and the pptn. was repeated. After filtration a new quantity of rare earths was brought into the soln. and pptd. The first 2 ppts. were put together, ignited to the oxides and converted into the sulfates. The hydroxides were then pptd. several times to remove Ra, and finally dissolved in dil. HCl to form the main soln. The 3rd ppt. was treated separately, but in exactly the same way and used as a test soln. which, when no growth of Ra took place in it, showed that all Io had been removed and was in the main soln. The minerals examd. were uraninite (North Carolina), cleveite (Norway), and 2 specimens of very pure bröggerite (Norway). The values obtained in the case of each mineral for the transformation const. of Ra are, resp., 3.7, 3.9, 4.2 and 4.1×10^{-4} (yr.)⁻¹. The corresponding half-value periods are 1,836, 1,780, 1,640 and 1,670 yrs. The values given for the 1st 2 detns. are considered less trustworthy than those for the last 2, which agree closely with one another, and with the value 1,690 yrs., calcd. by Rutherford (*C. A.* 8, 3753) from the number of α -particles emitted per sec. per g. of pure Ra.

W. H. Ross.

The life of radium. B. B. BOLTWOOD. *Science* 42, 851-9(1915).—A review with special reference to the results obtained by Gleditsch working in B.'s laboratory. (Cf. preceding abstr.)

W. H. Ross.

Advances in the field of radioactivity. V. F. HESS. *Fortschritte Chem.* 11, 33-42, 65-76(1915).—A review covering the period Mar., 1914, to Feb., 1915. E. J. C.

The use of radium emanation condensed in closed tubes in place of radioactive compounds (DEBIERNE) 11B.

DEBIERNE, A.: Recherches sur les phénomènes de Radioactivité. Paris. 249 pp.

KOHLRAUSCH, K. W. F. AND SCHRÖDINGER, E.: Ueber die weiche (β) Sekundärstrahlung von γ -Strahlen. Wien: Hölder. 49 ss. 1.70 M.

MEYER, S., HESS, V. F., AND PANETH, F.: Neue Reichweitenbestimmungen an Polonium, Ionium und Actiniumpräparaten. Wien: A. Hölder. 30 ss. 1.05 M.

SCHINCAGLIA, I.: I fondamenti della Röntgen-tecnica. Milan: U. Hoepli. 264 pp. 5.50 L.

Rendering gases or liquids radioactive. E. SCHWARZ. Brit., 18,023, July 30, 1914. The radioactive substance, either a solid or a soln. of a Na salt, used for rendering liquids or gases radioactive, is protected by a membrane of celluloid or celluloid-like substances which allows of the passage of the emanation.

4. ELECTROCHEMISTRY.

COLIN G. FINK.

The place of electrochemistry in the arts of war and peace. E. F. ROEBER. *Elec. World* 67, 26-7(1916).—A survey of the past year's developments. Practically all electrochem. factories show "well deserved prosperity." About 20,000 tons of abrasives were produced in 1915. Great progress has been made in the electrometallurgy of steel and Zn. C. G. F.

Recent researches in electricity at the Bureau of Standards. E. B. ROSA. *J. Franklin Inst.* 180, 539-59(1915).—A description of the new elec. lab. building and a brief summary of the recent work of the Bureau in various lines of elec. research. F. A. S.

Development of applied science in 1915. A. E. KENNELLY. *Elec. World* 67, 18-9(1916).—Includes a chapter on elec. cond. at low temp., etc. C. G. F.

Electrothermic smelting of iron ores in Sweden. A. STANSFIELD. Canada Dept. of Mines, Mines Branch, *Bull.* 344, 57 pp.—A report on the commercial operation of the electrothermic Fe-smelting furnaces in Sweden. Two main types of furnace are described: (1) The Elektrometall furnace in which the ore is preheated and partially reduced in a shaft by circulation of the furnace gases. (2) Furnaces of the Helfenstein, Californian, and Tinfos type in which there is no provision for preheating. Numerical data for the Elektrometall furnace are given which show the charge, heat distribution, and efficiency. The heating value of the furnace gases is 75% of the whole elec. supply. The circulation of the gases caused a saving per ton of iron of 35.2 kg. of coke (11% of the whole) and 152 kw. hrs. (7% of the whole), but the escaping gas is poorer in heating power by 340,000 cal. (23% of the whole). These furnaces have a daily output of 20 or 30 tons but on account of the large stack it would be impracticable to increase the size of the unit to 100 tons. If this could be done with the Helfenstein furnace, the gain in efficiency due to increased size would probably more than offset the absence of circulation. Detailed descriptions of various Swedish works are given together with figures for the consumption of elec. energy, charcoal or other fuel, fluxes and electrodes, and cost of plant and upkeep. There is no evidence to show that elec. Fe smelting can be undertaken on a large scale in competition with the existing blast-furnace industry in Canada. The cost of producing elec. pig iron in Canada is estimated at from \$18.50 to \$21.00 per 1000 kg. The report concludes with a description of the Rennerfelt elec. steel furnace. E. SCHRAMM.

Electrolytic copper. B. WELBOURN. *Engineering* 100, 524-5 (1915).—W. describes briefly the methods in use in the U. S. for the smelting of Cu ores, for electrolytic refining and for the manuf. of Cu wire. The Engineering Standards Committee definition of hard drawn Cu wire is wire which does not elongate more than 4% on a length of 10 inches and which has a resistance 2% higher than annealed Cu at 15.6° (60° F.). A satisfactory definition should cover tensile strength, elongation, limit of proportionality, modulus of elasticity (in exceptional cases) and ohmic resistance. In practice it is found that the tensile strength increases proportionately to the diam. and not to the sectional area. Some expts. indicate that the increased strength of hard drawn wire does not lie entirely in the outer skin as is commonly supposed. E. SCHRAMM.

Bronzing processes suitable for brass and copper. T. I. BAKER, SR. *Metal Ind.* 13, 464-5, 501 (1915).—A collection of practical bronzing formulas depending upon chem. and electrochem. actions for the production of color films. A summary is also given of expts. made to det. the weight per unit area for various color films, and the loss of metal per unit area incurred in the coloring process. Results are given for black and brown Cu oxide films obtained by dipping in solns. of various Cu salts, also for a black NiS film obtained electrolytically from a Ni soln. containing Zn and thiocyanates. The wt. of the color film ranged between 21.5 and 99 mg. per sq. dm., while the loss of metal, as detd. by weighing before bronzing and again after removing the color film, varied from 44 to 83 mg. per sq. dm. F. A. STRAUSS.

The Cumberland electrolytic process for preventing corrosion of all metals immersed in liquids. ELLIOTT CUMBERLAND. *Trans. Faraday Soc.* 1916 (advance copy), 4 pp.—After a brief review of the investigations of Whyte, Philip, *et al.*, C. describes what has proved to be the only effective method of overcoming the loss of Zn from condenser tubes: Pieces of Fe, serving as anodes (the body of the condenser is cathode) are suspended in the liquid and suitably insulated from the vessel to be protected. A small dynamo supplies d. c. at 10 v. All corrosive action is transferred to the Fe anodes which must be renewed about once in 2 yrs. This C. system has been employed for years in all types of steamships and in many large power plants. A further advantage of the system is the prevention of boiler scale. Two cuts are shown.

C. G. F.

Progress in illuminants and illuminating engineering. P. S. MILLAR. *Elec. World* 67, 27-9 (1916).—A review of 1916. "The year has not been marked by any radical development."

C. G. F.

Electrolysis of concentrated hydrochloric acid using a copper anode (JEFFERY) 2.

BONINI, C. F.: I processi termoelettrici della siderurgia moderna. Milan: U. Hoepli. 608 pp. 12.50 L.

MAYNARD, G. S.: List of References to Storage Batteries. New York: Public Library. 37 pp.

Electrolyzing zinc solutions. C. A. HALL. U. S., 1,163,911, Dec. 14. The free anion concn. of the electrolyte, *e. g.*, ZnSO₄ or ZnCl₂ soln., is maintained const. during electrolysis by adding finely divided CaCO₃ to the electrolyte and agitating to combine with the liberated anions and form an elec. inert compd.

Electrolytic production of alkali metal and alkaline earth metal nitrogen compounds. E. A. ASHCROFT. U. S., 1,163,498. Dec. 7. NaCl or NaOH or other Na compd.

is electrolyzed over a Pb bath to form a Na alloy with the molten Pb and the alloy formed is electrolyzed in a second cell as anode with an electrolyte of the desired product (Na amide, cyanamide or cyanide) to which NH_3 is supplied to form amide or NH_4 and C to form cyanamide or cyanide, the temps. of the second cell being 250–350°, 500° and 800°, resp., for the formation of these three compds. Hg, Sn or an alloy may be used instead of Pb.

Carbon-zinc-chlorine primary electric battery. H. E. R. LITTLE. U. S., 1,163,834, Dec. 14. Structural features. Cf. C. A. 9, 179.

Primary electric battery. G. A. LUTZ. U. S., 1,163,163, Dec. 7. An annular sheet Fe or Cu receptacle with minute slits in its walls is used to hold the depolarizer, *e. g.*, Cu oxide, in alk. batteries such as the Gordon battery. Cf. C. A. 10, 154.

Treating lead storage battery plates. C. C. CARPENTER. U. S., 1,164,464, Dec. 14. Pb battery plates are rendered more durable and resistant to charging and discharging of the battery by treatment with a soln. of Ba persulfate which oxidizes the Pb of the plate and forms BaSO_4 which is diffused throughout the plate.

Storage battery plates. W. S. O'CONNOR. U. S., 1,164,746, Dec. 21. Structural features.

Electric furnace for treating molten iron or steel. C. HERING. U. S., 1,162,773, Dec. 7.

Tungsten filaments for incandescent electric lamps. T. A. EDISON. U. S., 1,163,329, Dec. 7. W is vaporized by an elec. discharge *in vacuo* and deposited on a revolving glass drum in the path of the discharge, then stripped from the drum and cut to the desired shape and size, or shaped on wax or metal of low m. p. which can be sepd., by fusion, from the W.

Arc-light electrode. I. LADOFF. U. S., 1,164,728, Dec. 21. An arc-light electrode containing at least 60% of C is made with 30–40% of Ba titanate, which gives a white flaming arc of high c. p. Titanates of Al, Mg, Ce and Th and Ti borate give similar results.

Electric ozone generator. M. P. OTTO. U. S., 1,163,768, Dec. 14.

Ozonizer; sterilizing liquids. H. GRUNER. Brit., 18,025, July 30, 1914. The ozonizer (see C. A. 9, 761) may be used for sterilizing liquids, *e. g.*, the liquid may be supplied through a nozzle into the injector chamber, so as to induce a current of ozonized air through the generator. The liquid and gas pass into and are mixed in a chamber which is provided with an inner member having a recess into which the liquid and gas pass to assist mixing. Cf. C. A. 9, 761.

Arc lamps; vacuum tubes. H. GREINACHER. Brit., 18,149, July 31, 1914. Electrodes of material not conductive when cold and not readily scattered, *e. g.*, a mixt. of zirconia or thoria or yttria, are supported within a bulb by tubes of glass, SiO_2 , etc., through which pass leading-in wires. A small gap is left at the inner end of each tube, or the electrodes themselves are tubular, so that a discharge passes first between the leading-in wires and then between the electrodes, which incandesce in consequence of their resistance. A high elec. pressure, say 2000 v. a. c., is used. The bulb may contain dry air, at a pressure of 5–20 mm. Hg, or may be filled with another gas such as N. Such lamps may be connected directly to overhead lines for street lighting. Reference is made to the use of C or metal filaments as cathodes.

Effecting chemical reactions with an extended arc. H. ANDRIESSENS and J. SCHNEIDEMANDEL. Ger., 285,111, June 24, 1913. Addition to 284,341 (C. A. 9, 3178).

5. PHOTOGRAPHY.

L. DERR.

Dichroic fog. E. COUSTET. *Rev. gén. sci.* 26, 599-600(1915).—Dichroic fog formed during development is always a surface effect; when produced in the fixing bath it extends through the film. It is usually caused by hypo, KCNS or NH_4CNS or other AgBr solvents in the developer, or by any Ag salt dissolved in the developer, or by developer in the hypo bath. High temp. and prolonged development favor its formation, and thick films are more prone to it than thin ones. Its prevention is accomplished by keeping hypo out of the developer, by washing off all developer from the plate before fixing, and by using an acid hypo bath which is to be discarded before complete exhaustion. It can be removed by a bath of 1:1000 neutral KMnO_4 , followed by diluted commercial NaHSO_3 liquor; or by a bath of water 100 cc., CuSO_4 3 g., NaCl 3 g.

L. DERR.

BAGSHAW, W.: *Elementary Photo-Micrography*. 3rd ed. London: Iliffe & Sons. 143 pp. 2 s, 6 d.

RHODES, H. J.: *The Art of Lithography*. New York: Van Nostrand Co. 344 pp. \$3.50.

Color photography. C. L. A. BRASSEUR. U. S., 1,163,207, Dec. 7. A positive is printed on a surface with red, green and blue-violet lines (or other subdivisions) by means of pure red, pure green and pure blue-violet light, using a negative with orange, yellowish green and violet-blue subdivisions.

Photography. O. DODGE. Brit., 18,298, Aug. 7, 1914. Process of producing a planographic or intaglio printing surface without sensitizing, which is applicable alternatively for ornamenting surfaces. A flexible paper base which has been floated upon a soln. of dextrin, albumin, and starch, is coated with a gum or gelatinous film and sensitized with dichromate. After exposure to the printing-negative, the film is damped by floating upon H_2O and transferred on to a transfer surface, using gentle pressure only. The exposed portions remain adhering to the flexible paper base, and the unexposed portions are transferred. The film is inked and is subsequently removed together with the ink thereon, leaving the design on the transfer surface where the surface was exposed. Gradation in the design may be obtained by breaking up the image of the printing-negative with a large or small dot or grain. Alternatively to preparing the surface with the design on as a printing-surface, the design may be used for ornamenting purposes.

Applying gelatin to glass for copying processes. ROTOPHOT, AKT.-GES. FÜR GRAPHISCHE IND. Ger., 284,805, Jan. 18, 1914. A piece of com. gelatin paper (paper with colorless gelatin coating) is sensitized as a pigment paper in the chromate bath, and dried. The entire surface of the sensitized paper is then exposed for a short time to natural or artificial light, and then softened in H_2O and applied as in the pigment process. After removal of the paper the film is developed with hot H_2O , whereby a layer of gelatin of uniform thickness is obtained which is insol. in hot H_2O and serves the purposes of the processes.

Photographic pictures in blue tones. FARBW. v. M. L. & B. Ger., 284,423, Feb. 24, 1914. The black pictures obtained according to 283,149 (C. A. 9, 2842) are converted into blue tones by the action of oxidizing agents. Photographic reducers serve as oxidizing agents, e. g., alkali ferricyanides, alone or in admixt. with Ag solvents such as $\text{Na}_2\text{S}_2\text{O}_3$ or KCN, also CuO-NH_3 soln., Fe_3Cl_6 soln., etc. Farmer's reducer

is preferred (fixing soln. with some $K_3Fe(CN)_6$). The process is especially suitable for the production of cinematographic films in blue tones. After treatment with Farmer's reducer the picture is washed thoroughly in running H_2O and dried.

Cylindrical light-printing machine. R. GROSSKOPF. Ger., 284,328, Nov. 7, 1913.

Apparatus for vignetting. G. S. BARBERIS. Ger., 283,913, Apr. 10, 1913.

Photographs of palimpsests. G. KÖGEL. Ger., 285,154, July 7, 1914.

Copying apparatus for developing paper. A. BRHLE. Ger., 284,193, Feb. 28, 1913.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

The thermal dehydration of stilbite, thaumasite, and the hydrates of magnesium sulfate and copper sulfate. H. E. MERWIN. *Z. Kryst. Min.* 55, 113-4(1915); see C. A. 9, 31. E. T. WHERRY.

Preparation of pure uranium and other metals. W. I. BARAGIOLA. *Schweiz. Apoth. Ztg.* 53, 477-8(1915); cf. C. A. 8, 2855.—A claim of priority. B. describes his prepn., in 1903-4, of U by chlorinating U_2O_5 with CO_2 and CCl_4 and reducing UCl_4 with Na. Kahlbaum and B. also prepd. chem. pure Cu by very slow distn. of electrolytic Cu in the vacuum of a Hg pump, each distn. consuming weeks. The Cu finally became faintly pink. S. WALDBOTT.

Separation of the rare earths giving the more soluble double sulfates from Brazilian monazite sand. C. JAMES AND A. J. GRANT. *J. Am. Chem. Soc.* 38, 41-7(1916).—The rare earth sulfates were treated with K_2SO_4 in smaller quantity than that required for complete pptn. of the Ce metals, and the soln. was then pptd. with oxalic acid. These oxalates were ignited to oxides in a coke-fired furnace, dissolved in HNO_3 , $Ce(NO_3)_3$ was reduced by adding some of the original oxalates, and the filtered soln. treated with slightly less than the theoretical amt. of HNO_3 which had been neutralized with magnesite. Since the soln. in HNO_3 took place with violence, the content of Ce could not have been large. Fractional crystn. of the double nitrates with Mg gave results which are shown in a large table. Details are given of the sepn. of Ce, La, Pr, Nd, Sa, Eu, Gd, Tb, Dy, Ho, and Yt, but in such a condensed form as to need no further abridgment. E. B. M.

Action of hydrogen sulfide on arsenic acid. WILLIAM FOSTER. *J. Am. Chem. Soc.* 38, 52-7(1916); cf. Usher and Travers, *J. Chem. Soc.* 87, 1370(1905).— As_2O_5 is never reduced directly to As_2O_3 and free S by H_2S as stated by Rose (*Ann. Phys. Chem.* 107, 186(1859)). When H_2S reacts with As_2O_5 the first product is H_3AsO_4S , which is somewhat unstable; in the presence of dil. acids it breaks down slowly to As_2O_3 and S and in the presence of high concns. of acid it is still more unstable. Concd. HCl brings about the decompn. *very quickly*, even at 0° . When solns. of As_2O_5 are treated with a *rapid* stream of H_2S , no reduction takes place, even if no mineral acid is present. As_2O_5 satd. with H_2S yielded pure As_2S_3 after the soln. had stood 91 hrs. No reduction occurred in solns. of As_2O_5 in the presence of HCl ranging in concn. from 0.9 to 32%, when solns. were treated at 15° with a *rapid* stream of H_2S . These conclusions are based on qual. and quant. expts. which have been made, but only a few of which are given in the article. E. B. MILLARD.

HEDVALL, J. A.: Ueber Reaktionsprodukte von Kobaltoxyden mit anderen Metalloxyden bei hohen Temperaturen. Upsala: 170 ss. 6 M.

7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Application of cryoscopy to chemical analysis. M. DRAPIER. *Compt. rend.* 161, 461-3 (1915).—Cryoscopic methods may be used for detg. the concn. of a particular constituent of an org. mixt. under favorable conditions. GEORGE W. MOREY.

Nephelometry (photometric analysis). I. History of method and development of instruments. P. A. KOBER AND S. S. GRAVES. *J. Ind. Eng. Chem.* 7, 843-7 (1915).—A brief general discussion is given and different nephelometers are described. K. and G. have designed a new instrument, the optical workmanship of which is based on the Dubosq colorimeter. The advantages of the new instrument are increased accuracy and the fact that it can be used as a colorimeter. The cost is \$36. The article is illustrated with many figures. E. W. BOUGHTON.

Qualitative microanalysis. F. EMICH. *Z. anal. Chem.* 54, 489-502 (1915).—A description of some of the methods of qual. microanalysis (no new material).

GEORGE W. MOREY.

A rapid precise standardization of acid solutions. MERLE RANDALL AND CHAS. C. SCALONZ. Univ. of Cal. *Met. Chem. Eng.* 13, 787 (1915).— Na_2CO_3 can easily be obtained of sufficient purity for standardizing acid solns., with the exception of the H_2O content. Since Richards and Hoover (*C. A.* 9, 734) have shown that Na_2CO_3 can be completely freed from H_2O without decompn. by fusion in an atm. of CO_2 , the main objection to its use as an acidimetric standard has been removed. The fusion in CO_2 can be easily carried out in a Pt crucible fitted with a Rose crucible cover and delivery tube. The subsequent operations are obvious. GEORGE W. MOREY.

The separation and estimation of aluminium and beryllium by use of acetyl chloride in acetone. H. D. MINNIG. Yale Univ. *Am. J. Sci.* 40, 482-5 (1915).—The method is similar in all details to that previously described for the sepn. of Al and Fe (*C. A.* 9, 771). Because of the slight solubility of BeCl_2 , the mixt. of AlCl_3 and BeCl_2 should not exceed 0.15 g. in wt., and should contain less than one third BeCl_2 . A double pptn. is required for the Al-Be sepn., and even then the Al_2O_3 tends to carry down BeO .

G. W. MOREY.

Volumetric determination of cerium by means of potassium permanganate. VICTOR LENHER AND C. C. MELOCHE. *J. Am. Chem. Soc.* 38, 66-70 (1916).—The reaction studied was $6\text{Ce}(\text{NO}_3)_3 + \text{K}_2\text{Mn}_2\text{O}_8 + 4\text{H}_2\text{O} = 4\text{Ce}(\text{NO}_3)_4 + 2\text{Ce}(\text{OH})_4 + 2\text{KNO}_3 + 2\text{MnO}_2$; in addition to the $\text{Ce}(\text{OH})_4$ formed in this reaction, the nitrate undergoes hydrolysis with the formation of more $\text{Ce}(\text{OH})_4$ and HNO_3 which tends to reverse the reaction. Some suitable neutralizing agent must be used to take up this acid. In the first series, standard $\text{Ce}(\text{NO}_3)_3$ was dild., an excess of ZnO paste was added, then most of the KMnO_4 in the cold, after which the soln. was brought to boiling, and the titration finished hot. Under these conditions a coarse granular ppt. was obtained which settled readily. The end point was sharp, and its permanence was tested by boiling the soln. for a minute after finishing the titration. Agreement within 0.0003 g. was obtained in the ZnO series, whether the whole titration was performed hot or only the end of it. Results with CaCO_3 were as accurate, but the reaction proceeded slowly, so that this neutralizing agent is not recommended for practice. Milk of magnesia was found to be one of the best neutralizing reagents. Satisfactory results were obtained with soluble reagents when too great an excess is not used. Borax (satd. soln.), NaHCO_3 , Na_2CO_3 gave good results, (low with Na_2CO_3), but NaOH , KOH , $\text{Ba}(\text{OH})_2$, NaOAc , Na_2SiO_3 , Na_2PO_4 , Na_2HPO_4 , Na_2WO_4 and Na_2AsO_4 were not satisfactory. The method is applicable to Ce^{III} in the presence of Ce^{IV} . E. B. M.

New method for the iodometric estimation of vanadium. HUGO DITZ AND FRIEDRICH BARDACH. Prague. *Z. anorg. allgem. Chem.* 93, 97-137(1915).—The method is based on the reduction of V_2O_5 to V_2O_4 in a small vol. by HCl and KBr, and iodometric titration of the liberated Br, after diln. The reduction and titration are carried out in a 1.5 l. flask fitted with a ground stopper carrying a separatory funnel and an absorption tube for retaining the evolved Br vapor in KI soln. The effect of various factors on the method was detd. using NH_4VO_3 soln., whose content of V_2O_5 was detd. by ignition; because of a V content less than the theoretical the V_2O_5 so obtained was tested by reduction to V_2O_4 with H, and found to be pure. Expts. showed the reduction of V_2O_5 solns. in the cold by HCl to be negligible, but HCl plus HBr gives complete reduction to V_2O_4 , without danger of V_2O_5 formation. HCl and KI give irregular results, at times higher than correspond to reduction to V_2O_4 , probably due to a secondary reaction with the air; dil. HI solns. are without action on V_2O_4 . A systematic study of the effects of varying various factors showed the following to be the best method of carrying out a detn. To 25 cc. of the V_2O_5 soln. contained in the above app. add 10 cc. 10% KBr soln. and 75 cc. concd. HCl, let stand 5 min., dil. with H_2O to 1 l., wash the KI soln. in the absorption tube into the app., add 20 cc. 5% KI soln., and titrate I with $Na_2S_2O_3$. H_2SO_4 can be substituted for HCl, but more is needed and an hr. is necessary for the completion of the reaction. GEORGE W. MOREY.

Determination of mercury in cyanide solution and precipitate. W. J. SHEARWOOD. *Mining Sci. Press* 111, 663-5(1915).—In cyanide soln.: Measure 1000 cc. soln. into a 2500 cc. acid bottle, give the contents a rotary motion, then add 0.5 g. of finest Al powder. After shaking violently for $\frac{1}{2}$ min. and ending with a rotary motion allow to stand 1 min. Repeat the above method of agitation at least 6 times. Shake the soln. and transfer to a 1000 cc. narrow-necked flask. Invert the flask over a Gooch filter $\frac{1}{2}$ inch below the rim, clamp it in position and filter with a good vacuum. After all particles have been transferred to the filter rinse once with H_2O , once with alc., then twice with a little ether. Heat the crucible gently until completely dry, transfer filter pad and contents to a Whitton app. for detn. of Hg. Using 1000 cc. of soln. every mg. corresponds to 1 part per million. If the soln. is very low in alkali or cyanide add 1 g. NaOH. In cyanide ppt.: Place weighed sample in a covered 150 cc. beaker and add 10 or 15 cc. dil. HCl. Add more HCl and heat until action slackens. Dilute with warm H_2O , stir, allow to settle and filter through a Gooch crucible using gentle suction. Heat the residue with a little more acid, dilute and filter as before. Transfer the residue to the filter, wash with hot H_2O until free from all chlorides, suck dry, wash once with 10 cc. alc., then at least twice with ether. The residue contains all the Hg. Transfer the residue with asbestos mat to the Whitton app. containing a weighed disk of Ag or Au foil. Add 5 g. clean Fe filings or crushed steel and a little well burned CaO to the residue and grind the whole. Cover with 2 or 3 g. Fe or CaO. Clamp the foil and cooler upon the retort and heat for 20 min. as with ores. Weigh the foil with condensed Hg. The Whitton app. is a flanged, wide-mouthed retort turned from a piece of mild steel. The cover is a Ag or Au foil, preferably Au, cooled by a flat-bottomed brass dish of H_2O , the whole system being connected by a clamp engaging a steel plate with a hole in which the crucible fits.

L. P. WEBBERT.

Nephelometric estimation of phosphorus. A correction. P. A. KOBER AND G. EGERER. *J. Am. Chem. Soc.* 37, 2373-81(1915); *C. A.* 9, 2855.—In the original abstract instead of "the reagent of Pouget and Chouchak" should be read "a modified reagent of Pouget and Chouchak contg. HCl in place of HNO_3 ." E. B. MILLARD.

Estimation of selenium in sulfur. W. SMITH. *J. Ind. Eng. Chem.* 7, 849-50 (1915); cf. Denigès, *C. A.* 9, 1287.—Weigh about 50 g. of finely ground S into an Erlen-

meyer flask and add a few more cc. of Br than g. of S taken; allow to stand 15 min. Transfer to a 100 cc. sepg. funnel and shake vigorously with 40 cc. Br water for 1 min.; sep. the S_2Br_2 from the aq. soln. and pour the latter through a wetted filter paper. Add about 2 cc. of Br and 40 cc. Br water to the S_2Br_2 and repeat the extn. 4 times, the last ext. being kept separate. If S seps. during extn. add more Br. Boil the solns. (the combined first 3 extns. and the last) till clear and remove any free Br by addition of K_2SO_4 until soln. is just colorless. The Se may commence to ppt. at this stage. Dil. to about 250 cc., add 15 cc. HCl and about 5 g. KI, and boil. Proportionately less HCl and KI are added to the last extn. Se is completely pptd. and is gradually converted to the black allotrope. Remove free I with a few cc. of K_2SO_4 soln., boil for 20 min., filter through a tared Gooch crucible, wash the Se with hot H_2O and dry to const. wt. at 100° . If Se is found in the last ext., extn. is repeated as often as necessary. Expts. with mixts. containing known amts. of Se showed the method to be accurate. Te, if present, will be estd. as Se. To det. Te use the method of Browning and Flint (cf. C. A. 3, 2919).

E. W. BOUGHTON.

Determination of carbon dioxide in carbonates decomposed by solutions of ammonium chloride. A. CAVAZZI. Bologna. *Ann. chim. applicata* 4, 137-44(1915).—The method is based on the fact that small amts. of finely powdered carbonates of Ca, Ba, Sr, Mg, Zn, Pb, Cd, Bi, Cu, Li, Na, K and probably of other metals, when brought into contact with a boiling soln. of NH_4Cl , are slowly decompd. and dissolved, the carbonate changing into sol. chloride and the CO_2 evolving as $(NH_4)_2CO_3$. In this method the presence of organic substances in the carbonates is of no importance, and the rather serious inconveniences involved by certain impurities as H_2S , SO_3 , etc., in other methods, are here avoided. A soln. of $CaCl_2$ in NH_4OH is used to absorb the vapors of $(NH_4)_2CO_3$, on account of the less solubility of $CaCO_3$ than of $BaCO_3$. The prepn. of solns. and the app. employed are similar to those previously indicated (C. A. 9, 3310). The generator, however, has a capacity of 150-200 cc., and receives the carbonate in question and the NH_4Cl soln. In the collector there is always placed 40 cc. of the ammoniacal soln. of $CaCl_2$, contg. 1.66 g. $CaCl_2$. In testing some carbonates and special mixtures contg. carbonates which react in the warm with NH_4Cl and give a rapid and abundant evolution of ammoniacal vapors, the descending tube should be 60-5 cm. long and be provided with a stopcock. It is important that the samples should be finely powdered in an agate mortar, this applying also to carbonates obtained by chem. pptn. In testing argillaceous limestones 1 g. samples are taken, or when the clay is in excess, 1.5 g. The operation should take about 1.5 hrs. In this method the insol. residue contains, besides all the SiO_2 , Al_2O_3 and Fe_2O_3 , also a large part or all of the CaO and MgO that occur as silicates, and more rarely as phosphates, in marly clays. In testing cements, 4 g. material should be taken, and must be very finely powdered. Presence of sulfides, sulfites and hyposulfites does not interfere with the accuracy of the detn. In testing fat and hydraulic limes, the boiling should be continued for $1\frac{1}{4}$ hrs. Gypsum should be taken in samples of 10 g., or if contg. much $CaCO_3$ or $MgCO_3$, 5 g. or less are sufficient. Confirmatory tests were made on carbonates of arable soil, of ashes, alk. carbonates, on white lead, Bi carbonate, malachite, azurite and siderite.

S. LÉVY.

A modified method for determining carbon-free ash in plant substances. G. E. BOLTZ. *J. Ind. Eng. Chem.* 7, 859-60(1915).—Ignite 2-10 g. in a Pt dish over a low flame until most of the C is burnt off. Cool, cover with a watch glass and add 20 cc. hot H_2O . Filter into a tared 200 cc. Erlenmeyer flask, wash 3 or 4 times with hot H_2O , replace filter and contents in dish, and dry and ignite. Transfer remaining ash to the Erlenmeyer flask with hot H_2O and a policeman. Evap., dry at 110° and weigh. This wt. represents crude ash. Connect flask with app. for detg. CO_2 (cf. C. A. 7, 1994), add dil. HCl and det. CO_2 . Unburned C, sand and SiO_2 are detd. by the method

given in *Bull.* 107, U. S. Bur. of Chemistry. The CO_2 plus unburned C and sand is subtracted from the wt. of the crude ash. The remainder represents the amt. of C-free ash.

E. W. BOUGHTON.

A new reaction of isothiocyanates. G. DENIGÈS. *Bull. soc. chim.* 17, 380-1 (1915).—The alkali isothiocyanates give with Hg^{++} salts a cryst. ppt. of $\text{Hg}(\text{NCS})_2$, which seps. from 1% solns. The reaction is slow, not extremely sensitive, and is far from being characteristic. A better qual. test is that depending upon the formation of dithiotrimercuric salts according to the equation: $2\text{MNCS} + 3\text{HgSO}_4 + 4\text{H}_2\text{O} = \text{S}_2\text{Hg}_3\text{SO}_4 + 2\text{CO}_2 + 2\text{NH}_3 + 2\text{MHSO}_4$. To the soln. to be tested add 1-2 times its vol. of HgSO_4 soln., shake, filter if necessary (presence of alk. earths), and heat slowly to boiling. In presence of CNS^- a ppt. appears which under the microscope shows regularly radiating groups of prisms. Sensitivity, 0.25 g. HCNS per l. H. L. OLIN.

Rapid method for detecting mineral poisons in water. E. FLEURY. *J. pharm. chim.* 12, 215-20 (1915).—With a few test tubes and 4 reagents (HCl , Na_2S , SrSO_4 , and alk. Na-picrate paper, Grignard's reagent for HCN), a scheme of detection of As, Sb, Hg, Cu, Pb, Sn, Zn, Al, Ba, cyanides and nitroprussides in H_2O is given. In the case of cyanides, the moistened paper suspended over the liquid from which HCN is set free by boiling with 2 drops of HCl , turns a deep mahogany color. S. W.

The detection of methyl alcohol in ethyl alcohol. UMBERTO PAZIENTI. *Univ. Padua. Atti reale ist. Veneto, sci. lettere ed arti.* 74, 553-5 (1915); see *C. A.* 9, 2206.

E. J. WITZEMANN.

Simple method of obtaining melting points of fats, etc. A. W. KNAPP. *J. Soc. Chem. Ind.* 34, 1121-2 (1915).—The substance is placed on the bulb of the thermometer. The thermometer is inserted in a stoppered test tube, which acts as an air bath, and the test tube is placed in a beaker of water or glycerol. The liquid should be boiled and cooled to prevent the formation of bubbles on the side of the beaker. *For fats, waxes or fatty acids:* Very fine scrapings taken with the point of a knife are transferred with as little injury as possible to the bulb of the thermometer. They should cover less than $\frac{1}{2}$ of the bulb. Under these conditions one can plainly see when the sharp outline of the scrapings begins to soften, and also when the fat is completely transparent. *For cryst. organic substances:* If the bulb of the thermometer be pushed into a powdered organic substance some of the powder adheres. A very faint film, or a few crystals, is all that is necessary. The powder reflects irregularly the light coming from the mirror surface of the bulb, and the point at which the substance becomes liquid is plainly seen. A cryst. substance which does not adhere should be powdered.

E. J. C.

Purification of filter paper with hydrofluoric acid. A. GAWALOWSKI. *Raitz b. Brünn. Z. anal. Chem.* 54, 503 (1915).—A brief statement of the applicability of this method and of precautions to be observed in using it. GEORGE W. MORREY.

Estimation of sulfurous acid and sulfites and bisulfites. EDMUND KNECHT AND EVA HIBBERT. *J. Soc. Dyers and Colourists* 31, 209-10 (1915).—The method described was suggested in a recent paper by Knecht (*C. A.* 9, 2984). It depends upon the reduction of chromates by H_2SO_3 and subsequent estn. of the excess of chromate by the titanous chloride method. The new method is rapid and exact and is free from the uncertainty which is attached to the iodine method. L. A. OLNEY.

Separation of hydrogen and methane, catalysis of oxygen-hydrogen mixtures (HOFMANN) 2.

BACH, C.: *Ingenieur Laboratorium und Materialprüfungsanstalt der königlichen technischen Hochschule Stuttgart.* Stuttgart: K. Wittwer. 1.50 M.

GOOCH, F. A.: *Representative Procedures in Quantitative Chemical Analysis.* New York: Wiley. 258 pp. \$2.00.

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8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR, T. WHERRY.

A crystallographic investigation of several minerals from the Pfälz. H. STRINMETZ AND B. GOSSNER. Munich. *Z. Kryst. Min.* 55, 156-61 (1915).—The region is characterized by the association of the Hg minerals cinnabar, amalgam, and calomel, with barite. Crystallographic measurements of all 4 minerals are given. A. W.

Decomposition of smaltite and löllingite by atmospheric oxidation. A. BEUTEL AND F. LORENZ. Breslau. *Centr. Min. Geol.* 1915, 359-73.—Forty-three dependable analyses of smaltite ("Speiskobalt") heretofore published, and 3 new ones by L., are tabulated, and the ratio of Co:As found to vary from 1:3.30 to 1:1.32. So-called skutterudite ("Tesseralkies") shows similar relations, the ratio of Co:As in 11 analyses varying from 1:3.14 to 1:2.65. The latter mineral thus shows no sharp distinction from the former, and the two are to be regarded as the same species. Previous attempts to det. the cause of this variability have been unsuccessful. Expts. were made on carefully analyzed material from Riechelsdorf, of which 3 specimens showed the ratios Co:As = 1:2.85, 1:2.87, and 1:2.53. Heating in a vacuum to 410° showed the absence of free As, but after long heating at 510° the product had the compn. CoAs, although in the heating curve no breaks occurred at points corresponding to any intermediate compds. such as CoAs₂ or Co₂As. On covering the mineral powder with dil. HCl and exposing to the air, the dissolved material had at first the ratio Co:As = 1:2.5, ultimately 1:3, while the residue had 1:2. It is concluded that natural smaltite contains both CoAs₂ and CoAs, but that the existence of Co₂As₃ is not certain. In like manner löllingite was studied, and from 29 analyses the ratios found to vary from Fe:As = 1:2.08 to 1:1.32 if the S is regarded as present as FeAsS, or from 1:2.38 to 1:1.32 as FeS, the former being the more probable. The oxidation expts. proved the existence of both Fe₂As₃ and FeAs₂ in natural löllingite. E. T. W.

Remarks on the chemical constitution of certain minerals. F. ZAMBONINI. Z. *Kryst. Min.* 55, 132-55 (1915).—*The nepheline group*: Z. does not agree with Thugutt (C. A. 8, 3170) that the nephelines heretofore analyzed have consisted of a mixt. of a primary mineral with decompn. products. Most clear nepheline does not agree with Thugutt's formula, and the relation Na:K does not have to be constant. Z. concludes that the group consists of combinations of Na₂Al₂Si₂O₈, K₂Al₂Si₂O₈, CaAl₂Si₂O₈, Na₂SiO₃, and NaAlO₂ (this latter mol. has not as yet been observed in nepheline itself), and that the excess Si and excess Al are to be disposed of as Al₂O₃ and Al₂SiO₅. In the cancrinite sub-group Cl, SO₃ and CO₂ play a part in the constitution of the above named mols. *Augite*: Z. discusses at length the work relating to the chem. constitution of augite and agrees in most respects with Boeke (C. A. 9, 2045; 10, 31). The relationship SiO₂:(Ca Mg Fe Mn)O = 1:1 as postulated by the modified Tschermak hypothesis, does not hold. Z. concludes that ordinary augite consists of R'SiO₃, R'R₂'O₄ and rarely small amts. of R'R₃' (SiO₃)₄, the silicate R'R₃'SiO₃ playing

no part in its constitution. *Enstatite and hypersthene*: From a study of all available analyses Z. concludes that also in the case of these minerals the Tschermak hypothesis that $\text{SiO}_2:\text{R}^*\text{O} = 1:1$ does not hold, but that they are made up of the same compds. as augite, the silicate $\text{R}^*\text{R}_2\text{SiO}_3$, playing no part in their constitution. *Babingtonite*: This mineral is entirely distinct from augite, being composed of simple metasilicates of bi- and trivalent elements. A. WANDTKE.

The geology of the Waihi Grand Junction Mine. ARTHUR JARMAN. *Bull. Inst. Mining Metallurgy* 133, 38 pp.(1915). Discussion. H. F. BAIN, J. A. L. HENDERSON, W. FRECHEVILLE, A. JAMES, G. P. ASHMORE, A. E. KITSON AND S. J. LETT. *Ibid* 134, 3-11(1915).—The ores consist of Au-bearing quartz occurring in veins in dacite beneath andesite and rhyolite, all the rocks being greatly altered (propylitized). Bell and Fraser (*New Zealand Geol. Bull.* 15(1912)) considered the productive rock to be an intrusive, cutting bedded flows of lava of the same compn. J. can discover no line of demarcation between these 2 formations and, further, finds flow structure throughout, and [apparently believing that flow structure can not occur in an intrusive] concludes that no intrusive exists, but that the rocks are all bedded flows. Dark colored partings, called carbonaceous (although analysis shows only minute amounts of C) are also cited as evidence. It is concluded that ore may be expected to continue far beyond the limits of the supposed intrusion. The discussion brings out the point that the relations are by no means as simple as concluded by J. E. T. W.

Discovery of platinum in Spain. ROBERTSON HONEY. *Commerce Reports* 290, 993(1915); *Elec. World* 66, 1393(1915).—Pt deposits have been discovered by Orueta who was appointed by the Instituto Geológico to exam. the Ronda Mountain Range for possible mineral deposits. The new Pt deposits are believed to be richer and of greater extent than those of the Ural Mountains. E. H.

Petroleum in Colombia. ISAAC A. MANNING. *Commerce Reports* No. 286 937(1915).—Petroleum seepages, heretofore unrecorded, have been found in the districts bordering on the Magdalena River as far south as Girardot. E. H.

Plutonic rocks from the Canary Islands. C. GAGEL. Berlin. *Centr. Min. Geol.* 1915, 373-84.—A petrographic description, with 6 analyses, of various granitic rocks. E. T. W.

Natural gas (HAGER) 21.

HANMAN, W. D.: Practical Geology and Mineralogy. Rev. ed. Pasadena, Cal.: Way Press. 253 pp. \$2.50.

9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Washed metal. H. D. HIBBARD AND E. L. FORD. *Bull. Am. Inst. Min. Eng.* 1915, 2387-97.—The washing process consists in oxidizing out the impurities in Fe by the O of the fettling, the metal being kept at above its melting point. It was described by Holley (*Trans. Am. Inst. Min. Eng.* 8, 156(1879)) as then applied in the Krupp works. The only plant using it in this country is the Briar Hill Steel Co. of Youngstown, O. The product has a limited use in acid steel furnaces and as a carburizer in crucible steel. A plan and description of the Briar Hill plant are given. The metal is run from the blast furnace to a reservoir, where it is kept molten, and drawn off as required to the washing (Pernot) furnace which has a circular, revolving hearth. The fettling is a high-grade hematite packed so as to be practically monolithic. During the first 10 min. essentially all Si and Mn, and 75 to 80% of the P is oxidized out. In

15 min. 25 to 30% of the S is removed. At this stage, the slag is run off, and CaO added, the heat being continued to remove more P and S. Tests are taken at intervals about 5 to a heat. The test cakes when broken up show bubbles, and a faint crystalline structure. The larger the bubbles, and the fainter the crystalline appearance, the lower the P. But little C is removed. When Fe charged with C is in contact with Fe_2O_3 , both molten, formation of CO occurs at a high temp. The reaction is endothermic and the consumption of heat soon brings the temp. down to the point of stopping. This point is believed to be near 1300° . The proportion of P in the washed metal is inversely related to the amount of CO formed in a given period. As to removal of the S, the proportion in the metal bears a constant ratio to that in the slag. Curves of the elimination of Si, Mn, P and S are given. E. WALLER.

Cyanide treatment of flotation concentrate. C. BUTTERS AND J. E. CLENNELL. *Mining Sci. Press* **111**, 778-85 (1915).—Results are given of research on the application of a method of roasting, water washing and cyanide to a concentrate produced by flotation. The ore chosen (the value consisting essentially of Au) was a product of the San Sebastian mine in Salvador. The concentrates were prepd. by a modified type of the Minerals Separation flotation machine with the usual frothing agents. The results obtained indicate that the San Sebastian concentrate produced by flotation may be treated successfully by this method. The most favorable results were obtained when roasting was carried out at a low temp. Thorough washing was essential for high extn. Best results were obtained with a strength of 0.125% KCN. Assuming an extn. of 98% based on results obtained with the above method, the authors figure a net saving of \$2.26 per ton of raw ore treated. An added saving of \$0.48 in cyanide (cyanide at \$0.16 a lb. of KCN equiv.) is made, making a total saving of \$2.74 a ton or about \$9600 on a monthly output of 3500 tons. L. P. WEBBERT.

Cyanidation in Western Australia. V. F. S. LOW. *Mining Sci. Press* **111**, 819-23 (1915).—Equipment of the plant at the Corinthian North Mine is described. Oxidized ore (depth 90 ft.) is mined and treated. The sulfide ore (pyrrhotite) underlying the oxidized ore will be treated when additions to plant are completed. On entering the 20 stamp battery the ore comes into immediate contact with NaCN soln. and CaO (120 lbs. CaO to 10 tons ore under normal conditions). The crushed material is conveyed by launder to a 4 in. centrifugal pump which passes it to 2 cone separators (diam. 6 ft., depth $7\frac{1}{2}$ ft.). The overflow enters 2 thickeners, 25 ft. diam. The underflow from the cones enters 2 tube mills, the discharge of which unites with the material leaving the battery. The underflow from the 25 ft. thickeners enters 4 agitators (diam. 18 ft., depth 8 ft.) where NaCN is added to give a final strength of 0.05%. After agitation the pulp is pumped to 2 Ridgway filters; these are described in detail. The rate of wages paid in the mining and treatment departments is given. The cost of production has amounted to 63.62 c. per ton (2000 lbs.) and the treatment \$1.26 per ton, the final total cost amounting to \$2.35 per ton of ore raised and treated. L. P. W.

Metallurgy in the Coeur d'Alenes. H. A. MEGRAW. *Eng. Min. J.* **100**, 827-30 (1915).—A general description is given of the methods of milling in this district. The ores are varied and complex so that differing methods are used at nearly every mine. The fine structure and presence of blende and siderite cause serious metallurgical problems. Flotation has been of great assistance in aiding metal recovery from finely ground ores. L. W. RIGGS.

Gas-fired reverberatory furnace at Sulitjelma, Norway. C. OFFERHAUS. *Eng. Mining J.* **100**, 1033-7 (1915).—Concentrates from the Elmore vacuum oil-flotation process are roasted in an 8-hearth Wedge furnace and smelted in a gas-fired reverberatory furnace which has a regenerator for preheating the combustion air. Magnesite brick

and water-cooling pipes are used in the back part of the furnace to resist the strongly basic slag that is formed. E. J. C.

Open-hearth₁ furnace roof. ANON. *Iron Age* 95, 1284-5(1915).—In this, the Orth method of construction (cf. *C. A.* 9, 1299), the arch is built preferably of special brick shapes having a depth of 3-6 in. greater than regular roof brick. The construction is such that the roof is relieved of the function of supporting itself, and the extent to which it may be allowed to be burned away is much increased. This method of construction makes possible repairs that could not be applied₂ to the ordinary roof. L. W. RIGGS.

Determination of mercury in cyanide solution and precipitate (SHARWOOD) 7.
Bronzing processes for brass and copper (BAKER) 4.

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Apparatus for flotation separation and sulfating of ores. H. B. HOVLAND. U. S., 1,164,188, Dec. 14.

Apparatus for leaching metals from ores. B. R. KOERING. U. S., 1,163,828, Dec. 14.

Apparatus for leaching ore-pulp. B. MACDONALD. U. S., 1,163,097, Dec. 7.

Apparatus for sulfating ores. H. B. HOVLAND. U. S., 1,164,187, Dec. 14.

Apparatus for sulfating, sulfidizing and flotation of ores. H. B. HOVLAND. U. S., 1,164,189, Dec. 14.

Recovering metals from cyanide solutions. H. FORSTERLING and A. L. HALVORSEN. U. S., 1,164,636, Dec. 21. A cyanide soln., obtained, *e. g.*, from Cu, Au or Ag ore, is treated with a film of Na amalgam in a rotating drum to ppt. the metal from soln.

Apparatus for precipitating metals from cyanide solutions. B. R. KOERING. U. S., 1,163,829, Dec. 14.

Recovering zinc from an acid sulfite solution. C. S. VADNER. U. S., 1,163,286, Dec. 7. The soln. is continuously electrolyzed for the recovery of Zn and elimination of SO₂ and acid formed is partially neutralized during the process by the addition of basic Zn carbonate and lime.

Ore-roasting furnace. J. C. SIMMONS. U. S., 1,164,761, Dec. 21.

Ore-roasting furnaces. L. B. SKINNER. U. S., 1,164,130-1-2, Dec. 14.

Furnace for roasting ore. H. F. WIERUM. U. S., 1,162,894, Dec. 7.

Smelting sulfide ores. G. HAGLUND and A. GRÖNNINGSÄTER. U. S., 1,163,234, Dec. 7. The ores are continuously smelted in a converter-like furnace.

Smelting zinc ores. W. MCA. JOHNSON and E. W. HALE. U. S., 1,165,371, Dec. 21. Partly desulfurized high grade Zn ore is mixed with C and heated in fire-

clay retorts to not above 1150° to recover part of the Zn without forming slag and the residue is mixed with additional C and smelted electrically to obtain the residual Zn and other values.

Recovering iron from sulfides. L. T. WRIGHT. U. S., 1,164,049, Dec. 14. Pyrite or other Fe sulfides are heated to about 3000° to volatilize the S content and produce pure metallic Fe.

Smelting ferruginous copper sulfide ores. J. H. KLEPINGER, M. W. KREJCI and C. R. KUZELL. U. S., 1,164,653, Dec. 21. Cu sulfide ore containing Fe is sprayed into a chamber together with flux and powdered fuel and the mixt. is ignited, additional ore and flux being supplied after ignition, and air is supplied sufficient to oxidize the S and Fe and slag the Fe. The temp. is maintained sufficiently high to fuse the matte-forming Cu sulfide and slag while the particles are in suspension and raw material is added to the fused product to counteract any overoxidation. Cf. C. A. 10, 167.

Steel. A. C. DINKEY. U. S., 1,162,755, Dec. 7. High-P pig Fe is dephosphorized in a basic furnace, then mixed with undephosphorized pig Fe high in Si and the mixed metals are bessemerized in an acid converter.

Strengthening castings of steel, iron and alloys. H. E. FIELD and F. C. T. DANIELS. U. S., 1,164,487. Dec. 14. The castings are packed in old foundry sand or other inert material and heated in a furnace for at least 5 hrs. and preferably 2 or 3 days at a temp. of 675° and then allowed gradually to cool to 450° after which the supply of heat to the furnace used is shut off and the castings are allowed to cool in the closed furnace, to atm. temp.

Plating iron or steel with aluminium. F. MOENCH. U. S., 1,165,338, Dec. 21. The surface of Fe or steel is freed from oxidized matter and org. substances by successive treatment with hot HCl and with KMnO_4 and KClO_4 . The article is heated to a dull red heat and rubbed with a piece of Al previously washed with H_2O_2 and heated almost to the m. p. and the Al coating thus formed is smoothed while molten and allowed to cool slowly.

Alloy for non-rusting edged tools. P. J. A. DOUGLASS. U. S., 1,163,813, Dec. 14. Ni 67 is combined with Cu 33, ferro-Si 10 and Cr 2 parts.

Copper-alloy-coated zinc lithographic plates. F. NIEMEYER. U. S., 1,163,166-7, Dec. 7.

Hydrogen; sulfur; treating ores. W. M. HOOTON. Brit., 18,007, July 30, 1914. Metallic sulfides and sulfide ores, especially Fe pyrites, are treated with steam at 750 – 1000° , the products being porous oxides comparatively free from S and a mixt. of H, S, H_2S , and SO_2 . The H is purified, the S being sepd. during the purification. The pyrites are fed into a retort into which steam is blown. S condenses in the upper part of the retort and collects in a seal, and the gaseous products pass through a hot chamber containing bog Fe ore or porous Fe oxide obtained by the reaction to induce reaction between H_2S and SO_2 , then through a chamber in which S condenses in powder form, then through a cooler preferably containing cold bog Fe ore to remove the last traces of H_2S , and then through H_2O to remove any SO_2 . The steam may be superheated etc. To reduce the quantity of H_2S , the gases may be cooled quickly after leaving the retort.

Agglomerating iron ores. D. V. HOLLINGWORTH and R. C. MACGOWAN. Brit., 18,103, July 31, 1914. Blackband and like Fe ores are coked at a red heat with exclusion of air, and volatile constituents are recovered. The coked product contains particles of Fe oxide and C in very intimate contact, and part of the C is in chem. combination with the Fe.

Treating complex ores. C. J. INGLIS. Brit., 18,682, Aug. 14, 1914. Complex sulfide ores are chlorinated in the presence of NaCl or, if containing much Fe, are mixed with NaCl and subjected to a chlorinating roast, and the product is treated with hot H₂O to ext. sol. chlorides. A sol. iodide, such as kelp, KI, or ZnI₂, is then added to ppt. Ag, Au, and Pb iodides, which are reduced to the metallic condition by scrap Zn, thus re-forming ZnI₂ for use again. From the mother liquor, Cu is removed by electrolysis or treatment with Fe, and the ZnCl₂ remaining may be electrolyzed to regenerate the Cl and recover the Zn. The residue of the ore contains the Sn, which is recovered by washing, and the Bi and Te are rendered sol. and the soln. run off.

Cementation. SOC. ANON. ITALIANA G. ANSALDO & CO. Brit., 18,386, Aug. 7, 1914. In a process for the cementation of armor plates, in which both solid and gaseous agents are used, the plates are arranged vertically, two by two, on the hearth of a furnace so as to enclose, with two other metal plates or blocks, a space into which the solid agent is charged at the top and the gaseous agent is introduced at the bottom through pipes. The solid agent between the plates is gradually replaced as consumed from refractory receptacles. The furnace may be gas-fired and comprize one or two movable hearths.

Heat-treating steel. SOC. ANON. ITALIANA G. ANSALDO & CO. Brit., 18,387, Aug. 7, 1914. In a process of heat-treating steel articles such as gun parts and armor plates, the article is heated first to a temp. in the neighborhood of the first arrest on the cooling curve, such temp. being maintained const. during a certain interval, after which the temp. is gradually lowered to a second detd. temp. which is somewhat higher than the last arrest on the cooling curve, and is maintained const. for a shorter time than the first. The article is then cooled, and the treatment may be followed by an ordinary tempering or reheating. In specific examples, the first temp. may be 1070° or 1000°, and the second temp. 680° or 800°. Steels containing: (1) C 0.25, Mn 0.4, Si 0.1, S 0.005, P 0.008, Ni 2.56, Cr 0.55, V 0.15, W 0.78%; and (2) C 0.4, Mn 0.6, Si 0.15, S 0.009, P 0.02, Cr 2.2, and Ni 2.5%, are referred to.

Melting metals. J. E. LOWDEN. Brit., 18,429, Aug. 7, 1914. Means are provided for maintaining a const. level in the melting pot.

Furnaces. A. W. CALVERT. Brit., 18,460, Aug. 8, 1914. A gaseous fuel furnace for removing Sn, Pb, or other metallic coating from sheets, hollow metal ware and similar articles, comprizes a hopper, having inlet and outlet doors, from which the articles are fed on to two or more traveling conveyers arranged tandem-wise. Means are provided for collecting the molten metal, and the articles finally pass into a collecting chamber, from which they are discharged.

Cover for hardening vessels for ore briquets, lime sandstone. G. KRÄSTING. Ger., 285,340, May 1, 1914.

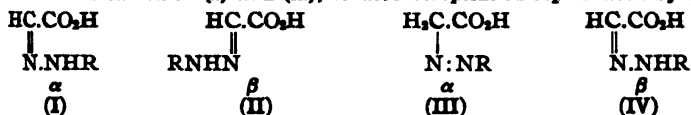
Permanent mold for casting spoke- and disk-wheels. F. ROEMER. Ger., 285,032, June 12, 1913.

10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

Isomeric hydrazones of glyoxylic acid. M. BUSCH, FRIEDR. ACHTERFELD AND RUD. SEUFERT. Univ. Erlangen. *J. prakt. Chem.* 92, 1-39(1915).—The occurrence of hydrazones of OHCCO₂H in 2 isomeric forms has previously been noted in only 2 cases, that of phenylhydrazone-*o*-nitrophenylglyoxylic acid [cf. Fehrlin, Ber. 23, 1574(1890)] and of *o*-bromophenylhydrazoneglyoxylic acid [cf. Busch and Meussdörffer, C. A. 1, 1719]. The *o*-nitrophenylhydrazoneglyoxylic acid has been previously

prepd. [cf. Elbers, *Ann.* 227, 353(1885) and B. and M., *loc. cit.*] and is described as occurring in but 1 form. B., A. and S. have now found that this hydrazone and also several other substituted hydrazones of OHCCO_2H may be isolated in 2 forms, one difficultly sol. in C_6H_6 and predominating when the reaction between $\text{Cl}_2\text{CHCO}_2\text{H}$ and the corresponding hydrazine is carried out in the presence of alkali carbonates or bicarbonates, and the other form, readily sol. in C_6H_6 , with its formation favored by the presence of caustic alkali. The former is designated as the α -form, while the latter, sol. in C_6H_6 , is called the β -form. Two types of isomerism are theoretically possible, stereoisomerism as shown in (I) and (II), or desmotropism as represented by (III) and



(IV). The authors favor (I) and (II), basing their views on the following facts: (1) Two series of salts, esters, and Bz derivs. are formed, *i. e.*, the isomerism continues in the derivs. (2) There is no marked difference in the intensity of color in the 2 forms. (3) The acids are rather stable and are not very readily converted one into the other; alc. HCl or H_2SO_4 more or less isomerizes the β -form; under certain conditions alkali will convert the α - into the β -form, but an *o*-substituent must usually also be present. Heating the free acids at the m. p. to produce isomerization is unsatisfactory, due to decompn.; when the esters are similarly treated, an equil. is established after some time, in which the β -form usually predominates. When heated in indifferent solvents, the acids are more or less easily decompd., while the esters remain unchanged and are not isomerized. (4) Ac_2O causes the β -form of the esters to rearrange, forming the same Ac compd. as the α -ester. (5) Both isomers are unattacked by Zn dust + AcOH . (6) HNO_3 reacts with both forms of the acids giving, in most cases, one and the same HON:CHN:NR ; many *o*-substituted hydrazones fail to react and only the α -forms of the esters are attacked by HNO_3 . (7) Dialkylhydrazones, $\text{R}_2\text{NN:CHCO}_2\text{H}$, occur in only one form. (8) The elec. cond. of the β -acids is about 2.5 times as great as that of the α -acids. Points 6 and 7 cannot be explained on the assumption of stereoisomerism, and these reactions will be further investigated. While a substituent in the *m*- or *p*-positions of the PhNHNH_2 has little influence on the proportions of the isomers formed, an *o*-substituent distinctly favors the formation of the β -form, to the entire exclusion of the α -form in some cases. To prep. the α - and β -forms of phenylhydrazoneglyoxylic acid, 10 g. $\text{Cl}_2\text{CHCO}_2\text{H}$ in 10 g. H_2O were treated with 17 g. KOH (4 mols.) in 30 cc. H_2O and 8 g. PhNHNH_2 in alc. added. The mixt. was then heated at 100° for 2 hrs., freed from alc., shaken out with Et_2O , freed from Et_2O and acidified with AcOH , when the acid K salt of the α -acid sepd. The free α -acid, previously described, is pptd. from aq. solns. of this salt by HCl in excess; stout brownish needles from alc., m. (not sharply) 138° , decomp. $142-3^\circ$, varying according to the rate of heating; yield, 4-5 g.; acid potassium salt and acid sodium salt, compns. indefinite; normal sodium salt, $\text{C}_6\text{H}_5\text{O}_2\text{N}_2\text{Na}$, sepg. from alk. solns., leaves from H_2O or alc., shrivels 250° , but does not m. below 300° ; ammonium salt, $\text{C}_6\text{H}_5\text{O}_2\text{N}_2$, pptd. from NH_3 soln. by AcOH , amber prisms efflorescing in the air with the evolution of NH_3 , m. 175° with effervescence; Me ester (a), needles or leaves from alc., m. $136-7^\circ$ [cf. Harries, *Ber.* 36, 1936 (1903)]; acetyl derivative of (a), formed when (a) is heated with Ac_2O + fused AcONa at 100° for 1 hr., needles from dild. alc., m. 105° . Two mols. of (a) condense in the presence of very concd. alc. HCl to form ethyl benzeneazoacetylphenylhydrazoneglyoxylate, $\text{PhN}(\text{COCH}_2\text{N:NPh})\text{N:CHCO}_2\text{Et}$, orange-red needles from alc., m. 154° , which is decolorized by Zn + AcOH ; yield, 70%; the free acid, obtained on gentle warming with dild. KOH , orange-yellow needles from abs. alc., m. 225° with effervescence. β -

Phenylhydrazonегlyoxylic acid is pptd. by HCl in excess from the AcOH soln. remaining after the pptn. of the acid K salt of the α -form. It is sepd. from a small amt. of the α -form by extg. with C_6H_6 , from which the β -form seps. in clusters of yellow needles on concg. or dilg. with petr. ether; yield, 2.0 g.; yellow needles from alc., shriveling 125° and m. $128-9^\circ$ (decompn.); *ammonium salt*; *sodium salt*, yellow leaves, shrivels 230° and m. indefinitely at about 273° (decompn.); *methyl ester* (b), from the Ag salt and MeI or the free acid and Me_2SO_4 , yellow crystals from petr. ether, m. 70° (not sharply); the α -ester partially rearranges to the β -form on heating at $145-50^\circ$, but when the β -acid is treated with $MeOH + H_2SO_4$, it rearranges largely to the α -form with accompanying esterification. Thus, while the esters of the α -forms were best obtained by esterification in the presence of H_2SO_4 , the esters of the β -acids had to be prepd. by another method—the Me esters by shaking at room temp. with an excess of Me_2SO_4 and Na_2CO_3 . (b) + Ac_2O gives the Ac deriv. of (a). The phenylazoformaldoxime obtained by the action of HNO_3 on the β -acid is identical with that prepd. from the α -form (cf. B. and M.). The following glyoxylic acid hydrazones were prepd. and sepd. in a similar manner. *asym. m-Xylylhydrazonегlyoxylic acid*; α -form, yellow leaves, m. $125-6^\circ$ with effervescence; *sodium salt*, yellow leaves; β -form, obtained almost exclusively in the presence of an excess of alkali, yellow needles, m. 110° with effervescence; *sodium salt*, yellow leaves; *methyl ester* (c), needles from alc., m. 69° . The β -acid on standing at room temp. 4 hrs. in 10 parts $MeOH + 1$ part H_2SO_4 gave 20% α -acid, 40% *methyl ester of α -acid* (d), light yellow needles from alc., m. $142-3^\circ$, and 30% unaltered material. Both esters are unattacked by $Zn + AcOH$ at $60-70^\circ$; on heating at $150-60^\circ$ each is partially converted into the isomeric form; on standing for 24 hrs. at room temp. with $MeOH + H_2SO_4$, 15% of (d) is converted into (c) and, starting with (c), 50% of (c) is converted into (d); if (c) is allowed to stand 4 days with $MeOH + H_2SO_4$, 67% is isomerized. Both esters give the α -acetyl derivative, prisms from dild. alc., m. 88° , when treated with Ac_2O and $AcONa$. *vic-m-Xylylhydrazonегlyoxylic acid*; α -form, light yellow cubical prisms, m. $142-4^\circ$ with effervescence; β -form, S-yellow needles, m. $115-7^\circ$ (decompn.); in $MeOH + H_2SO_4(10:1)$ at room temp. for 5 hrs., 50% was converted into the α -form. *ps-Cumylhydrazonегlyoxylic acid*; α -form, obtained in small amt. in the presence of K_2CO_3 , yellow leaves from alc. on adding C_6H_6 , m. $144-5^\circ$; the β -form, which predominates in this case and is rather difficultly sol. in C_6H_6 , greenish yellow needles from alc., m. 127° with effervescence; *methyl ester* (e), deep yellow columnar prisms from alc., m. 86° ; the *methyl ester of the α -acid* (f) was obtained, mixed with (e), when the β -acid was treated with $MeOH + H_2SO_4$, bright yellow needles, m. 175° ; heated at 175° , (f) is chiefly converted into (e); the reverse change does not occur. Only the β -form of *o*-anisylhydrazonегlyoxylic acid is formed in either KOH , K_2CO_3 , or $NaHCO_3$ solns. (cf. B. and M., *loc. cit.*). *o*-Chlorophenylhydrazonегlyoxylic acid; α -form, blunt yellow needles, m. $153-4^\circ$ with effervescence; β -form, previously prepd. by B. and M., m. $142-3^\circ$. The β -form of *o*-bromophenylhydrazonегlyoxylic acid (cf. B. and M.) is formed exclusively in the presence of KOH ; 33% of the α -form is obtained when K_2CO_3 is used. The conversion of the β - into the α -form in the presence of $MeOH + H_2SO_4$ is very slow, 4 days being required to convert 80% into the α -ester, needles from dild. alc., m. 139° ; 20% alc. KOH at room temp. will convert the α -acid into the β -form. *m*-Bromophenylhydrazonегlyoxylic acid; α -form, yellow needles from dild. alc., m. $136-9^\circ$ (not sharply); β -form, bright yellow needles, m. 122° . *p*-Bromophenylhydrazonегlyoxylic acid; α -form, bright yellow needles, m. $130-7^\circ$ (decompn.); *benzoyl derivative*, $BrC_6H_4NH:N:CHCO_2Bz$, obtained in C_6H_5N with $BzCl$, bright yellow leaves from dild. alc., m. $175-6^\circ$; *methyl ester*, needles from alc. or C_6H_6 , m. $191-2^\circ$; β -acid, bright yellow leaves from C_6H_6 , m. 121° with effervescence; *benzoyl derivative*, bright yellow leaves or needles, m. 123° ; *methyl ester*, leaves from dild. alc.

m. 102°. The β -form of *o*-iodophenylhydrazonoglyoxylic acid (cf. B. and M.) could not be rearranged to form a β -form; this constitutes the only case in which a β -acid could not be isomerized. *p*-Iodophenylhydrazonoglyoxylic acid; α -form, orange-yellow needles, m. 155° (decompn.); β -form, straw-colored needles, m. 135° with effervescence (not sharply). The yields of both forms were small. Methylphenylhydrazonoglyoxylic acid seps. in only 1 form, probably the β -form (g), leaves from alc., m. 165–7° (decompn.); methyl ester (h), light yellow prisms or plates from alc., m. 61–2°. A 2nd form of ethylphenylhydrazonoglyoxylic acid could likewise not be isolated (cf. Elbers, *loc. cit.*) nor could a 2nd form of semicarbazonoglyoxylic acid or phenylhydrazonopyruvic acid (i) be prep'd. (cf. Darapsky and Prabhakar, *C. A.* 7, 347). (a) in alc. with HNO_3 gave methyl benzeneazoformaldoximecarboxylate, $\text{PhN:NC(:NOH)CO}_2\text{Me}$, red crystals from dild. alc., m. 136°; in concd. HCl it produces a blue-violet coloration. Under similar conditions (d) is converted into an oxime, red crystals from alc., m. 132°; the soln. in concd. HCl is dark blue; (c) did not give a similar oxime. Oxime of (f), pointed crystals, m. 170°; (e), (g) and (h) were not appreciably attacked by HNO_3 ; (i) was converted into PhN:NCMe:NOH with the elimination of CO_2 [cf. Bamberger and Grob, *Ber.* 35, 70(1902)]. The hydrazone acids and salts will not add PhCNO ; the ester (a) heated with PhCNO at 120° is converted into methyl diphenylsemicarbazonoglyoxylate, $\text{PhNHCONPhN:CHCO}_2\text{Me}$, needles, m. 159°, which is sapond. by dild. alc. KOH on gentle heating, giving diphenylsemicarbazonoglyoxylic acid, needles from alc., m. 191° with effervescence and blackening. (d), (c) and (f) do not add PhCNO , while (e) gives a small yield of semicarbazone at 170–80°, needles, m. 215–6°. When Cl-CHCONHPh in $\text{C}_6\text{H}_5\text{N}$ was heated with PhNHNH_2 and K_2CO_3 for several hrs. and then allowed to stand exposed to the air, formazylhydride, PhNHN:CHN:NPh was obtained; this was also produced when phenylhydrazonoglyoxylic acid was treated with PhNHNH_2 .

NORMAN A. SHEPARD.

Preparation of glycoll and diethyl carbonate. W. A. DRUSHEL AND D. R. KNAPP. *Am. Jour. Sci.* 40, 509–10(1915).—About 700 cc. NH_4OH satd. with NH_3 at 0° was slowly treated with 100 g. $\text{CH}_2\text{ClCO}_2\text{H}$ in the least possible amt. of H_2O and allowed to stand for 5 days. The glycoll was recovered from the mixt. by the Cu(OH)_2 method but in no case was the yield over 55% of the acid used so this is no improvement over Kraut's method of working at 10°. Et_2CO_3 was made by treating powdered KCN covered with abs. alc. with 1 equiv. of ClCO_2Et in an equal vol. of abs. alc. and boiling on the H_2O bath for 1 hr. to complete the reaction. The residue was filtered off and the filtrate fractionally distd. Re-distn. gave Et_2CO_3 , b. 127°, in 50% yield of the ClCO_2Et used.

R. L. SIBLEY.

Preparation and properties of hydracrylic esters. W. A. DRUSHEL AND W. H. T. HOLDEN. *Am. J. Sci.* 40, 511–4(1915); cf. *C. A.* 9, 615.—Hydracrylic acid was prep'd. by adding to the Na salt in the least possible amt. of H_2O a little less than the theoretical amt. of H_2SO_4 (1:1) and keeping the mixt. cold. The H_2O was then evap'd. off and the acid extd. from the residue by the alc. used in the subsequent esterification process. The alc. soln. of the acid was treated with an excess of pure anhydrous CuSO_4 and boiled under a reflux condenser on a sand bath until 80–90% of the acid had been esterified, which was detd. by titration against 0.1 N Ba(OH)_2 . At the end of the reaction the CuSO_4 was filtered off, the unchanged acid neutralized with Na_2CO_3 , the excess of alc. distd. off and the ester distd. under 12–20 mm. The esters so prep'd. were: methyl, b_{12} 79°, d_4^{25} 1.118, n_D^{23} 1.4306; ethyl, b_{12} 84°, d_4^{25} 1.064, n_D^{23} 1.4271; propyl, b_{12} 98°, d_4^{25} 1.043, n_D^{23} 1.4341; isopropyl, b_{12} 95°, d_4^{25} 1.071, n_D^{23} 1.4303; isobutyl, b_{12} 104°, d_4^{25} 1.013, n_D^{23} 1.4342; isoamyl, b_{12} 121.5°, d_4^{25} 0.988, n_D^{23} 1.4374. R. L. SIBLEY.

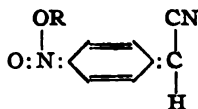
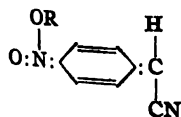
Electrochemical synthesis of phenylhydroxylamine. F. M. FREDERIKSEN. Cornell Univ. *J. Phys. Chem.* 19, 696–701(1915).—F. obtained PhNHOH in 30–40%

yield by Wohl's method (*Ber.* 27, 1432(1894)) by heating PhNO_2 with CaCl_2 and Zn dust in alc. He then duplicated the reaction electrolytically with Zn electrodes in NH_4Cl . A diaphragm was not needed so that the current was not cut down. The alc. soln. was stirred during electrolysis. After reduction had proceeded to the desired point, the soln. was filtered by suction and the alc. distd. off. The soln. was then satd. with NaCl and extd. with Et_2O ; the Et_2O was removed and the residue crystd. from C_6H_6 containing a little ligroin to render the PhNHOH less sol. Five different expts. are reported in which the amts. of NH_4Cl , of PhNO_2 , the temp., the time of reduction and the current were varied and yields of 21–9% resulted. R. L. SIBLEY.

Some derivatives of anemonin. YASUHIKO ASAHINA. *J. Pharm. Soc. Japan* 403, 1041(1915).—By the prepn. of the tetra-Br addition compd., $\text{C}_{10}\text{H}_8\text{O}_4\text{Br}_4$, m. 175° , and of the dihydrobromide, $\text{C}_{10}\text{H}_8\text{O}_4\cdot 2\text{HBr}$, m. 182° , the work of Beckurts (*Arch. Pharm.* 230, 205(1892)), and that of A. (*C. A.* 8, 1780) are confirmed. Anemoninic acid was obtained in cryst. form by digesting anemonin with aq. KOH , acidifying the deep brown soln. with HCl , and extg. with AcOEt . The crystals, $\text{C}_{10}\text{H}_{10}\text{O}_7$ (from petr. ether) m. $116\text{--}7^\circ$, are very hygroscopic, sol. in H_2O and alc. A 2nd anemoninic acid, designated α -anemoninic acid, and its sodium, potassium and lead salts were prepd.; the Na salt by digesting anemonin with alc. NaOH in abs. alc.; on cooling the yellowish brown crystals sep. out; the Pb salt by treating the Na salt with $\text{Pb}(\text{OAc})_2$, discarding the brown ppt. first formed and retaining the white ppt. which sepd. out on standing. The acid was obtained by decomp. the Pb salt with dil. H_2SO_4 and extg. with Et_2O . The white, needle-like crystals, from Et_2O , m. 120° and were sol. in H_2O and alc. By boiling in dil. HCl , it was converted into the other anemoninic acid (m. p. 210°) which A. termed the β -acid, and which had been previously prepd. by Beckurts, who treated anemonin with H_2O and PbO , and by Meyer (*Monatsh.* 17, 283), who hydrolyzed dimethylanemonin with dil. HCl . The semicarbazones are white in color, that of the α -acid m. 220° , that of the β -acid at 270° . The phenylhydrazone of the α -acid is brown while that of the β -acid is carmine. Both change color at about 220° and decomp. around $235\text{--}40^\circ$. In the catalytic reduction of anemoninic acid and that of dimethylanemonin 2 mols. H_2 were absorbed. The phenylhydrazone of the compd. formed m. 170° . In the catalytic reduction of anemoninic acid 1 mol. H_2 was absorbed. The product of the last reduction was found to be identical with anemoninic acid, $\text{C}_{10}\text{H}_{10}\text{O}_6$, prepd. according to M.'s method (reduction of anemonin with Zn and HCl). A. concludes that anemoninic acid is not a simple anhydride of anemoninic acid because of its different behavior toward alkalis. The latter when treated with the equiv. amt. of KOH becomes yellow, but when an excess is added, a red-brown soln. results. The yellow color is assumed to be due to the K salt of the acid and the red-brown color to an anhydride which forms a colored enol salt with alkalis. A. attempts to explain the reactions involved in the hydrolysis of anemonin to anemoninic acid. The structural formulas of the last named compds. are given. An abstract in German precedes the article. E. W. DAUDT.

Chromoisomeric salts and chromo esters from *p*-nitrobenzyl cyanide. J. LIPSCHITZ AND F. W. JENNER. Univ. Zurich. *Ber.* 48, 1730–40(1915).—When 2 g. $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CN}$ (a) in just enough boiling abs. alc. is shaken vigorously with the calcd. amt. of NaOEt or KOEt , quickly cooled, treated with dry Et_2O , quickly filtered on a covered funnel and dried *in vacuo* over KOH and H_2SO_4 , the sodium and potassium salts are obtained as almost black cryst. powders; attempts to obtain the Rb salt with alc. RbOH gave products always containing too little Rb (33.61% instead of 34.68%). When freshly prepd., the salts dissolve in alcs. with intense KMnO_4 -red color; on standing (the Na salt about 3 hrs., the K salt 24 hrs.), the solns. change color, finally becoming a pure emerald-green; the solid salts likewise slowly change into the green form on

standing (the Na salt most rapidly (8-14 days), while the Rb salt after 9 months had changed only superficially); the same change is effected more rapidly at high temps. (after 5-6 hrs. at 105° in the case of the Na salt and 10 hrs. at $130-3^{\circ}$ in the case of the K salt, while the Rb salt is unchanged after days at 135°); at higher temps., there is sudden, complete decompn. with evolution of gas and formation of a black residue insol. in org. solvents. There is no change in wt. in the transformation and the resulting green salts have the same compn. as the original red ones; the red and the green Na salts show the same mol. wt. (119.9 and 123.7, resp.) in boiling MeOH. The green solns. turn KMnO_4 -red with alcoholates and conversely the red become green with (a) or CO_2 . Acid green salts could not be obtained with 2 mols. (a) and 1 mol. alcoholate, the red neutral salts being always formed. Other alkali salts could not be obtained pure; the impure green Ag salt (8 g.), however, in the necessary amt. of Me_2CO , shaken 12 hrs. with 40 g. MeI, filtered, evapd. *in vacuo* and recrystd. from Me_2CO , yields the *dimethyl ester*, $\text{MeO}_2\text{N}:\text{C}_6\text{H}_4:\text{C}:\text{NMe}.\text{Me}_2\text{CO}$, emerald-green leaflets, smells of isonitrile even at room temp., sol. in org. solvents with green color changed by KOH to deep blue; 4 hrs. boiling with alc. KOH produces evolution of carbilamine and a gradual change in color to dark brown or black; on cooling there seps. a black-brown, ill-defined K salt giving with HCl a yellow-brown flocculent acid; boiling of the ester with HCl gives as the final product a very small amt. of a brown substance m. about 210° , sol. in alkalies with violet to blue-red color, possibly $[(\text{O}_2\text{NC}_6\text{H}_4)(\text{O}_2\text{NC}_6\text{H}_4\text{CO})\text{CH}]_2\text{C}-(\text{CH}_2\text{C}_6\text{H}_4\text{NO}_2)\text{NHMe}.\text{HCl}$ (found: 56.09% C, 4.14% H), resulting from the condensation of $\text{O}_2\text{NC}_6\text{H}_4\text{COCH}_2\text{C}_6\text{H}_4\text{NO}_2$, first formed as chief product, with the half sapon. ester $\text{O}_2\text{NC}_6\text{H}_4\text{CH}:\text{C}:\text{NMe}$. When 5 g. of the Na salt in 150-200 cc. MeOH is boiled 3 hrs. at most with 25 g. MeI under a reflux condenser, quickly freed from MeOH and MeI in a wide dish on the H_2O bath, dried *in vacuo*, warmed to 40° in small amts. with H_2O , cooled with ice-NaCl as soon as the ester melts and floats on the NaI soln. and quickly filtered as soon as it solidifies again, dissolved in dry Et_2O (this leaves an insol. dark green substance with 9.09% N), and quickly evapd. *in vacuo* over KOH and H_2SO_4 there is obtained the *monomethyl ester*, $\text{MeO}_2\text{N}:\text{C}_6\text{H}_4:\text{CHCN}$, in green cryst. aggregates m. below 40° ; when fresh, it dissolves in org. solvents with emerald-green color at once changed to KMnO_4 -red by alkalies and to yellow-brown, with regeneration of (a), by HCl. In a vacuum desiccator it is stable about 48 hrs.; in the air and slowly *in vacuo* it rearranges into a light yellow substance much less sol. in Et_2O , which is also the sole product when the prepn. of the green ester is not carried out with sufficient rapidity; the yellow product is 3,4-Me(O_2N) $\text{C}_6\text{H}_3\text{CH}_2\text{CN}$, m. 63° after alternate recrystns. from alc. and H_2O (Barger and Ewins, *C. A.* 5, 1083, give 52°); with KMnO_4 in boiling alkali it gives the acid, m. about 220° . The spectra of the green and red salts are identical in the ultraviolet and in the visible region are at least analogous, the bands of the green salt and ester being merely shifted further towards the shorter wave lengths, whereas the spectra of quinone and quinol differ considerably. Therefore, if the spectrum of the red salt is considered as quinoid (cf. Hewitt, *C. A.* 7, 564), so must also that of the green salt, and the difference between the salts is not to be assigned to structural isomerism. As a secondary valence relation to the CN group would involve a 7- or 8-membered ring and is quite improbable, L. and J. tentatively propose the formulas below for the 2 salts.



CHAS. A. ROULLER.

Organic antimony compounds. I. Action of antimony trichloride on triphenyl-antimony. GERHARD GRÜTTNER AND MAXIMILIAN WIERNIK. Charlottenburg. *Ber.* 48, 1749-59(1915); cf. *C. A.* 9, 3247.—The results reported by various investigators of the action of SbCl_3 on SbPh_3 differ so greatly that their work has been repeated. In working up the product (from 30 g. SbPh_3 , 40 g. SbCl_3 and 18 cc. xylidine) by Hasenbäumer's method (*Ber.* 31, 2910(1898)), the amt. of SbCl_3 removed by shaking with HCl is, contrary to his statement, considerable, and since very nearly the amt. calcd. for the formation of PhSbCl_2 was used and only very little Ph_3Sb was detected after the reaction, the latter does not proceed exclusively according to H.'s equation: $\text{Ph}_3\text{Sb} + 2\text{SbCl}_3 = 3\text{PhSbCl}_2$. To be sure, analysis of the distillate b. $270-300^\circ$ give values agreeing, within the exptl. errors, with those calcd. for PhSbCl_2 (C 26.39%, H 1.95%, Sb 44.65%, Cl 26.17%), but if it is shaken with 2 vols. of 15% HCl , the Cl content of the residue decreases considerably (17.60%; calcd. for an equimol. mixt. of PhSbCl_2 and Ph_3SbCl 18.44%). Working up the product by Michaelis' method (*C. A.* 5, 3810) gave a distillate b. $180-220^\circ$ with 23.8% Cl falling, after shaking with 15% HCl and removing the HCl *in vacuo* over P_2O_5 and KOH , to 19.22%; repeated shaking with cold 15% HCl , which easily and completely removes admixed SbCl_3 , produced only a very slight further lowering of the Cl content, and the excess over that calcd. for Ph_3SbCl (11.47%) is due to PhSbCl_2 , which is insol. in cold 15% but quite sol. in hot 20% HCl . A portion of the distillate which had been shaken with cold 15% HCl and contained 19.22% Cl was heated 4 hrs. in CO_2 at $200-10^\circ$, again shaken with 2-3 vols. of cold 15% HCl and freed from HCl over P_2O_5 and KOH ; it then contained 13.1% Cl, completely solidified after a time and after repeated rubbing up with petr. ether showed the m. p. 68° of M.'s Ph_3SbCl . May's (*C. A.* 7, 70) and Morgan's (*C. A.* 6, 1153) modifications of the method produced no material changes in the compn. of the distillate. These results show that the crude product changes in compn. in every method of purification involving distn., so that the true course of the reaction cannot be detd. in this way, although the splitting off of SbCl_3 which always occurs makes it probable that the decompn. proceeds according to the equation $2\text{PhSbCl}_2 = \text{Ph}_3\text{SbCl} + \text{SbCl}_3$, but as no other means than distn. is known for the sepn. of the constituents the extent of this dissociation cannot be detd. The conversion of the chlorides into the corresponding oxides or acids also does not offer a means of sepn., as these compds. occur in differently hydrated forms of varying solubility; indirect analysis, likewise, offers no clue to the constitution of the reaction products, as the number of their constituents is not known. The conversion of the chlorides into their alkyl derivs. by means of the Grignard reagent, however, affords a method of considerable accuracy, as the reaction proceeds smoothly, the resulting compds. can be distd. *in vacuo* in CO_2 without decompn. and there is never a replacement of the Ph groups by the entering alkyls. The use of MeMgBr and EtMgBr gave the same results; only those obtained with EtMgBr are reported. Two portions each of 150 g. Ph_3Sb , 195 g. SbCl_3 and 90 cc. xylene were heated in sealed tubes 40 hrs. at $240-5^\circ$, the combined products extd. twice with 2-3 vols. of cold 15% HCl , filtered, dried with CaCl_2 , freed from xylene under 16-8 mm. (temp. of the bath not above 80°) and 35 g. of the viscous residue treated with EtMgBr (Expt. 1), while the remainder was distd. in CO_2 under 16-8 mm. up to 280° (bath temp.) at the rate of 3 drops every 2 sec.; 25 g. of this distillate were treated as above with HCl and then with EtMgBr (Expt. 2), while the remainder was again distd. as above and 25 g. of the new distillate again treated with HCl and then with EtMgBr (Expt. 3). The 3 distillates in 5 vols. Et_2O and the Mg compd. from about equal wts. of EtBr were boiled 0.5 hr., decompd. with H_2O , the Et_2O layers removed in CO_2 (air being carefully excluded), freed from Et_2O by distn. over CaCl_2 in CO_2 at atm. pressure, filtered and fractionated under 16-8 mm. in CO_2 . The following vols. of the various fractions were obtained in Expts. 1, 2 and 3, resp.: $125-52^\circ$,

6.2, 3.7, 2.0; 152–75°, 3.0, 1.9, 1.8; 175–205°, 2.9, 7.4, 9.1; 205–225°, 2.9, 2.0, 2.0 cc. The 125–52° fraction contains about 95%; the 152–75° fraction about 50% of EtSbPh (see following abstr.); the other 50% of the latter fraction and all of the 175–205° fraction consist of EtSbPh₃, while the 205–225° fraction contains 50% of EtSbPh₃ and 50% of a higher boiling substance not certainly identified as SbPh₃. The relative % of PhSbCl₂ and Ph₂SbCl in the 3 expts. were therefore 57, 43; 34, 66; 21, 79, resp. In other words, PhSbCl₂ decomps. at its b. p. *in vacuo* into Ph₂SbCl and SbCl₃, and the lack of agreement in the literature is due to the different lengths of time the various workers distd. their products. Under conditions otherwise the same, a 50% increase of the amt. of SbCl₃ does not materially change the relative amts. of the 2 chlorides (58, 42%), while an increase in the temp. to 250–5° and of the length of the heating to 75 hrs. increases the amt. of the PhSbCl₂ (68 and 70%, resp.). II. Preparation of mixed alkylarylstibines. *Ibid* 1759–64.—*Dimethylphenylstibine*, prepd. as indicated above (yield, 5–6 g. from 25 g. of the crude product of the reaction between SbPh₃ and SbCl₃), b₁₈, 112°, fumes slightly in the air, quickly oxidizes, especially in soln., mol. wt. in freezing C₆H₆, 228, d₄²⁰ 1.4490, n_D^{19.5} 1.5983, n_F–n_C^{19.5} 0.02523. Boiled a short time with excess of MeI it quant. yields the *methiodide*, needles from alc.-Et₂O, evolves I about 235°, sublimes at a slightly higher temp. *Ethiodide*, prepd. by heating the Me₂SbPh 5 hrs. at 100° with excess of EtI, evolves I about 150°, sublimes 225°. *Chloride*, C₆H₅SbCl₂, obtained almost quant. by passing Cl 0.5 hr. into the Me₂SbPh in 10 parts CCl₄, evapg. at room temp. and crystg. from AcOH, m. 128°. *Bromide*, m. 112–3°. *Iodide*, from the Me₂SbPh and somewhat less I than is necessary to produce a color in petr. ether, cryst. powder, m. 98.5–9.0°; excess of I gives dark products richer in I and crystg. poorly. *Diethylphenylstibine*, in 6–6.5 g. yield from 25 g. crude chlorides, b₁₈, 128°, mol. wt. in C₆H₆, 250°, d₄²⁴ 1.3487, n_D^{21.8} 1.5903, n_F–n_C^{21.8} 0.02373, fumes strongly in the air, oxidizes with vigorous evolution of heat and, when finely divided (on filter paper), occasionally ignites. *Methiodide*, obtained quant. by heating the components 2 hrs. at 100°, needles from alc., loses I above 225° and then sublimes. EtI is not added after 5 hrs. at 100°. *Chloride* and *bromide*, oils which cannot be distd. without decompn. *Iodide*, pale yellow, hexagonal leaflets from C₆H₆, long prisms from Et₂O, m. 88.5–9.0°. *Methyldiphenylstibine*, obtained in 10–1 g. yield from 25 g. PhSbCl, b₁₈, 174–7°, mol. wt. in C₆H₆, 283, d₄²⁰ 1.2134, n_D²⁰ 1.6021, n_F–n_C²⁰ 0.02399, does not add MeI or EtI after 10 hrs. at 100°, does not fume in the air but oxidizes energetically. *Chloride*, prisms from CCl₄, m. 144°. *Bromide*, prisms from CCl₄, m. 148°. *Ethyl-diphenylstibine* (yield, 10–1 g.), b₁₈, 190–2°, mol. wt. in C₆H₆, 291, d₄^{19.6} 1.3541, n_D^{20.8} 1.6309, n_F–n_C^{20.8} 0.02732, does not add MeI or EtI after 10 hrs. at 100°, hardly fumes in the air but oxidizes energetically. *Chloride*, plates from CCl₄, m. 163–4°. *Bromide*, monoclinic tables from CCl₄, m. 158°.

CHAS. A. ROULLER.

α,β-Diantipyrylurea, its derivatives and physiological properties. MAXIMILIAN GÖTLER. Winnenden (Württemberg). *Ber.* 48, 1765–70(1915).—*α,β-Diantipyrylurea* (a) is obtained in 16 g. yield when 20 g. 4-aminoantipyryne (b) in 300 cc. PhMe at 50° is slowly treated with 40 g. of a 20% soln. of COCl₂ in PhMe and the voluminous yellow to scarlet ppt. boiled 20 min. in the PhMe, whereby torrents of HCl are evolved and the ppt. balls up to a viscous brown resin; after cooling, the product is sepd. from the PhMe, treated with H₂O and dil. soda and crystd. from MeOH; it m. 259–60°. The PhMe on evapn. leaves a few crystals of (a) and a little yellow oil, probably *anti-pyrylurea chloride* (c), giving with alc. the prisms, m. 206–7°, of antipyrylurethan. The voluminous ppt. first formed, if quickly filtered and dried protected from the air, then treated (1 g.) with 1 cc. alc., evolves CO₂ and (b)-HCl seps.; the mother liquors with H₂O and soda give only 0.18 g. (a). The formation of (c) or (a) therefore is due to a further action of COCl₂ on the addition product CO[OC:C(NH₂).CMe:N(MeCl).NPh]₂.

(a) heated with Millon's reagent gives a yellow, then a red color and deposits a dirty red ppt.; the slightest traces in H_2O color $FeCl_3$ deep red; the reaction is also given in very dil. mineral acids while stronger acids prevent the formation of the red color. Of the salts, only the *hydriodide*, (a).1.5HI.EtOH, crystals; it seps. from alc. in olive-green needles, quickly weathering and turning Cu-red in the air, m. $225-6^\circ$, and, free from EtOH, crystd. from AcOH, m. $210-1^\circ$, loses I when heated with H_2O . *Mono-phenyldiantipyrylurea*, $C_{11}H_{11}ON_2NHCONPhC_{11}H_{11}ON_2$, from equal parts (a) and $PhNH_2$ heated 15 min. at $170-5^\circ$ in 68% yield, m. $240-1^\circ$ (decompn.), also obtained, together with brick-red needles, m. 158° , from equal parts (a) and $PhNHNH_2$ heated 10 min. at $190-5^\circ$. *Mono-p-tolyldiantipyrylurea*, hair-like needles from alc., m. 235° . *p-Ethoxyphenyldiantipyrylurea*, obtained together with a substance m. $208-9^\circ$ from equal parts (a) and *p*-EtOC $_6$ H $_4$ NH $_2$ heated 1 hr. at 180° , m. $234-5^\circ$. *p-Methoxy homolog*, needles from alc., m. 200° . *N,N'-Diantipyryldiethylbarbituric acid*, obtained in 6 g. yield from 8 g. (a) in 90 g. $CHCl_3$ heated 8 hrs. on the H_2O bath with 4 g. $CEt_3(COCl)_2$, evapd., digested with dil. HCl (which removes 1.7 g. unchanged (a)), then with dil. soda and crystd. from AcOH- H_2O or alc.-AcOH, needles, m. $312-3^\circ$. Expts. on animals (mostly rabbits) showed that the above compds. have distinct antipyretic action in doses of 0.5 g. and more; collapse never occurred even with very large doses (up to 3 g.). No central nervous effects were observed, even with dogs. In a 1700 g. rabbit given 0.25 g. (a) *per os* at 11.20 A.M. and again at 4.30 P.M. and killed the following day at 9 A.M., only 0.05 g. (a) was found in the contents of the stomach and intestines and in the feces.

CHAS. A. ROUILLER.

Color dimorphism in stilbene derivatives. PAUL PFEIFFER, with S. BRAUDE, J. KLÉBER, G. MARCON AND P. WITKOP. Univ. Zurich. *Ber.* 48, 1777-809(1915).—Nitromethoxystilbenes in many cases are capable of existence in a yellow and in an orange form; there is no general method of prepn. of one particular form and the conditions have to be established in each case; there is no regularity in the relative stability of the 2 forms; in no case can the 2 forms be distinguished by means of their m. ps. as in almost all cases before the m. p. is reached, the form which is labile at that temp. rearranges into the stable form; the solns. of the 2 forms are identical in color. So far it has not been possible to prove color dimorphism in *o*- and *m*-methoxystilbenes and in nitrostilbenes with Me and NMe $_2$ groups, but the great differences between the colors of nitrodimethylaminostilbenes and their solns. are a hopeful indication of the possibility of obtaining 2 differently colored forms in these cases also. The colors of the solns. of these compds. vary greatly with the solvent; they generally lie between greenish yellow and orange, being less deep in C_6H_6 , somewhat deeper in AcOH and alc. and deepest in CCl_3CO_2H . This change in color with solvents is characteristic of unsatd. NO $_2$ compds. and is not due to the stilbene structure or the MeO groups of the compds. above. Just as in the case of unsatd. ketones, these compds. with strong acids form more or less deeply colored solns. and with metallic salts give color reactions. That these different colors in solns. and with salts are due to the formation of addition compds. with the solvent or salt was shown by the isolation of such addition products; the deepening in color produced by these addition compds. is explained in the same way as the halochromism phenomena in ketones (*C. A.* 5, 3581), *vis.*, that the solvent mols. are coordinatively combined with the NO $_2$ groups (probably with their O atoms). To explain the differently colored forms of the solid nitromethoxystilbenes, P. has recourse to his recent theory as to the structure of crystals (*C. A.* 9, 3000), according to which crystals are merely mol. compds. containing a large number of mols.; in the orange forms P. believes the mols. are so combined that the NO $_2$ group of 1 is coordinatively combined with the unsatd. C atom of another just as in the colored compds. of aromatic NO $_2$ derivs. with phenol ethers, while in the yellow forms the same groups

of the individual mols. mutually sat. each other more or less completely in a kind of loose polymerization (as in butadienes, NO compds., etc.). *allo-2,4-Dinitrostilbene*, obtained in 0.25 g. yield from 3 g. ordinary 2,4-(O₂N)₂C₆H₃CH:CHPh (a), m. 140°, in 50 cc. xylene kept 2 days in a quartz flask 2-3 cm. above a Heraeus quartz Hg-vapor lamp, then boiled a short time with charcoal, evapd. on the H₂O bath and the final fractions crystd. from AcOH, lemon-yellow tables, m. 127°, depresses the m. p. of (a) to 106°; exposed to sunlight in CHCl₃ in the presence of a little I, it reforms (a). 2-Nitro-4-isovalerylaminostilbene, in 12 g. yield from 10 g. of the 4-NH₂ compd. warmed 3 hrs. on the H₂O bath with 8 g. EtCHMeCOCl, lemon-yellow needles from C₆H₆, m. 139°; short boiling with aq. KOH gives no red color. 4-Nitro-4'-methylstilbene, in 0.6 g. yield from 3.4 g. *p*-O₂NC₆H₄CH₂CO₂H, 2.2 g. *p*-MeC₆H₄CHO and a little piperidine heated 2.5 hrs. at 140°, greenish yellow leaflets from alc., m. 150°. 2-Nitro-4'-methoxystilbene is obtained in 0.5 g. yield when 10 g. of the 4-NH₂ compd. (see below) in 200 cc. alc. are slowly treated with turbinine with 5 g. concd. H₂SO₄, then, with stirring and cooling, with 6 g. AmNO₂ containing a little alc., allowed to stand 2 hrs., filtered and broken up on clay and 5 g. of the *diazonium sulfate*, Bordeaux-colored leaflets with golden luster, deflagrates 165°, is added in small portions to 100 cc. boiling alc. containing 3 drops H₂SO₄, boiled 20 min., freed from alc. on the H₂O bath, and distd. with steam at 150°; it seps. from alc. in long, dark yellow needles, m. 88-90°. 4-Nitro-4'-methoxystilbene, obtained in 50% yield of the *p*-O₂NC₆H₄CH₂CO₂H used when 1.9 g. of this acid, 1.4 g. *p*-MeOC₆H₄CHO and 15 drops piperidine are heated 1 hr. (reaction begins at about 100° and at 130° there is energetic evolution of CO₂), m. 132-4° after repeated crystns. from AcOH, from which it seps. in leaflet-to-table-like yellow crystals with orange tinge; from a concd. C₆H₆ soln. ligroin ppts. leaflets of the same color, while a dil. soln. treated with low boiling ligroin and quickly shaken often gives a network of greenish yellow slender needles; the latter change from greenish to orange yellow at about 100° and then m. 132-4°. 4-Amino-4'-methoxystilbene, from the NO₂ compd. with SnCl₂, brownish yellow leaflets from alc., m. 173-4°; *acetyl derivative*, in 0.6 g. yield from 0.5 g. of the amine heated 3 hrs. on the H₂O bath with 10 g. Ac₂O, leaflets from alc., m. 237°; *benzoyl derivative*, in 1.1 g. yield from 1 g. amine and 6 g. BzCl after 3 hrs. on the H₂O bath, leaflets from AcOH, m. 249°. 4-Nitro-3'-methoxystilbene, from *m*-MeOC₆H₄CHO, *p*-O₂NC₆H₄CH₂CO₂H and piperidine heated 3 hrs. at 160°, yellowish leaflets from alc., m. 87°. 4-Nitro-2'-methoxystilbene, in 1 g. yield from 1.5 g. *o*-MeOC₆H₄CHO, 1.9 g. *p*-O₂NC₆H₄CH₂CO₂H and piperidine heated 0.5 hr. at 120°, canary-yellow needles from alc., m. 122°, becomes dull in the air. 4-Nitro-4'-dimethylaminostilbene, red leaflets with blue surface luster from C₆H₆, m. 250-1°, sol. in C₆H₆ with golden yellow color and yellow fluorescence; addition of ligroin changes the color to greenish yellow and the fluorescence to green; 0.01 g. dissolves in 1 cc. of C₆H₆, alc., AcOH and CCl₃CO₂H with golden yellow, yellow-orange, orange-red and light greenish yellow color, resp. 2-Cyano-4-nitro-4'-methoxystilbene, from 2,4-NC(O₂N)₂C₆H₃Me, *p*-MeOC₆H₄CHO and piperidine heated 1-1.5 hrs. at 140-50° and crystd. from AcOH, orange-red leaflets, m. 198°. An AcOH soln. satd. at room temp., cooled to 0° and poured into cold H₂O, deposits a yellow pulverulent ppt. which does not lose wt. in a drying oven, assumes a distinctly orange tinge above 170°, becomes completely orange 180° and m. 196°. 4-Cyano-2-nitro-4'-methoxystilbene (see P. and Braude, *Ann.* 1915); the yellow form is obtained with certainty when a hot concd. C₆H₆ or AcOH soln. is quickly cooled, when it seps. in pure yellow leaflets; if the suspension of the yellow form in C₆H₆ is allowed to stand at room temp. it begins to change in a few hrs. to orange prisms which are obtained directly when a C₆H₆ or AcOH soln. is allowed to evap. slowly at room temp. A C₆H₆ soln. satd. at room temp. and allowed to evap. at 5° deposits pure yellow tablets weathering in the

air, with loss of 0.5 mol. C_6H_6 , to an orange powder. The orange form m. $157-8^\circ$; the yellow form becomes orange in a few min. at $120-5^\circ$ and then m. $157-8^\circ$; at room temp. both forms are stable for months, even in direct sunlight. Exposed 1 week to Br vapors, both the orange and yellow forms yield the same *tribromide*, leaflets from AcOH, m. $210-1^\circ$. Treated in hot C_6H_6 with 2.5 parts anhydrous $SnCl_4$ and cooled in a closed vessel, the stilbene gives the *addition compound* $2C_{10}H_{12}O_2N_2 \cdot SnCl_4$, orange crystals regenerating with H_2O or dil. HCl an orange-yellow nitrile; similarly, on cooling a hot $PhNH_2$ soln. of the nitrile is obtained the *compound* $2C_{10}H_{12}O_2N_2 \cdot PhNH_2$, in orange crystals giving on the H_2O bath or with dil. HCl at room temp. an orange powder. *Methyl 2-nitro-4'-methoxystilbene-4-carboxylate*, in 2.8 g. yield from 5 g. of the nitrile suspended in 200 cc. MeOH and treated on the H_2O bath with HCl for 2 hrs., long, slender, yellow needles from MeOH, m. $117-8^\circ$, becomes distinctly orange at $100-5^\circ$; after heating some hrs. at $100-5^\circ$ and cooling it remains permanently yellow-orange; this form is obtained cryst. when the heated product is recrystd. from MeOH, care being taken that a little remains undissolved; it gradually seps. in broad, flat, orange-yellow needles, m. $117-8^\circ$; a hot concd. MeOH soln. quickly cooled deposits the yellow needles. *Ethyl ester*, obtained in 4.5 g. yield from 4 g. of the nitrile, pure yellow, slender needles from hot alc., m. $103-4^\circ$ without becoming orange; if a suspension in alc. in a covered vessel is allowed to stand for weeks a part changes into orange tablets which are isolated by warming cautiously until the yellow crystals disappear and decanting hot; they m. $103-4^\circ$ to an orange-yellow liquid solidifying to a yellow cryst. mass. A hot alc. soln. of the orange crystals quickly cooled deposits the yellow form; the 2 forms do not depress each other's m. p. *Free acid*; the *yellow form* is obtained by boiling 2 g. of the Et ester in 120 cc. AcOH, 50 cc. H_2SO_4 and 50 cc. H_2O for 2-3 hrs.; it seps. from AcOH in needles, from alc. in leaflets, m. 250° to an orange liquid, sol. in AcOH with yellow but in CCl_3CO_2H with orange color. A hot C_6H_5N soln. deposits on cooling the *pyridine salt* in pure yellow needles which, when cautiously heated in thin layers at $90-100^\circ$, leaves the *orange form* of the acid as an orange powder, turning yellow at 140° and m. 250° . A suspension of 1 g. of the acid in 20 cc. hot H_2O treated with aq. K_2CO_3 until almost dissolved, filtered and evapd. yields the *potassium salt*, sepg. from hot H_2O in orange leaflets or needles with 2 H_2O , stable in the air, also obtained from an aq. soln. evapd. at room temp.; over P_2O_5 it goes over into a *monohydrate* and at 100° into a red-orange *anhydrous form*; aq. solns. are yellow-orange, Me_2CO and alc. solns. containing a little H_2O greenish yellow. The *sodium salt*, from an aq. suspension of the acid and a slight excess of soda, exists in several forms; homogeneous long yellow needles with 5 H_2O , stable for days in the air, are obtained when the soln. satd. at room temp. is slowly allowed to evap. at room temp.; on heating it loses its H_2O and becomes brown-orange. A hot concd. aq. soln. quickly cooled in general deposits brown-orange leaflets with 6 H_2O , weathering in the air to a yellow *dihydrate*; a form apparently identical with the latter is obtained when a hot concd. aq. soln. is slowly cooled. *4-Cyano-2-nitro-2'-methoxystilbene*, in 2.7 g. yield from 2 g. $2,4-O_2N(NC)C_6H_3Me$, 1.8 g. $o-MeOC_6H_4CHO$ and a few drops piperidine heated 1.5-2.0 hrs. at 100° , yellow needles from hot AcOH, m. 183° , sol. in AcOH and C_6H_6 with greenish yellow, in CCl_3CO_2H with orange-yellow color. *Ethyl 2-nitro-2'-methoxystilbene-4-carboxylate*, in 2.8 g. yield from a suspension of 3 g. of the nitrile in 250 cc. alc. treated 3 hrs. on the H_2O bath with HCl, slender yellow needles from alc., m. 101° ; the mother liquors deposit on slow evapn. yellow leaflets of the same m. p.; it is sol. in C_6H_6 and AcOH with greenish yellow, in CCl_3CO_2H with orange-yellow color. *4-Cyano-2-nitro-3',4'-methylenedioxy stilbene*, in 7.5 g. yield from 6 g. $2,4-O_2N(NC)C_6H_3Me$, 6 g. piperonal and 2 g. piperidine heated 1.5-2.0 hrs. at 150° , yellow-orange needles from AcO

2° , sol. in C_6H_6 , AcOH and

Me_2CO with yellow, in $\text{CCl}_4\text{CO}_2\text{H}$ with bright orange color. *2,4-Dinitro-4'-methoxystilbene* (see P. and Kléber, *Ann.* 1915) occurs only in a red form; 0.01 g. dissolves in 2 cc. of C_6H_6 and $\text{CCl}_4\text{CO}_2\text{H}$ with greenish yellow and orange color, resp.; the C_6H_6 soln. on evapn. gives the compound $2\text{C}_{18}\text{H}_{12}\text{O}_5\text{N}_2\cdot\text{C}_6\text{H}_6$ in orange-red prismatic crystals, losing the C_6H_6 without change in color on heating. *Aniline compound*, $2\text{C}_{18}\text{H}_{12}\text{O}_5\text{N}_2\cdot\text{PhNH}_2$, orange-red needles losing the PhNH_2 on heating. PhNMe_2 forms no addition product. *2-Nitro-4-amino-4'-methoxystilbene*, in good yield from the 2,4-(NO_2)₂ compd. in alc. treated 4 min. with NH_3 , then with H_2S until almost all has dissolved and the liquid is deep red, Bordeaux-red needles from C_6H_6 , forms a thick red melt at 154° , liquefies 157° ; 10 g. heated 1 hr. on the H_2O bath with excess of Ac_2O , dild. with an equal vol. of H_2O and again heated 1 hr. gives 11 g. of the *acetyl derivative*, yellow needles from C_6H_6 , assumes an orange tinge at 170° , m. 181° to an orange-red liquid; in 1 expt. a C_6H_6 soln. quickly cooled deposited bright orange-red leaflets turning orange-yellow at about 130° and m. 182° ; the expt. could not be repeated, but by heating hot C_6H_6 solns. of the yellow form with the orange-red leaflets once obtained the latter could now be obtained as desired. From hot alc. or AcOH the Ac deriv. seps. in orange-yellow crystals, probably a mixed form of the yellow and orange-red isomers. *Benzoyl derivative*, in 12 g. yield from 10 g. of the amine heated 1 hr. on the H_2O bath with 15 cc. BzCl , treated with 50 cc. alc. and heated 15 min. longer, pure yellow leaflets or needles from alc., C_6H_6 , BzMe , PhNH_2 or PhNMe_2 , m. 172° , first becoming orange-red; heated on the H_2O bath under a reflux condenser with a little PhMe it changes in a few hrs. to orange-red crystals, more of which sep. from the PhMe if it is cooled slowly on the H_2O bath; if cooled rapidly, however, the mother liquor solidifies to yellow needles. The orange-red crystals m. 172° , do not weather on heating and when recrystd. from hot C_6H_6 yield the yellow needles; the same change slowly occurs under C_6H_6 at room temp. A hot AcOH soln. of the Bz deriv. deposits on cooling yellow needles with 1 mol. AcOH , become red-orange $110\text{--}20^\circ$ and m. $167\text{--}8^\circ$. In the same way is obtained a *trichloroacetic acid compound*, orange leaflets, m. $115\text{--}21^\circ$, weathering on the H_2O bath to a yellow powder, m. $169\text{--}70^\circ$. *2-Cyano-4-nitro-4'-dimethylamino-stilbene*, in 1 g. yield from 1.5 g. $2,4\text{-NC(O}_2\text{N)}\text{C}_6\text{H}_3\text{Me}$, 1.4 g. $p\text{-Me}_2\text{NC}_6\text{H}_4\text{CHO}$ and 15 drops piperidine heated at $120\text{--}30^\circ$, almost black leaflets with greenish luster from AcOH , m. $209\text{--}10^\circ$, sol. in AcOH and C_6H_6 with deep orange-red color; the dil. orange C_6H_6 soln. shows orange fluorescence. *4-Cyano-2-nitro-4'-dimethylaminostilbene*, black-green needles from AcOH , m. 178° , sol. in AcOH , alc. and C_6H_6 with deep red, in $\text{CCl}_4\text{CO}_2\text{H}$ with greenish yellow color, pptd. unchanged by ligroin from C_6H_6 and by H_2O from AcOH . *2,4,6-Trinitro-4'-methoxystilbene*, long brick-red needles from AcOH , m. $168\text{--}9^\circ$, sol. in AcOH and C_6H_6 with orange-yellow, in $\text{CCl}_4\text{CO}_2\text{H}$ with red-orange color. *2,4,6-Trinitro-4'-chlorostilbene*, brown-yellow leaflets from AcOH , m. $154\text{--}5^\circ$, obtained in 2.2 g. yield from 4.4 g. $(\text{O}_2\text{N})_3\text{C}_6\text{H}_3\text{Me}$, 2.8 g. $\text{ClC}_6\text{H}_4\text{CHO}$ and a little piperidine heated 0.5 hr. at 120° .
C. A. ROUILLER.

Genetic relationships of the optically active forms of β,β' -iminodibutyric acid and β -aminobutyric acid. II. HELMUTH SCHEIBLER AND J. MAGASANIK. Berlin. *Ber.* 48, 1810-15 (1915); cf. C. A. 6, 2933.—The *meso*- β,β' -imino acid, after standing 1 year in a closed vessel, solidified to a cryst. mass which, dissolved in boiling alc., concd. on the H_2O bath to a syrup, treated with an equal amt. of warm MeOH and seeded after cooling, gave microscopic, ill-characterized crystals, m. $177\text{--}8^\circ$ (decompn.), i. e., 2° lower than the active but considerably higher than the racemic compd., while the *meso*-di-Me ester hydrochloride and chloroplatinate m. lower than the corresponding racemic derivs., a further indication that the racemic compd. is not a true racemate but a mixt. of equal parts of the active forms. The *meso*-dimethyl ester (a), b₁₀ 130° , is obtained from the mother liquors of the racemic chloroplatinate, the hydrochloride,

after recrystn., being treated in just enough cold MeOH with NH_3 in MeOH, then with Et_2O as long as NH_4Cl is pptd., filtered, freed from Et_2O , dried with Na_2SO_4 and fractioned. Heated 1 hr. under a reflux condenser with excess of MeI and freed from the MeI by evapn. it gives *dimethyl N-methyl- β,β' -iminodibutyrate iodide* as a syrup, from which the free ester is liberated in the same way as (a). Of its derivs. only the *benzyl iodide addition product* was obtained in cryst. form. If the theory of the pseudoasym. C. atom (Fischer, *Ber.* 24, 4224(1891)) can also be extended to a N atom with correspondingly arranged groups, 2 isomeric forms should be capable of existence in this case also and as a matter of fact a part of the product remained syrupy. To study further the mechanism of the resolution of the β -imino acid by NH_3 , the action of aq. NH_3 on the active *N-methyl- β -imino acid* should be tried and as this might give active or inactive *β -methyl-aminobutyric acid* (b) and $\text{MeCH}(\text{NH}_2)\text{CH}_2\text{CO}_2\text{H}$, (b) was prepd. by heating 3.5 g. crotonic acid with 20 cc. of 25% aq. MeNH_2 24 hrs. at 140° , concd. on the H_2O bath, evapd. several times with alc., dissolved in a little warm alc., seeded with crystals obtained as described below and gradually treated with Et_2O ; yield, 1.3 g. It was also obtained by heating 15 g. $\text{MeCHClCH}_2\text{CO}_2\text{H}$ with 20 g. of 10% alc. MeNH_2 2 hrs. at 100° , evapg. *in vacuo*, dissolving in H_2O , heating 15 min. on the H_2O bath with excess of $\text{Ba}(\text{OH})_2$, evapg. *in vacuo*, again heating with H_2O on the H_2O bath, repeating the operation until the odor of MeNH_2 was no longer perceptible, removing the Ba with H_2SO_4 , evapg. *in vacuo*, then several times with MeOH, satg. in dry MeOH with HCl, allowing to stand 24 hrs., evapg. *in vacuo*, repeating the esterification, removing the excess of HCl by repeated evapn. with MeOH, treating in an equal amt. of cold MeOH with NH_3 , adding Et_2O , filtering from the NH_4Cl , evapg. *in vacuo*, dissolving in a little Et_2O , drying with Na_2SO_4 and fractionating. The *methyl ester* b_{15} 66° . Boiled 4 hrs. with 10 parts H_2O and evapd. it gives the free (b) as a syrupy crystg. on standing; evapd. in MeOH, at once treated with 10 parts warm EtOH and allowed to stand 12 hrs. in the ice chest it gives 2.8 g. (b). At the same time considerable $\text{MeCH}(\text{OH})\text{CH}_2\text{CONHMe}$ is formed, probably due to the intermediate formation of β -butyrolactone (cf. Johansson, *C. A.* 9, 2651). To obtain the active forms, the active *β -chlorobutyric acids* were prepd.; 20 g. of the *dl*-acid and 64.8 g. quinine in 100 cc. each of MeOH and H_2O are evapd. to 0.5 vol. not above 25° , giving an oil which, on seeding and rubbing, crysts.; it is drained off, treated twice in the same way with 75 cc. of MeOH and H_2O and the 48.5 g. of salt thus obtained is crystd. from 50 and 40 cc. of H_2O after evapn. of the MeOH used for soln., then treated in 40 cc. MeOH with H_2O to turbidity and allowed to stand 48 hrs. in the ice chest; a repetition of the process gives 16 g. of well defined crystals which, cautiously decompd. with cold dil. H_2SO_4 and extd. with Et_2O , gave the *l*-acid, the mother liquors yielding the *d*-form, which forms a difficultly sol. brucine salt. The crotonic acid used in the work was obtained in 54.5% yield by treating 100 g. malonic acid in 135 g. cold alc. and 86 g. $\text{C}_6\text{H}_5\text{N}$ with 85 g. AcH in 2-3 portions in the course of 0.5 hr., warming gently until reaction began, at once removing the source of heat until bubbles were no longer formed, repeating the operation several times and finally warming 3-4 hrs. on the H_2O bath, cooling, making acid to Congo with cold dil. H_2SO_4 and extg. with Et_2O .

CHAS. A. ROUILLER.

Chemical constituents of the bituminous tar oils rich in sulfur (ichthyol oils). I. HELMUTH SCHEIBLER. Berlin. *Ber.* 48, 1815-26(1915).—The work reported in this paper was done on a crude oil from southern France. On distn. under diminished pressure the 1st fractions distil over smoothly but as the temp. rises the oil begins to foam and there is strong decompn. All the fractions, especially the high boiling ones, form with Na dark insol. products and contain not only strongly acid substances (org. acids, phenols and mercaptans) but on decompn. with H_2O yield volatile oils insol.

in aq. alkalis, having an unpleasant odor and showing a strong tendency to condense; they are apparently hydrocarbons with acid methylene groups. If the crude oil is treated with Na and washed with dil. HCl, there is obtained a lighter colored oil which has lost the disagreeable odor and can be distd. *in vacuo* without decompn. but still contains a small amt. of substances containing O; from the latter it can be freed by means of Grignard reagents which form with the O compds. substances which again react with Na; the purified oil undoubtedly contains ketones which are converted by the Mg compds. into tertiary alcs. After decompn. of the Mg compds. and distn. over Na there is obtained a light yellow oil of pleasant odor, which contains only C, H and S and which can be sepd. into a number of fractions of very similar chem. properties. Various reactions (formation of dyes with phenanthrenequinone and H_2SO_4) indicate the presence of thiophene compds. By means of $AcCl$ and $AlCl_3$ a definite acetylthiophene was isolated. This was also obtained from the corresponding fractions of 2 crude oils from Tyrol; in fact, all three samples of crude oils yielded purified oils of identical chem. behavior, the only difference being in the relative amts. of the constituents, the typical S compds. being higher homologs of thiophene (in some cases 50% of the oil); the accompanying hydrocarbons belong chiefly to the C_8H_8 series, together with small amts. of compds. richer in H. From 500 g. crude oil were obtained 225 g. purified oil which yielded 43.9 g. b_{16} 54–70° and 10.0 g. b_{16} 70–80°; these fractions distd. under atm. pressure and then twice over Na gave 17.6 g. b_{30} 170–80°, with 75.03% C, 9.73% H, 14.33% S, d_{20} 0.901. By partial acetylation it is possible to obtain a product richer in S; thus, 10 g. of the above fraction were treated (on the assumption that 0.5 of it was propylthiophene) in 20 cc. of cold low-boiling petr. ether with 1.6 g. $AcCl$ and 2.7 g. $AlCl_3$ in alternate small portions in the course of 0.5 hr., allowed to stand 1 hr. at 0°, the resulting product washed with petr. ether, decompd. with ice, extd. with Et_2O , washed with dil. soda and H_2O , dried with $CaCl_2$ and fractionated; this gave 2.5 g. b_{14} 118–27°, with 65.62% C, 7.68% H and 17.68% S; 1 g. of this boiled 3 hrs. with a soln. prepd. by treating 1 g. $H_2NCONHNH_2 \cdot HCl$ in alc. with 0.2 g. Na in alc., cooling and filtering from the NaCl, gave 0.66 g. of a semicarbazone, $C_{10}H_{11}ON_3S$, m. 178–92°, of propylacetothienone or an isomer (trimethyl-, methylethyl- or isopropylacetothienone) or perhaps of a mixt. of isomers; as the oil from which it was obtained had the compn. of a Bu rather than a Pr deriv., it must have contained, besides propylacetothienone, higher homologs. Attempts to isolate the thiophene compds. from the oil fractions with halogens or Hg salts had but little success; treatment with Br gives also the brominated C_8H_8 derivs. and Hg salts only partially ppt. the thiophene compds. From 1 g. of a fraction b. 130–40° of a Tyrolese oil in 40 cc. alc. treated with 37 g. of 10% alc. $HgCl_2$ and 7.5 g. of 33% $NaOAc$ and allowed to stand 20 hrs. was obtained 0.55 g. crystals which, on washing with H_2O , alc., and Et_2O , yielded up 0.15 g. cryst. material to the Et_2O ; the washed crystals only partially dissolved in boiling alc. and the filtered soln. on cooling deposited leaves, m. 189–93° (Steinkopf and Bauermeister, C. A. 8, 1418, describe the $HgCl_2$ compd. obtained from α, α' -dimethylthiophene as m. 186–7°). The neutral constituents of the crude oils which combine with the Na in the purification process also contain S; they are probably compds. with mobile H atoms (condensed cyclopentadiene and thiophene rings), or perhaps compds. similar to the so-called penththiophene; cf. C. A. 9, 3245).

CHAS. A. ROULLER.

New method of preparation of allochrysoketonecarboxylic acid and its derivatives. Intramolecular Friedel-Crafts reaction in acid anhydrides. ALFRED SCHAAER-SCHMIDT, with N. IRNEU. Berlin. Ber. 48, 1826–33 (1915); cf. C. A. 9, 2256.—To study further the nature of the reduction products of 1-benzoylanthraquinones it was desirable to extend the reaction to similarly constituted polyketones like 1-benzoylfluorenone. With the purpose of obtaining such compds. it was attempted to condense

1-phenylnaphthalene-2,3-dicarboxylic anhydride (a) with aromatic hydrocarbons by means of AlCl_3 , but the hydrocarbon does not enter into reaction, the (a) undergoing an intramol. Friedel-Crafts reaction and giving exclusively allochrysoketone-carboxylic acid (b). (a) was obtained in 38 g. yield from 50 g. $\text{PhC}:\text{CCO}_2\text{H}$ gently boiled 3 hrs. with 6 parts of Ac_2O ; 60 g. of the finely powdered (a) suspended in 420 cc. of C_6H_6 are treated in the course of 0.5 hr. with 100 g. AlCl_3 , heated 4 hrs. at 70° with frequent shaking, poured upon ice, freed from C_6H_6 by distn., boiled twice with dil. HCl , then with 8 l. H_2O and 80 cc. NH_4OH , filtered boiling hot and treated hot with dil. HCl , which gives 59–60 g. of (b) as a voluminous ppt. sepg. from xylene in Bordeaux-red needles, m. $288-9^\circ$, sublimes 260° in rodlets which, like the crystals, are yellow in transmitted and red in incident light. From 50 g. (a) suspended in 200 cc. PhMe gently boiled 0.5 hr. with 42 g. PCl_5 , dild. with 150 cc. more PhMe , brought to a boil and filtered hot is obtained 43 g. of the chloride, golden yellow needles, m. $194-5^\circ$; 6.3 g. of this in 70 cc. PhCl slowly treated at room temp. with 8 g. AlCl_3 , allowed to stand 0.5 hr. and then heated 1 hr. at $60-70^\circ$ gives 7 g. of 1-*p*-chlorobenzoylallochrysoketone, golden yellow needles from AcOH , m. 220° , sol. in concd. H_2SO_4 with brownish red color unchanged by gently warming with Cu powder; H_2O gives a yellow ppt. 1-Dimethylbenzoylallochrysoketone, from the chloride, *m*-xylene and AlCl_3 heated 1.5 hrs. at $70-80^\circ$, orange-yellow plates from AcOH , m. 212° , sol. in H_2SO_4 with brown-red color unchanged by warming with Cu powder. Methyl ester of (b), from the chloride boiled 15 min. with 10 parts MeOH , orange needles from MeOH , m. $146-7^\circ$; Et ester, from the chloride and EtOH or from the Ag salt boiled 3 hrs. in 20 parts C_6H_6 with 2 parts EtI , orange needles from alc., m. $182-3^\circ$. The Ag salt, which is pure yellow when fresh, becomes brown-red on long standing in the light. When gently boiled 0.5 hr. with 2 parts Zn dust and 20 parts NH_4OH , (b) gives a compound $\text{C}_{18}\text{H}_{12}\text{O}_4$, hair-like needles from AcOH , turns brown 225° , m. $244-6^\circ$; apparently the C:O group has been reduced to the alc.

CHAS. A. ROULLER.

Imide character of hydrazoic acid. I. Synthesis of azidodithiocarbonic acid FRITZ SOMMER. Berlin. Ber. 48, 1833–41(1915).—Salts of HN_3 react with CS_2 to form the compds. $\text{N}_3:\text{NCS}_2\text{M}$. Thus, when 6 g. NaN_3 in 25 cc. H_2O are slowly treated at $40-50^\circ$ with 7.5 g. CS_2 , filtered, concd. over P_2O_5 and slowly cooled to 0° there is obtained a good yield of long, highly refractive prisms becoming yellowish on long standing and weathering in the air at room temp. and having the compn. $\text{N}_3\text{CS}_2\text{Na}$, $4\text{H}_2\text{O}$ of sodium azidodithiocarbonate; they are stable in closed vessels below 10° and only moderately explosive in the hydrated form, as they cannot be made to explode by shock but deflagrate violently on a Pt foil; the anhydrous salt can be exploded by shock and detonates loudly on gentle heating. Potassium salt, similarly prepd., exploded violently while being freed from the mother liquors by cautiously spreading on clay with a porcelain spatula. After pressing out between paper it had the appearance of leaflets and was probably anhydrous, as small samples did not lose wt. over H_2SO_4 . Barium salt refractive hexangular tables with 5 H_2O , very stable in the air and with about the same degree of explosiveness as the Na salt. Qual. expts. on the heavy metal salts (they are fearfully explosive) showed that they are of a very complex nature (many are insol. in acids but sol. in org. solvents and the color of the solns. differs from that of the metal ion). Thus, the Na salt and AgNO_3 give a white curdy Ag salt sol. in excess of the Na salt, insol. in HNO_3 and NH_4OH , explodes on the least touch when dry. Cu^+ salt give a dark dirty green-brown ppt. changing to a Cd-yellow with excess of the Na salt the yellow salt is insol. in half-dild. HCl and HNO_3 but sol. in NH_4OH with green an in excess of azido salt with yellow color. Hg^+ salts give an amorphous white ppt. slowly becoming cryst., sol. in dil. HCl , with difficulty in cold dil. HNO_3 , easily in NH_4OH an org. solvents and in excess of HgCl_2 or azido salt. HgNO_3 gives a black-gray pp

becoming white on addition of more HgNO_3 but unchanged by excess of azido salt, sol. in dil. HCl , insol. in cold dil. HNO_3 . $\text{Pb}(\text{OAc})_2$ gives a yellowish white ppt. sol. in cold dil. HCl and HNO_3 ; the same is true of TlNO_3 . The Cd salt forms needles sol. in excess of azido salt, in cold dil. HCl and HNO_3 and in NH_4OH , but insol. in dil. AcOH . $\text{Bi}(\text{NO}_3)_3$ gives a Cd-yellow salt sol. in excess of azido salt with red-yellow color, sol. in cold dil. HNO_3 , dil. HCl and AcOH . SnCl_2 in HCl gives no ppt.; the same is true of Al , Cr , Fe'' , Ni , Co and Mn salts. ZnSO_4 gives a white salt insol. in excess of azido salt but sol. in HCl , HNO_3 and AcOH . Ce'' and Th salts give no ppt. FeCl_3 gives needles free from Fe , and the liquid contains Fe'' but no Fe''' ions; a similar oxidation is effected by KMnO_4 , $\text{K}_2\text{Cr}_2\text{O}_7$, Ce'' salts in H_2SO_4 and I in KI ; undoubtedly the disulfide $[\text{N}_2:\text{NC}(:\text{S})\text{S}-]_2$ is formed; if the needles are heated in a test tube in aq. suspension, the tube is shattered before the H_2O reaches the b. p. C. A. R.

An oxidation product of indigo blue. P. FRIEDLÄNDER AND N. ROSCHDESTWENSKY. Darmstadt. Ber. 48, 1841-7 (1915); cf. C. A. 3, 1268.—As previously pointed out, indigo and other indigoid dyes are slowly oxidized when boiled in contact with air in high-boiling solvents. On boiling a few mg. indigo in 1-2 cc. of $\text{o-C}_6\text{H}_4(\text{CO}_2\text{Et})_2$ (b. 295°) and shaking, the blue color disappears in a few min. and changes to a brownish yellow, and on long standing small amts. of difficultly sol. crystals sep. In boiling phenanthrene (b. 340°) in a current of air the change is still more rapid; 1 g. indigo in 20-30 g. phenanthrene is completely destroyed in about 0.5 hr., giving chiefly a dark brown, amorphous, difficultly sol. product, and in smaller amt. a yellow compd. distg. over with the phenanthrene and coloring it brownish yellow; it was not isolated in solid form but the reactions of the phenanthrene soln. make it probable that it is identical with the compd. $\text{C}_{18}\text{H}_{14}\text{O}_2\text{N}_2$ (a) obtained by Perkin by sublimation of indigo in the presence of a limited amt. of air (P. Chem. Soc. 22, 198 (1906)). A direct comparison of (a) with the compd. $\text{C}_{18}\text{H}_{14}\text{O}_2\text{N}_2$ obtained from indigo or isatin with KMnO_4 (Meister, Lucius & Brining, C. A. 9, 966, 1999) showed that they are identical and confirmed the correctness of P.'s formula. On warming with strongly acid SnCl_2 it gives white needles of the HCl salt, dissociated by H_2O , of an easily oxidizable, faintly basic reduction product which is brownish yellow and sol. in cold dil. NaOH to the vat dye obtained with hyposulfite. The presence of a $\text{C}:\text{O}$ group in (a) is further indicated by the formation of an oxime, faintly yellowish needles, m. about 265° (decompn.), sol. in warm dil. NaOH and concd. (1:1) HCl , and of a phenylhydrazosone, orange-yellow needles, m. 242° . Shaken with 5% NaOMe (a) gradually dissolves without color and H_2O reprecipitates it; on warming the soln. becomes violet-blue, then, owing to reduction, brown, shaking with air restoring the blue color; in greater concns., violet-black needles sep. which in contact with H_2O slowly regenerate (a). In boiling 10% aq. NaOH it slowly dissolves without color and becomes yellow-red on addition of H_2SO_4 ; extrn. with AcOEt removes isatin while the acid soln. contains an equiv. amt. of $\text{o-H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$. The conclusion drawn from these facts that (a) is anhydro- α -isatinanthranilide,

$\text{C}_6\text{H}_5-\text{C}(\text{CO}:\text{N})-\text{C}(\text{N}:\text{CO})-\text{C}_6\text{H}_5$, is confirmed by the fact that it is obtained in the following

ways: α -Isatinilide and somewhat more than 1 mol. of $\text{H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ in sufficient AcOH are heated until the originally brown-yellow soln. no longer becomes a brighter yellow; a dehydrating agent (Ac_2O , H_2SO_4 + AcOH) is added, whereupon the warm mixt. solidifies to a magma of yellow needles of (a). Again, 2 mols. of $\text{H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ in enough boiling xylene treated with 1 mol. isatin chloride deposits $\text{HCl}\cdot\text{H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ and the xylene soln. on cooling solidifies to a magma of (a). Finally, (a) is obtained from $\text{o-ONC}_6\text{H}_4\text{CO}_2\text{H}$ and indoxyl in faintly alk. soln., subsequently warmed and acidified.

CHAS. A. ROUVILLER.

Method of obtaining melting points (KNAPP) 7.

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COOK, E. P.: *Laboratory Experiments in Organic Chemistry*. Philadelphia: Blakiston. 52 pp. \$0.35.

FISCHER, E. UND BRIEGER W.: *Studien über die Allylpropyl-cyanessigsäure*. Berlin: G. Reimer. 50 Pf.

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II. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.
A. GENERAL.

FRANK P. UNDERHILL.

Calcium in permeability and irritability. JACQUES LOEB. Rockefeller Inst. *J. Biol. Chem.* 23, 423-30(1915).—The variation of the amt. of Ca, or of Ca + Mg, required to antagonize various concns. of NaCl, or of NaCl + KCl, was investigated for a case in which the antagonism concerned permeability (eggs of *Fundulus*), and for a case in which it concerned irritability (larvae of *Balanus eburneus*). It was found that in the case of irritability the Ca required varied in direct proportion to the change in the concn. of NaCl (Weber's law), while in the case of permeability the concn. of Ca required for antagonism varied approx. as the square of the ratio of the concn. of NaCl.

I. GREENWALD.

The time required for reduction of oxyhemoglobin in vivo. D. FRASER HARRIS AND H. J. M. CREIGHTON. *J. Biol. Chem.* 23, 469-70(1915).—If a spectroscope is directed to the red glare between 2 adjoining fingers placed before a bright light, the 2 bands of oxyhemoglobin can be detected. If the wrist be tightly bandaged, these fade away and are replaced by the single band of hemoglobin in from 18 to 26 seconds. The same change in the rabbit's ear requires about 40 seconds. The reduction by tissues, *in vitro*, requires from 2 to 2.5 min.

I. GREENWALD.

The refractive indices of solutions of certain proteins. IX. Edestin. CARL A. SCHMIDT. Univ. Calif. *J. Biol. Chem.* 23, 487-93(1915).—Edestin, in varying amts., was dissolved in solns. of acids, bases and salts. These were found to follow the law $n - n_1 = a \times c$, where n is the refractive index of the protein soln., n_1 that of the solvent, c the % concn. of protein, and a a constant expressing the change in n of the solvent by the addition of 1% protein. The value of a was found to be 0.00174 and 0.00006, and remained constant even though the solvent causes hydrolysis of the protein.

I. GREENWALD.

Preparation and composition of caseinogen. JOHN MELLANBY. St. Thomas' Hospital, London. *Biochem. J.* 9, 342-50(1915).—Caseinogen was prepd. by adding 3 vols. of alc. to 1 vol. of fresh, separated milk, at a temp. below 15°. The ppt. was strained through muslin, ground up with ether, filtered, and again extd. with ether until free from fat and pigment. This product was passed between folded filter and dried in the air. The impurities present—lactose and lactalbumin—can be estimated by dissolving them in H₂O at 15°, under which conditions caseinogen is insol. Casein

ogen is probably a complex of protein and calcium phosphate; 3500 g. of caseinogen contain a gram mol. wt. of $\text{Ca}_3(\text{PO}_4)_2$. Six gram mols. AcOH ppt. acidic caseinogen from about 3500 g. of caseinogen. 1 g. atom of P is contained in about 3400 g. of acidic caseinogen. The reaction between AcOH and caseinogen is expressed thus: Protein, $\text{Ca}_3(\text{PO}_4)_2 + 6\text{HOAc} = \text{Protein}, 6\text{HOAc} + \text{Ca}_3(\text{PO}_4)_2$. The relation of the
(Caseinogen) (Acidic caseinogen)

protein to the calcium phosphate in caseinogen is suggested as $\text{R} \begin{cases} (\text{NH}_2)_2\text{Ca}_2\text{H}_2(\text{PO}_4)_2 \\ \text{XCa} \end{cases}$

in which the group (X) has feeble acidic properties. [Cameron and Seidell (*J. Am. Chem. Soc.* 26, 1454(1904)) have shown that $\text{Ca}_3(\text{PO}_4)_2$ and $\text{CaH}_2(\text{PO}_4)_2$ are considerably decomposed by water, whereas $\text{Ca}_2\text{H}_2(\text{PO}_4)_2$ is stable.] B. HOROWITZ.

Composition of "lecithin," together with observations on the distribution of phosphatides in the tissues and methods for their extraction and purification. HUGH MACLEAN. *Biochem. J.* 9, 351-78(1915).—Phosphatides extd. from tissues by alc. contain nitrogenous impurities, and these are difficult to remove by any of the ordinary methods for prepg. "lecithin." This crude lecithin is a mixt. of true lecithin—in which all of the nitrogen is in the form of chlorine—and cephalin, which contains no choline, and in which all of the nitrogen is in the form of aminoethyl alc. These two components were sepd. by precipitation as their Cd salts and extn. of the ppt. with ether. *Prepn. of "lecithin."* The tissue used (heart, kidneys or egg yolk) was ground to a fine paste, spread out in a thin layer on a glass plate, and dried at 30° (using a fan). The dried tissue was powdered in a coffee mill. The powder was extd. several times with excess of abs. alc. and the exts. united and concd. to a small vol. under reduced pressure at 40° . The residue was taken up with a small vol. of ether, in which it did not completely dissolve. To the unfiltered mixt. acetone was added in excess and the ppt. obtained was ground in a mortar. The ppt. was again mixed with ether, pptd. by acetone and treated as before. This was repeated three times. The ppt. was then rubbed in a mortar with a large excess of water, and one-third volume of acetone added. The ppt. was reemulsified and repptd. three times. The final ppt. was dried by the addition of acetone and ether. The ether soln. was centrifuged, giving an impure ppt. of sphingomyelin, the ether layer decanted and acetone added. The resulting ppt. was redissolved in ether and repptd. with acetone. The ppt. was then dissolved in alc., allowed to stand to ppt. the cephalin, and filtered. The filtrate was evapd. under reduced pressure at 40° , the residue taken up with ether, and the phosphatide pptd. with acetone. The ppt. gave a clear soln. with ether and alc. B. HOROWITZ.

ARRHENIUS, S.: *Quantitative Laws in Biological Chemistry*. London: G. Bell & Sons.

HUXLEY, T. H.: *Lessons in Elementary Physiology*. Rev. ed. London: Macmillan & Co. 604 pp. 4 s, 6 d.

PLIMMER, R. H. A.: *Practical Organic and Bio-Chemistry*. London: Longmans, Green & Co.

Publications from the Jefferson Medical College and Hospital. Vol. VI. Philadelphia. 1915. 190 pp.

ROBERTS, A. A.: *The Poison War*. London: W. Heinemann. 144 pp. 5 s.

B. METHODS AND APPARATUS.

STANLEY E. BENEDICT.

An apparatus for the perfusion of isolated organs. A. H. RICHARDS AND CHCII. K. DRINKER. Philadelphia. *J. Pharmacol.* 7, 467-83(1915). P. J. HANZLIK.

The diazo reactions of histidine and tyrosine. GINSABURO TOTANI. Cambridge. *Biochem. J.* 9, 385-92(1915).—By reducing the red diazo compounds of histidine and tyrosine, and then rendering the soln. alk., the tyrosine gives a rose red whereas the histidine yields a golden yellow color. *Method:* A few cc. of the soln. to be tested are made alkaline with an excess of Na_2CO_3 soln. A few cg. of the *freshly prepared* diazobenzenesulfonic acid are dissolved in a small quantity of Na_2CO_3 soln. The reagent and soln. are then mixed. Within three minutes the fluid assumes a dark red color if histidine or tyrosine be present. Enough concd. HCl is then added to make the soln. distinctly acid. The acid soln. is reduced by Zn dust, yielding a colorless soln. To a small portion of this, two volumes of NH_4OH (25%) are added.

B. HOROWITZ.

The use of radium emanation condensed in closed tubes in place of radioactive compounds, and the estimation (in millicuries of emanation decomposed) of the energy used up in radioactive applications in general. DEBIERNE AND REGAUD. *Compt. rend.* 161, 422-4(1915).—Attention is called to the advantages, in the biological application of Ra, of using Ra Em condensed in small closed tubes over the use of solid Ra preps. The former may be inclosed in a tube of any shape most applicable to the case for which it is to be used, and by using the Em danger of loss of the mother material during the application is avoided. It is suggested that the dosage of radioactivity applied should be expressed as millicuries of Ra Em decomposed during the application.

W. H. ROSS.

Determination of carbon-free ash in plant substances (BOLTZ) 7.

NEUBAUER-HUPPERT: *Analyse des Harns*. Wiesbaden: C. W. Kreidels. 1600 ss. 47 M.

C. BACTERIOLOGY.

ERNEST D. CLARK.

A new culture medium for cholera diagnosis. C. LANGE. *Deut. med. Wochschr.* 41, 1119-20(1915).—The principle of the new medium is based on the fact that only very few bacteria encountered in the feces attack starch at high degrees of alkalinity. Agar is prepd. containing 40 cc. 10% Na_2CO_3 soln. in 1000 cc., after neutralization of agar to litmus. Six parts of this agar are mixed with one part of 5% starch soln. Rice starch is added to cold water and heated in the water bath. It is then sterilized by short treatment in the autoclave. The cholera bacilli grow abundantly on this agar, forming round translucent areas on the otherwise turbid medium. Cholera colonies have a very characteristic appearance.

S. AMBERG.

The supposed biochemical variation of the Bulgarian ferment. F. DUCHACEK. Paris. *Ann. inst. Pasteur* 29, 347-56(1915); cf. *C. A.* 9, 2920.—The organism of Bertrand and that of Effront act similarly when grown on media containing glucose, but in no case was the transformation of one into the other observed.

GEO. T. CALDWELL.

An improvement in the composition of lactose bile. T. W. MELIA. *Am. J. Pub. Health* 5, 1168-74(1915).—Five % dried ox-gall in the bile is better than 10%, as heretofore recommended. It gives a gas more rapidly and in greater amt. Positive tests appear in higher dilns. Attenuated *B. coli* are shown more readily; interference by other bacteria, especially streptococci, is less. In identifying *B. typhi* by this method it is better to omit the lactose and incubate longer; in the case of *B. coli* the lactose sometimes changes its character to non-acidifying; this sometimes interferes with the identification of *B. typhi*. Advantages with reference to clearness, foaming, etc., obtained by using the 5% bile, are pointed out.

J. GAUB.

The reducing enzyme of *Bacillus coli communis*. A. HARDEN AND S. S. ZILVA. Lister Inst., London. *Biochem. J.* 9, 379-84(1915).—*B. coli communis* (Escherich), when washed, will not reduce methylene blue. The addition of various reagents incapable in themselves of effecting reduction—such as the sodium salts of some of the fatty acids, the common sugars, some amino acids, albumin, globulin, Witte peptone, etc.—causes the bacilli to re-acquire reducing power. B. HOROWITZ.

Resistance to chemical agents of certain series of *Bacillus subtilis*. P. PORTER. *Compt. rend.* 161, 397-9(1915).—The pure cultures of the bacteria in question were sown on ordinary beef bouillon containing 5% of glycerol and the growths obtained were immersed in the various chemical agents whose action is to be studied. After contact, the liquid was poured off and immediately replaced with either sterile H_2O or 95% EtOH. The culture fragments were then aseptically transferred to new bouillon, incubated at 40° , and the time noted in which the culture develops. The periods of resistance to growth shown by various germicidal agents were as follows: 5% C_2H_5OH , more than 50 hrs.; 20% $HCHO$, more than 25 hrs.; tincture of I, o.1 strength, more than 24 but less than 48 hrs.; fixing liquid of Bouin, more than 13 but less than 24 hrs.; 65 or 95% EtOH, more than 14 months. Immersion in the following liquids was preceded by dehydration with abs. alc.: oil of cloves more than 4 hrs.; oil of turpentine or oil of cedar, more than 15 hrs.; $CHCl_3$, more than 14 months. L. W. RIGGS.

ABBOTT, A. C.: The Principles of Bacteriology. 9th ed. New York: Lea & Febiger. 650 pp. \$2.75.

D. BOTANY.

C. L. ALSBERG.

Some effects of selection on the production of alkaloids in belladonna. A. F. SWEERS. Bur. of Plant Ind., U. S. Dept. Agric., *Bull.* 306(1915).—First generation plants, grown from seed of cross-pollinated selected individuals, displayed the characteristic of the maternal plant with respect to alkaloid productivity; this was usually true at all stages of growth during a season, and also for at least 2 successive seasons. Close pollination of the parent plant exerted only a moderate influence on the transmission of this characteristic. Second generation plants from cross-pollination were grown in Virginia, South Carolina and Wisconsin; at all 3 places they displayed the relative alkaloid-producing tendencies which were evident in the original parent plant and the generation preceding. The yield of alkaloids varied with the locality, but no definite relationship could be traced between the amt. of atm. pptn. and sunshine and the % of alkaloids. Plants, grown from cuttings and examd. at 2 stages of their growth, showed a marked tendency to display the same characteristic with respect to alkaloid production, as the plants from which they were propagated and the original parents of these plants. JOSEPH S. HEPBURN.

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F. PHYSIOLOGY.

ANDREW HUNTER.

The occurrence of pituitrin and epinephrine in fetal pituitary and suprarenal glands. CARRY P. MCCORD. Detroit. *J. Biol. Chem.* 23, 435-7(1915).—"Physiol. reactions characteristic of exts. of pituitary and suprarenal glands have been obtained from bovine fetal glands during all developmental stages in which the macroscopic recognition of the glands is possible. For the pituitary gland, this period is from the 8th week

to full term; for the suprarenals the period is from the 6th week to full term. The presence of the active principles of these glands at so early a developmental period suggests that the fetus *in utero* may be under the influence of its own secreting glands as well as the maternal glands."

I. GREENWALD.

The effect of alkalis on the rates of oxidation and reduction of blood. TOROJIRO KATO. Cambridge. *Biochem. J.* 9, 393-411(1915).—Alkali in the strength of 0.005 *M* NaOH at body temp. increases the velocity of reduction of blood on an av. to 0.78 of its normal values and increases that of oxidation to approx. 1.2-1.3 times the normal. Equimol. concns. of NaOH and Na_2CO_3 have equiv. effects. The same holds true for Na_2HPO_4 and NaHCO_3 , but their effect is less marked than that of NaOH and Na_2CO_3 .

B. HOROWITZ.

The part played by the different blood elements in glucolysis. H. MACLEAN AND H. B. WEIR. *Biochem. J.* 9, 412-9(1915).—Both the red and the white cells of normal blood take part in glucolysis. The ratio of glucolytic activity of the white to the red cells varies from 200:1 to 1000:1.

B. HOROWITZ.

MATHEWS, A. P.: *Physiological Chemistry*. New York: Wm. Wood & Co. 1948 pp. \$4.25.

G. PATHOLOGY.

H. G. WELLS.

Advances in the bacterio-serological field for the years 1912 to 1914. M. PIORKOWSKI. *Ber. pharm. Ges.* 25, 100-8(1914).

E. J. C.

Renal function as measured by the elimination of fluids, salt and nitrogen and the specific gravity of the urine. HERMAN O. MOSENTHAL. Johns Hopkins Hosp. *Arch. Intern. Med.* 16, 733-74(1915).—The nephritic test-meal of Hedinger and Schlager (*Deut. Arch. klin. Med.* 114, 120(1914)), slightly modified and elaborated by M., is considered to be a valuable test of renal function and of great value in the diagnosis of cardiac, renal and other conditions. The meal contains approx. 13.4 g. N, 0.5 g. NaCl and 1760 cc. of fluid with a considerable quantity of purine material in the form of meat, soup, tea and coffee. This meal is divided into 3 parts, taken at 8 A.M., 12 noon, and 5 P.M. The urine is collected in 2-hr. periods from 8 A.M. to 8 P.M. and then in one period from 8 P.M. to 8 A.M. Normal individuals yield urines whose sp. gr. varies 0.010 from the highest to the lowest; they yield a night urine whose vol. is 400 cc. or less and whose sp. gr. is 1.018 or more, and which contains at least 1% N. When kidney function becomes involved, the first signs are usually demonstrated in the night urine, one or all of the following changes being observed: increase in vol., decrease in sp. gr. and N concn. Severe functional inadequacy of the kidney is indicated by a markedly low and fixed sp. gr., a diminished output of NaCl and N, a tendency to total polyuria and a night urine showing increase in vol., low sp. gr. and low concn. of N. Such functional inadequacy is not confined to nephritis but is also found in pyelitis, hypertrophied prostate, marked anemia, pyelonephritis, polycystic kidney and diabetes insipidus. Prognosis and therapy depend upon the cause of the impairment and not upon its degree. In cardiac cases, with decompensation, the sp. gr. is fixed at about 1.020, the NaCl output is diminished, that of N is high and there is oliguria. As compensation is established, the compn. of the urine changes until when complete compensation has been established there is a tendency to a low, fixed sp. gr. and nocturnal polyuria for some time until the kidney resumes its normal activity. In combined chronic nephritis and cardiac decompensation, the urine shows the characteristics of both conditions, the degree to which the one or the other predominates depending upon the severity of the lesions in the two organs.

I. GREENWALD.

The resistance of the red blood cells to hypotonic salt solutions in the various

anemias, with observations on the resistance after arsenical treatment and after splenectomy. LEWIS WEBB HILL. Mass. Gen. Hosp. *Arch. Intern. Med.* 16, 809-17 (1915).—Washed corpuscles were treated with NaCl solns. of different concns. for 2 hrs. and the concns. in which hemolysis had begun and in which it had been completed were observed. The resistance of normal blood cells to hemolysis is const. The figures for pernicious anemia and secondary anemia are practically the same. In any given case the resistance may be high, low or normal. In general, initial hemolysis is likely to occur in a higher concn. of NaCl but to be complete in a lower concn. than is the case with normal blood. The hemoglobin content of the cell seems to bear no relation to its resistance. The previous administration of As increases the resistance of the red cells. Splenectomy lowers the limit of complete hemolysis but partial hemolysis may occur at a higher concn. than before the operation. A review of literature is included.

I. GREENWALD.

Clinical studies on the respiration. I. The effect of carbon dioxide in the inspired air on patients with cardiac disease. FRANCIS W. PRABODY. Peter Bent Brigham Hosp., Boston. *Arch. Intern. Med.* 16, 846-64 (1915).—In normal individuals, the total ventilation of the lungs is doubled when the concn. of the CO₂ in the inspired air is increased to between 4.2 and 5.4%. A similar result is obtained with patients with cardiac and cardiorenal disease, whose alveolar CO₂ tension indicates the absence of acidosis. If acidosis exists, such patients are much more susceptible to an increase of CO₂ in the air and ventilation may be doubled when the air contains only between 2 and 3% CO₂. It is suggested that, although probably not the sole factor causing the dyspnea in cardiac and cardiorenal disease, the acidosis may be an element of considerable importance. II. The acidosis of chronic nephritis. *Ibid* 955-66.—In chronic nephritis there is little or no acidosis unless the phenolsulfonephthalein output is diminished. The "alkali tolerance" is first affected. Generally only advanced cases show a diminution of the alveolar CO₂ tension and this may be normal even in severe cases. In the few cases in which acidosis is evident, it is readily relieved by alkali therapy.

I. GREENWALD.

The coagulation test for syphilis, as devised by Hirschfeld and Klinger. HAROLD N. COLE AND SAMUEL E.-K. CHIN. Western Reserve Univ. *Arch. Intern. Med.* 16, 880-9 (1915); cf. *C. A.* 9, 469.—The coagulation test carefully carried out is as specific as, and more delicate than, the Wassermann, in cases of treated, latent and cerebrospinal syphilis. After prolonged and effective treatment, syphilitic cases give negative results with the coagulation test. A few primary cases have given good results with the coagulation test while the Wassermann test was still negative. Detailed descriptions are given for the prepn. of the reagents and the performance of the test.

I. GREENWALD.

The relation of dentistry to neurology. CHRISTOPHER C. BELING. Newark, N. J. *Dental Cosmos* 57, 1360-5 (1915).—Of biochemical interest are the sections devoted to influence of occupations on the teeth, and to ductless glands. "Workers exposed to the effects of Hg and As are more prone to suffer from putrefactions of the gums which induce pyorrhea and oral sepsis." The Cu salts, to which workers in Cu are exposed, exert a prophylactic action with respect to caries and oral sepsis. Hypothyroidism gives rise to a deficiency of Ca salts or other chem. constituents of the teeth.

JOSEPH S. HEPBURN.

PHILLIPS, L. P.: *Amoebiasis and the Dysenteries.* London: H. K. Lewis. 147 pp. 6 s, 6 d.

H. PHARMACOLOGY.

A. N. RICHARDS.

Clinical and experimental investigation of the relation of the active principle of Apocynum to the heart mechanism. ADOLF H. HECHT. Vienna. *Z. exp. Med.* 4, 264-58(1915).—Apocynum and cymarin produce on the heart effects similar to those produced by strophanthin. These substances are less active and also less poisonous. They lack any marked cumulative action. GEO. T. CALDWELL.

The effect of Erlenmeyer's bromide mixture and of codeine upon experimentally produced convulsions. H. JANUSCHKE AND M. MASSLOW. Vienna. *Z. exp. Med.* 4, 301-12(1915).—Erlenmeyer's mixt. injected intravenously in rabbits in very small doses produces convulsions and death. The quieting action of this mixt. is not quite identical with that of NaBr: (a) with subcutaneous injection the convulsion centers of camphor in the medulla are clearly protected, while the cocaine centers of the cerebrum are not; (b) with long-continued administration by mouth, the motor centers of the cerebral cortex and the medulla oblongata are protected, while the picrotoxin center of the spinal cord is not; (c) a retarding influence on the sensory neurone of the reflex arc and on the motor curve endings of the skeletal musculature is lacking with this mixt. just as with NaBr. The protection of the convulsion center of the medulla is quantitatively no greater than with NaBr. Codeine in animals protects against some of the convulsion-producing poisons investigated, but acts rather as a convulsant. GEO. T. CALDWELL.

The so-called sensitization of the vascular system toward epinephrine by cocaine. RICHARD FISCHEL. Prague. *Z. exp. Med.* 4, 562-78(1915).—Cocaine in extremely small doses (0.000001 g.) injected intravenously into rabbits increases the excitability for epinephrine during the perfusion of the vascular system by the latter. A cocaine-epinephrine mixt. (both substances being applied at the same time) produces the most marked effects. If the cocaine is applied before the epinephrine a much smaller vasoconstriction is obtained and cocaine administered in the relaxing phase produces no recognizable effect. GEO. T. CALDWELL.

The use of quinine in the treatment of experimental gaseous gangrene. The value of quinine hydrochloride as a general antiseptic. K. TAYLOR. Paris. *Lancet* 1915, II, 538-40.—*In vivo*, quinine was 70 times as effective as phenol in inhibiting the growth of the gas bacillus. In animals it reduced the mortality from 100% to 41%. Quinine does not damage healthy tissues in local injections of effective concn. It produced no symptoms of intoxication in the animals treated. GEO. T. CALDWELL.

The similarity and synergy of morphine and strychnine action. HUGH MCGURGAN AND E. L. ROSS. Chicago. *J. Pharmacol.* 7, 385-405(1915).—Oxidized morphine (by treatment with HNO_3) to a certain degree produces tetanus more quickly than unoxidized morphine after intraspinal injection in dogs and cats, or in the lymph of frogs. Oxidized codeine will also produce tetanus. Unoxidized codeine produces tetanus in frogs more quickly than morphine, but not in dogs. Oxidized morphine administered other than intraspinally does not produce convulsions in mammals. The strychnine-like action of morphine is apparently due to an oxidation product which is first produced and then destroyed in the body. Differences in the rate of oxidation will explain the varied reaction in different animals. P. J. HANLICK.

The synergism of morphine and the scopolamines. MAURICE I. SMITH. Ann Arbor. *J. Pharmacol.* 7, 407-21(1915).—Scopolamines are synergistic with morphine in the frog, both in combined sublethal as well as combined lethal doses. There is a synergistic action between scopolamine and morphine on the frog heart and in the respiratory centers. The toxicity of the scopolamine-morphine com-

bination in the mouse is increased with the relative increase of the scopolamine content of the combined dose. *l*-Scopolamine is more toxic to the mouse in combination with morphine than *d*-scopolamine. In other respects the 2 scopolamines are essentially alike in their relation to morphine.

P. J. HANZLIK.

The action of cocaine. M. KURODA. London. *J. Pharmacol.* 7, 423-39(1915).

—Cocaine was found to dilate the surviving vessels of frog and mammal, depress the heart (frog and mammalian), augment the intestinal and gastric peristalsis with small doses and depress with large, contract the non-pregnant uterus of dog, cat and rabbit and pregnant uterus of cat, augment bladder peristalsis, but had no effect on the salivary gland. With the exception of rabbit and dog non-pregnant and cat pregnant uterus, epinephrine in all cases produces the opposite effects. Cocaine first stimulates then depresses smooth muscle, whatever be the nature of the sympathetic control. Upon the basis of the results obtained it is suggested that the pupilo-dilatation produced by cocaine is due to a direct action on the muscle of the iris and not to stimulation of sympathetic endings. The effects of cocaine on smooth muscle are analogous to those on the other forms of protoplasm, inclusive of sensory organs.

P. J. HANZLIK.

The effect of caffeine upon the blood flow in normal human subjects. J. H. MEANS AND L. H. NEWBURGH. Boston. *J. Pharmacol.* 7, 449-65(1915).—The method of Krogh and Lindhard for the detn. of blood flow was used. The action of caffeine on the blood flow was studied in two subjects at rest, and in one during work. The drug produced an increase in total blood flow without a corresponding increase in O absorption, hence a decreased coeff. of utilization of O-carrying capacity of the blood; pulse rate remained unchanged, and consequently systolic output was increased. During work there was possibly an increase in pulse rate and consequently slight diminution in systolic output. It is suggested that during rest when the supply of blood to the right heart is "inadequate" caffeine increases the blood flow by increasing the venous supply through an action upon some mechanism outside the heart. When the supply becomes "adequate" or approaches adequacy, no such action is obtained.

P. J. HANZLIK.

Urine formation by the perfused kidney: Preliminary experiments on the action of caffeine. A. N. RICHARDS AND O. H. PLANT. Phila. *J. Pharmacol.* 7, 485-509 (1915).—Rabbit kidney was perfused *in situ* with hirudinized blood under conditions which permitted adjustment and measurement of the blood flow through the kidney, using the special app. constructed by Richards and Drinker (cf. *C. A.* 10, 345). When blood flow through the perfused kidney amounts to 28 cc. per minute, fluid similar in compn. to urine is obtained from the ureter. When the blood flow through the kidney is constant, rate of urine secretion is constant, and apparently independent of pressure changes in the renal circulation provided changes in pressure do not cause changes in vol. of blood flowing through it. Caffeine causes diuresis in the perfused kidney when the rate of blood flow through the organ remains constant. From this it is suggested that increased renal blood flow produced by caffeine is not essential in its diuretic action. Five % NaCl is diuretic when blood flow through the kidney is constant, but 0.9% NaCl in dosage used is perhaps not diuretic; phlorhizin causes both diuresis and glucosuria.

P. J. HANZLIK.

The response of the surviving uterus to morphine and scopolamine. HENRY G. BARBOUR AND MAT H. COPENHASER. *J. Pharmacol.* 7, 509-39(1915)—Morphine (0.002 to 0.1%) and scopolamine (0.001 to 0.06%) alone, and when mixed, produce an increase in tone of the isolated uterus (pregnant and nonpregnant cats and guinea pigs). Scopolamine as a uterine stimulant is 10 times as powerful as morphine. Very high concns. of both drugs produce uterine tetanus. No synergism or antagonism upon

the uterus could be demonstrated for these drugs. These results are contradictory to those of Kehrer (*Arch. f. Gynäkol.* 81, 160(1907)). P. J. HANZLIK.

The action of phenylethylamine on the heart. HENRY G. BARBOUR AND EDWARD N. FRANKEL. New Haven. *J. Pharmacol.* 7, 511-27(1915).—Phenylethylamine (1:10,000 to 1:500) produces a diminution in rate and amplitude of the frog heart; the effects are temporary. Perfusion of the isolated rabbit heart with small doses gives a constant increase in amplitude without change in rate; larger doses decrease both. These effects are accompanied by marked reduction in coronary flow, but after larger doses the flow is increased. The intact heart of the cat shows increase in amplitude and rate with large and small doses; large doses cause decrease. Blood pressure rises with increased cardiac activity, also when the heart action is unchanged. With decreased cardiac activity the blood pressure falls. The vagus mechanism is thought not to be concerned in these effects. Phenylethylamine is presumably a cardiac muscle poison, in small amts. being stimulant, and in large amts. depressant; in all doses it produces coronary vasoconstriction, but with large doses a secondary relaxation occurs. P. J. HANZLIK.

Morphine and scopolamine action upon the intact uterus. HENRY GRAY BARBOUR. New Haven. *J. Pharmacol.* 7, 547-55(1915).—The tone of cat uterus *in situ* is increased by morphine and scopolamine in the same way as with the isolated organ. This was true of decerebrate and anesthetized animals. Neither drug, however, produces profound changes in uterine activity. A mixture of the drugs (up to 0.02 g. each) produces little or no effect. The delay in labor produced by either or both of these drugs is ascribed to their cerebral action. P. J. HANZLIK.

The action of caffeine and of epinephrine upon the vagus nerve. HENRY G. BARBOUR AND SIMON B. KLEINER. New Haven. *J. Pharmacol.* 7, 541-5(1915).—Perfusion of the frog heart with caffeine and epinephrine markedly lessens the response to faradic stimulation of the vagus. The minimal adequate concn. of caffeine lies between 0.02 and 0.05%; of epinephrine between 0.0005 and 0.001%. A more complete recovery of vagus sensitivity occurs after caffeine than after epinephrine. The results obtained with epinephrine are interpreted in the nature of a real vagus depression; with caffeine they are in part due to increased irritability of heart muscle. P. J. H.

The urinary phenomena of coffee. WILLIAM A. PEARSON. Hahnemann Medical College, Phila. *J. Am. Inst. Homeopathy* 8, 507-12(1915).—The diuretic effect of caffeine was noted; no marked effects were produced on sp. gr. and amt. of total solids, urea, chlorides and phosphates of the urine. Increased elimination of uric acid was noted in subjects taking 2x, 10x, 12x and 200x. JOSEPH S. HEPBURN.

The physiological effects of the rare earths. C. RICHARD BOHM. *Chem. Ztg.* 39, 875-8, 895-7(1915).—A review of the investigations of the action of salts of Ce, Th, Zr and Di on animal and plant life, their antiseptic and bactericidal properties, radioactivity, and the suitability of some of the oxides as substitutes for Bi compds. in Röntgen ray diagnosis. J. H. MOORE.

The treatment of amebic dysentery. GEORGE C. LOW. *Brit. Med. J.* 1915, II, 714-6.—In the majority of cases, emetine hydrochloride given subcutaneously or intramuscularly eliminates *Entameba histolytica*. In a case in which *Lambia intestinalis* was accompanied by *Entameba histolytica* cysts, emetine hydrochloride was without effect, while β -naphthol diminished, but did not entirely destroy the parasites. A. H. RAHE.

Amyl nitrite in chloroform poisoning. J. S. GILMAN, *et al.* Richmond. *Southern Med. J.* 8, No. 10(1915); *J. Am. Med. Assoc.* 65, 1586.—The results indicate that in-

halations of amyl nitrite definitely increased the dose of CHCl_3 required to cause the death of animals.

L. W. RIGGS.

Adalin intoxication. A. NIEUWENHUIJSE. *Nederlandsch Tijdschrift Geneeskunde* Sept. 18, 1915; *J. Am. Med. Assoc.* 65, 1594.—In the case reported the symptoms were like those of veronal poisoning, unconsciousness persisting nearly 60 hrs. and being followed by recovery. The dose had been about 3 g.

L. W. RIGGS.

Case of stramonium poisoning. W. D. McNALLY. Chicago. *J. Am. Med. Assoc.* 65, 1640(1915).—McN. reports a fatal case of a boy, aged 7 years, who died 14 hrs. after eating about 100 seeds of the "thorn apple," *Datura stramonium*. Symptoms and necropsy findings are given.

L. W. RIGGS.

Pharmacology of bronchial asthma. D. E. JACKSON. St. Louis. *J. Lab. Clin. Med.* 1, 126-30(1915).—A discussion of the action of various drugs in relation to the question of whether or not there are two distinct forms of spasmodic bronchial asthma, the one of nervous, the other of muscular origin.

H. G. W.

Quantitative studies on the persistence of chemotherapeutic agents in the blood of men and animals. E. BORCKER. Koch Inst., Berlin. *Z. Immunität.* 24, 148-66 (1915).—After intravenous injection of salvarsan a considerable amt. can be demonstrated in the blood, after 1-2 hrs. in man, horse and guinea pig, and after 24 hrs. usually in rabbits. Ethylhydrocuprein leaves the blood more quickly, but in guinea pigs it persists 2 hrs.; it is fixed by the blood cells and again given off. Formaldehyde and "Rhodaform" disappear quickly from the blood, and the latter prepn. cannot be found in the bile of dogs or rabbits in effective amts. These expts. demonstrate not only the importance of a low degree of organotropy, but indicate perhaps the most useful method of administration and the cause of unequal action in different species.

H. G. W.

Further investigations on the action of chemotherapeutic agents in vitro. OSCAR SCHIRMANN. Koch Inst., Berlin. *Z. Immunität.* 24, 167-87(1915).—Salvarsan and optochin (ethylhydrocuprein) in bouillon or serum are both bactericidal and inhibitory for the organisms for which they are specific, but the inhibitory action is much more striking and more useful in orientation expts. Serum and blood of different species often show considerable differences in these expts. Doses that in animal expts. are recognized as curative seem to correspond to a concn. in the blood that is not only inhibitory but also bactericidal. Chicken cholera could not be cured by quinine, and a corresponding ineffectiveness was found in the *in vitro* expts.

H. G. W.

Vibricidal power of the bile of animals after administration of hexamethylene-tetramine and its compounds. E. D. W. GREIG. *Indian J. Medical Res.* 2, 907-25 (1915).—Urotropine, helmitole (anhydromethylene citrate of urotropine) and cystopurine (urotropine-sodium acetate) were studied. Helmitole appeared to be distinctly more toxic than the others. The bile of a rabbit which had received helmitole, showed definitely the presence of HCHO , even though the bile was alk. in reaction. The bactericidal power of the bile of animals after administration of helmitole and urotropine is well marked in respect to the cholera vibrio; the bile of the treated animals must remain in contact with the vibrios for some time to effect their complete destruction. Only helmitole exerts any bactericidal action on the cholera vibrio *in vitro*; the addition of bile does not influence this action.

C. J. WEST.

α,β -Diantipyrylurea, its derivatives and physiological properties (GÖTTLIEB) 10.

DIXON, W. E.: *A Manual of Pharmacology.* 4th ed. London: E. Arnold, 467 pp. 15 s.

I. ZOÖLOGY.

R. A. GORTNER.

The salts required for the development of insects. JACQUES LOEB. Rockefeller Inst. *J. Biol. Chem.* 23, 431-4(1915).—Five generations of banana-flies were raised on an aq. soln. of glucose, sucrose, NH_4 tartrate, citric acid, K_2HPO_4 and MgSO_4 . In these flies muscular activity is apparently possible without any Na or Ca, or with only such traces as were present in the pure chemicals used. K, PO_4 , Mg and SO_4 are necessary. Recent investigations seem to show that bacteria may form carbohydrates from the CO_2 of the air without the intervention of light. If this be true, as highly developed an animal as the banana-fly might have been evolved before the existence of chlorophyll. I. GREENWALD.

Note on the reduction of oxyhemocyanin in the serum of *Limulus polyphemus* L. CARL L. ALABERG. U. S. Bur. of Fisheries, Woods Hole. *J. Biol. Chem.* 23, 495-503(1915).—The blood of *Limulus* becomes decolorized on standing, but the reaction is much more marked in old blood than in fresh. The color may be restored by shaking with air but then fades very rapidly. These facts do not agree with the assumption that the fading is due to the presence of enzymes, of auto-oxidizable substances, of cell-fragments, etc. The serum has no marked oxidizing action upon other substances. The fading is inhibited by antiseptics such as toluene and CHCl_3 . "It would appear, therefore, that the reduction on standing of oxyhemocyanin observed in the serum of *Limulus* is probably due neither to enzymes nor to the presence of auto-oxidizable substances, but to the action of microorganisms." I. GREENWALD.

12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

Report on heavy metals in foods. H. M. LOOMIS. *J. Assoc. Official Agr. Chem.* 1, 244-54(1915).—The work on the detn. of As in foods was limited to modifications of the Gutzzeit method. That proposed by C. R. Smith, details given, appears to be very good, but requires a little further study. The Seeker-Clayton gravimetric method, Potter's modification of Teed's method, and the later method using NaHSO_4 , were used in detg. Pb in baking powder and baking powder chemicals. Potter's, and the NaHSO_4 modifications of Teed's method, are given in full. With the Seeker method, 20 cc., instead of 10 cc. of 10% HCl as originally proposed, were recommended for the collaborative work. Further study on all methods is recommended. H. S. BAILEY.

Heavy metals in foods: tin. E. L. P. TREUTHARDT. *J. Assoc. Official Agr. Chem.* 1, 254-64(1915).—A study of digestion methods, using HNO_3 and H_2SO_4 , and of 6 different methods for the detn. of Sn. The methods are given in detail, together with the results obtained by 6 collaborators. The Baker volumetric method is the most satisfactory. The electrolytic method of Cushman and Wettengel does not recover all of the Sn. Until some new means is devised which will recover all of the Sn without digestion, it seems safest to use the acid digestion. The volumetric method of Alexander, Bloomberg and Lourie, and a modification by Bloomberg, look promising, but the work done with these is not sufficient to warrant any conclusions. H. S. B.

Report on fruits and fruit products. H. C. GORE. *J. Assoc. Official Agr. Chem.* 1, 480-5(1915).—During 1914 a general method for the detn. of malic acid applicable to fruit juices, jellies, sirups, and other fruit products probably including vinegars and wines, was established. The malic acid is sepd. as Ba malate from alc. soln. and is then dissolved in hot water. Aliquots of this soln. are treated by each of the following methods: (1) Prep. a soln. of uranyl acetate containing 33.996 g. of the pure crystd. salt per l. Mix 25 cc. of this soln. with 25 cc. of the Ba malate soln. which should be neutral or faintly acid. Keep in the dark for at least 5 hrs. or preferably overnight

and polarize in a 200 mm. tube at 20°. From the observed levo-rotation find the amt. of malic acid present by consulting the table attached. (2) Prep. a soln. of $(\text{NH}_4)_2\text{MoO}_4 \cdot 4\text{H}_2\text{O}$ containing 172.8 g. MoO_3 per l. and a soln. containing 300 g. acetic acid per l. Mix 20 cc. of the molybdate soln. with 25 cc. of the malate soln. in a 50 cc. flask. Make up to the mark with the AcOH soln. Polarize as above and find the amt. of malic acid corresponding to the observed dextro-rotation by consulting a second table.

H. R. SMITH.

The acid ester of lemon juice. L. WOLFRUM AND J. PINNOW. *Z. Nahr.-Genussm.* 30, 144-56(1915).—A lemon juice containing 8.59 g. per 100 cc. of EtOH was found by W. and P. to contain 1.3 g. per 100 cc. of an acid Et ester of citric acid, $(\text{C}_6\text{H}_5)_3\text{H}_3\text{C}_6\text{H}_7\text{O}_7$. The substance was isolated by extg. the dealcoholized juice in a continuous extractor with ether, evapg. the ether, dissolving the residue in water and again extg. with ether. Extn. of the residues obtained in this way was repeated 3 times, the acid ester being finally pptd. as the Ca salt from an aq. soln. of the last residue; this ppt. was then decomposed with H_2SO_4 and the pure ester extd. from the soln. by extn. in a continuous extractor with ether. The pure substance recrystd. from ether had a m. p. of 108.5-109.5°. It differs from citric acid in not forming insol. Ba or Sr salts and in being much less sensitive to the Denigès reaction. Owing to its greater soly. in ether it may be sepd. from citric acid by repeated extn. in a continuous extractor of the aq. soln. as above. Analysis of its Ca, Pb and Ag salts, all of which are difficultly sol., shows it to be a mono-Et ester, and because of its resistance to oxidation, with KMnO_4 , W. and P. believe it to have a symmetrical structure. It can be made by boiling an EtOH soln. of citric acid under a reflux condenser and sepg. from the free acid in the manner given above. The distribution coeff. for the acid ester in ether-water for ordinary concns. is about 11 at 15° and 13 at 27°. Because of its slow rate of sapon. with alkalis (detd. by W. and P.) it cannot be accurately detd. in solns. containing sugars owing to the formation at the same time of acid substances due to decompn. of the sugars. To det. it in lemon juice evap. 50 cc. to $\frac{1}{2}$ its vol. to remove EtOH, make up to 25 cc. with water and ext. for 4 hrs. by perforation with ether. Evap. the ether, take up the residue in water, and neutralize exactly with alkali. Then add a measured excess of standard alkali and distil. Det. EtOH in the distillate by sp. gr. and titrate the excess of alkali in the residue remaining in the distn. flask. The quantity of EtOH found as well as the amt. of alkali used for the sapon. represents the amt. of acid ester present.

A. F. SEEKER.

Report on flavoring extracts. A. E. PAUL. *J. Assoc. Official Agr. Chem.* 1, 498-506(1915).—Collaborative work during 1914 on the detn. of essential oil in flavoring exts. warranted the following recommendations: (1) That the saponification method of Hortvet and West for wintergreen ext. as modified by R. S. Hiltner (*Bur. Chem., Bull.* 152, 41) be adopted as provisional. (2) That the Hortvet and West method (*C. A.* 3, 1189) be made provisional for anise and nutmeg exts. (3) That the following modification of the Howard-Mitchell method be provisionally adopted for peppermint and spearmint exts. and also as an additional method for wintergreen ext. *Method:* Pipet 10 cc. into a Babcock milk bottle, add 1 cc. CS_2 , mix, add 25 cc. cold water, and 1 cc. concd. HCl, shake vigorously, centrifuge 6 min. and remove all but 3 or 4 cc. of the supernatant liquid. Apply suction and immerse the bottle in water at 70° for 3 min. shaking vigorously every 15 sec. Continue in the same manner for 45 sec. using a boiling water bath. Remove from the bath and shake while cooling. Fill the bottle to the neck with satd. salt soln., centrifuge 2 min. and read from the top of the meniscus. Multiply the reading by 2 to obtain the % oil by vol. H. R. S.

Relationship between alcohol-soluble solids and ether-soluble solids in standard ginger extracts. C. W. HARRISON AND A. L. SULLIVAN. *J. Assoc. Official Agr. Chem.*

1, 506-10(1915).—The high cost of alc. has led to the attempt to put out exts. of low alc. content. Ginger differs from most spices in that water and weak alc. ext. a larger amt. of solid matter from it than does 95% alc.; but these additional extractives add nothing to the value of the ext. since the aromatic principles of the root,—the essential oils and oleoresins—are almost insol. in dil. alc. and water. Street (Bur. Chem., *Bull.* 137, 76) found that practically all of the solids in high grade exts. are sol. in 95% alc. H. and S. found that nearly all of these solids are also sol. in ether and, since some of the adulterants of ginger ext., sugar, molasses, glycerol, caramel, etc., are more or less sol. in alc. and are practically insol. in ether, it was thought that the latter solvent would give a better index of the purity of the sample. Eleven samples of the ginger root representing the African, Cochin, and Jamaica varieties were analyzed, and from each of these samples 2 exts. were made according to the U. S. P. method—one using 95% alc. and the other 50% alc. Tables showing the analyses of the roots and exts. are given. The solids in ginger exts. made with 95% alc. are nearly all sol. in ether. The soly. of the solids in ether decreases the weaker the alc. ext., even though the amount of total solids increases. Solids from exts. prepd. with 25% alc. are practically insol. in ether. Solids from exts. made from weak alc. are more insol. in ether than in alc. The % solids sol. in ether conveys more information as to the strength of an ext. than does the % of alc.-sol. solids.

H. R. SMITH.

Report on separation of nitrogenous bodies (meat proteins). A. D. EMMETT. *J. Assoc. Official Agr. Chem.* 1, 267-79(1915).—For the detn. of total N the Kjeldahl-Gunning-Arnold method gave as good results as either the Kjeldahl or Gunning methods. The time of digestion for the K.-G.-A. method has little or no influence. The percentage values were as high for 1.5 hrs. as for 4 hrs. digestion. The provisional method (Bur. Chem., *Bull.* 107, rev., p. 108) and a proposed optional method (details given) were used for the detn. of insol. N. From the results obtained by the collaborators, it would seem that the range between extreme values is greater for the provisional than for the optional method, but the grand averages indicate little difference between the 2 methods. The optional method is probably preferable, as no ether extrn. is necessary, and it gives more accurate results for sol. N, and is no less accurate for insol. N. For the detn. of creatine and creatinine in meat products the Folin method is the best at present available. Results from 6 laboratories indicate that the errors in this method for creatine in a standard soln. average about 4%. It is recommended (1) that the K.-G.-A. method for total N in meat and beef extract be made official; (2) that the following method for detg. sol. and insol. N in meat be made optional: Exhaust 7 to 25 g. of sample with 330 cc. of cold H₂O. Make 11 successive extns.; 4 of 50 cc., 4 of 25 cc., and 3 of 10 cc. Dil. the entire ext. to 500 cc., and det. N in 50 cc. Deduct the % of N found from the % of total N, and multiply the difference by 6.25 to obtain insol. protein. (3) That the Folin method for creatine and creatinine in meat and beef ext. be made official.

H. S. BAILEY.

Report on inorganic phosphorus estimation in plant and animal substances. E. B. FORBES AND A. E. D. WUSSEW. *J. Assoc. Official Agr. Chem.* 1, 221-43(1915).—An investigation of methods of inorganic P estn. involving a comparison with animal substances, of the neutral Mo method of Emmett and Grindley, Siegfried and Singewald's BaCl₂, and Forbes' magnesia mixt. methods. On plant substances the acid-EtOH methods of Forbes and of Collison, for the sepn. of phytin and inorganic phosphate, were investigated. Estns. with and without the addition of known amts. of inorganic P were used as a basis for judging the reliability of the methods. In the work on plant substances attention was given to completeness of extrn. and the influence of phenol in the extractive reagent. The methods used in the prepn. of the flesh, blood, brain, muscle, and the other exts., as well as all analytical procedure, are given in detail. A large amt.

of analytical data is also tabulated. On vacuum-dried muscle all 3 methods give almost identical results. The BaCl_2 method is inapplicable in the presence of $(\text{NH}_4)_2\text{SO}_4$ and cannot be used on exts. of brain and blood prepd. with this reagent. The magnesia mixt. method has usually given satisfactory results on all animal substances; further work, however, is needed on the influence of heat in the prepn. of exts. The prepn. of blood samples for analysis should be further studied, as there is evidence that some cleavage of org. P takes place during the heating of the ext. With plant substances the Collison method, although more easily workable, and yielding more complete recovery of added P than Forbes' method, either does not give complete extn., or the reagent causes cleavage of org. P compds. so that it seems to be without promise. Forbes' method gives exts. which are slow in filtering, and enzymic cleavage consequently sets in. The results are higher the more prolonged the filtration. The addition of phenol prevents the cleavage and does not interfere with the pptn. of the $\text{Mg-NH}_4\text{PO}_4$. The presence of phenol gave lower results with alfalfa, brewers' grains, rice polish, gluten feed, and wheat, and higher with blue grass, timothy, and wheat bran. The use of phenol in the method seems desirable. H. S. BAILEY.

The estimation of glycerol in meat juices and extracts. F. C. COOK. *J. Assoc. Official Agr. Chem.* 1, 279-81 (1915).—As semi-solid and fluid meat exts. often contain added glycerol, cane sugar, alc., and foreign protein, there is need for a quant. method for detg. glycerol. After exptg. with C_6H_6 , CHCl_3 , EtOH , gasoline, CCl_4 , and acetone as glycerol solvents, the following acetone method was adopted: Weigh into a Pb dish containing 20 g. of ignited sand 2 g. of solid or 5 g. of liquid meat prepn., and after transferring the dish and its contents to a mortar mix thoroughly with more ignited sand and several g. of anhydrous Na_2SO_4 . Transfer the entire mixt. to a Soxhlet, the siphon arm of which is loosely plugged with cotton. Ext. with anhydrous acetone 10 hrs. Distil off the solvent carefully, using a vacuum pump to remove the last traces. Take up the glycerol in H_2O , add a little AgNO_3 ; make up to 100 cc., let stand overnight, and filter. Oxidize part of the filtrate with $\text{K}_2\text{Cr}_2\text{O}_7$ by the Hefner method. The results obtained on samples of meat and yeast exts. to which known amts. of glycerol had been added show a recovery of 92-100%. This method is also applicable to the detn. of glycerol in inking pads. H. S. BAILEY.

Report on feeds and feeding stuffs. W. J. JONES, JR. *J. Assoc. Official Agr. Chem.* 1, 289-314 (1915).—The effect of time of extn. and of moisture on the detn. of fat by the petr. ether method, and the effect of petr. ether from different sources, were studied by J., using 25 different cattle feeds. The official Et_2O and petr. ether methods were compared, as also the results obtained when using abs. Et_2O on dried and undried samples. Using Squibb's ether containing 3% of EtOH , 16 of the samples showed an increase in ext. of 0.03 to 2.99% over that obtained with anhydrous Et_2O free from EtOH ; in 1 sample there was no difference, and in 6 there was a decrease of 0.02 to 0.21%. The effect of the time of drying the exts. also was studied. The analytical results are all tabulated in detail, and from these the following conclusions are drawn: With rare exception the official (Et_2O) method gives higher exts. than the petr. ether method; instead of 3 hrs., 9 hrs. are required to get max. results with petr. ether; the presence of H_2O materially affects the amt. of ext. obtained with petr. ether; the extn. of the same material with petr. ethers from different sources does not give concordant results; the exts. with petr. ether must be dried at least 3 hrs. to secure const. wt.; the extn., with abs. Et_2O , of undried samples usually gives higher results than those obtained by the official method. It is recommended that the petr. ether method for detn. of fat in cottonseed products be not adopted. H. S. BAILEY.

Change in potatoes during drying. H. I. WATERMAN. *Chem. Weekblad* 12 924-7 (1915).—W. adds further proof to his previous discoveries concerning the change

of starch into sucrose during drying at low temp. He found that the Eigenheimer variety after drying at 40° showed an increase of sucrose of 1%, while the "Zeeuwache blauwe" variety showed an increase of 3%. J. T. FLOHIL.

Report on dairy products. E. M. BAILEY. *J. Assoc. Official Agr. Chem.* 1, 289 (1915).—In view of the distinct advantages of the CuSO_4 method over the provisional AcOH method for the prepn. of milk serum for examn. by the refractometer, it is recommended that it be studied for adoption as an optional method. H. S. BAILEY.

The freezing point of milk from sick cows. A. C. PLIESTER. *Chem. Weekblad* 12, 354-9(1915); cf. *C. A.* 8, 3602.—P. gives data proving that the f. p. of milk from sick cows is never higher than -0.54° . Milk of sick cows has either a normal or lower f. p. In many cases in milk of sick cows the lactose had decreased considerably but at the same time the Cl content had increased to such an amount, that the osmotic pressure and f. p. were quite normal. P. furthermore confirmed the statements of Hamburger, Dreser, Winter and Koeppe that the osmotic pressure and f. p. in the milk is practically the same as that of the blood serum of the same cow; he found f. p. milk -0.605° and f. p. blood serum of the same cow -0.601° . P. advises a combination of the f. p. detn. with detn. of lactose (rotatory power), detn. of Cl, detn. of sp. gr. of serum, detn. of refractive index of the serum and enzymic reaction for the examn. of milk and concludes that milk is adulterated with water when the f. p. is higher than -0.54° ; the enzymic test shows no sickness and the other detns. point to the addition of water. J. T. FLOHIL.

Freezing point determination in milk. N. SCHOORL. *Chem. Weekblad* 12, 220-2 (1915).—To obtain reliable results with the f. p. detn. in milk the following precautions are suggested: The temp. of the freezing mixt. should be equal throughout. The surface of the milk must be a few cm. lower than that of the freezing mixt. The inoculation with frozen milk is preferable to the inoculation with ice and should be done by simply dropping into the milk a capillary tube filled with milk, previously frozen in the freezing mixt. Every thermometer used for the f. p. detn. should be standardized, as not all thermometers are reliable especially on account of thermic changes in the glass. J. T. FLOHIL.

The examination of cheese. S. TIJMSRA. *Chem. Weekblad* 11, 902-9(1914).—*Sampling*: When the cheese is new and the salt not yet evenly distributed it is advisable to analyze a segment instead of a boring. *Fat detn.*: T. advises the use of van Gulik's modification of Gerber's method for the detn. of fat in milk. To obtain accurate results, care should be taken that the following procedure is carried out exactly: Dissolve 3 g. cheese with H_2SO_4 (sp. gr. 1.53) in Gerber's butyrometer, heat to 68° and shake vigorously; let stand for 1 hr., add 1 cc. of amyl alc., shake, fill the butyrometer with H_2SO_4 and stopper, shake again for 5 min., heat to 68° , and centrifuge for 5 min. (2000 revolutions per min.), or longer when smaller speed is used. The reading is made after heating for 5 min. The results obtained by means of this method were compared with those obtained by the Bondzynski-Ratzlaff method and it was found that 12 out of 15 analyses checked within 0.2%. *Detn. of the dry matter*: 5 g. of cheese are weighed into a tared dish containing 25 g. of fine dune sand and a stirring rod. Five cc. of alc. are added, the mixt. heated to 70° for 5 min., stirred and dried to const. wt., being weighed at 45 min. intervals. J. T. FLOHIL.

"Owere" seeds 27. *Madia sativa* seed 27.

BAILEY, E. H. S.: *Laboratory Experiments on Food Products*. Philadelphia: Blakiston. 44 pp. \$0.25.

BEYTHIEN, A., HARTWICH, C., AND KLUMMER, M.: *Handbuch der Nahrungsmitteluntersuchung*. Bd. II. Botanischmikroskopischer Teil. Leipzig. 474 ss. 20 M.

GIBSON, A. E.: *Destructive and Constructive Food Mixtures*. Los Angeles, Cal.: Phillips Press. 142 pp. \$1.00.

JONE, H.: *An Easy Test for Bacteria in Milk and Cream*. Brooklyn: The Author. 23 pp. \$0.50.

LIPPOLD, E.: *Obstkonserven, Fruchtsäfte, Marmeladen*. Leipzig: M. Jänecke. 143 pp. 3.60 M.

SCHNEIDER, A.: *Bacteriological Methods in Food and Drugs Laboratories*. Philadelphia: Blakiston. 288 pp. \$2.50.

Desiccating milk. D. J. HAUSS. U. S., 1,163,339, Dec. 7. After condensing by evapn., milk is atomized into a chamber heated externally and a downward current of heated air and milk particles undergoing desiccation is maintained through the chamber; the milk powder produced is sepd. at the bottom of the chamber.

Preserving eggs. H. E. THORNBURGH. U. S., 1,163,873, Dec. 14. Eggs in the shell are heated to 43-55° for several hrs. to render their bacterial content inactive. The eggs are then broken and their contents are dried or frozen.

Vinegar. H. BOULARD. U. S., 1,164,063, Dec. 14. See C. A. 9, 1206.

Sterilizing and preserving grain. E. R. BARROW. U. S., 1,165,220, Dec. 21. Oats, rice or other grain with the hulls on is intimately mixed with about 5% its wt. of finely pulverized NaCl to sterilize and preserve it. Cf. C. A. 9, 227, 3372.

Temporarily preserving green peas between harvesting and canning. C. H. PLUMMER. U. S., 1,164,861, Dec. 21. The peas are spread in shallow trays and treated with cold CO₂ or other gases to skin-dry them and are cooled to a point at which fermentation does not readily take place.

Unfermented beverage. W. O. KAISER and G. F. STROEBEL. U. S., 1,164,193, Dec. 14. Cf. C. A. 9, 2563. A lautmash is made by infusing ground malt with H₂O and peptonizing. Then ground cereals such as rice or grits are mashed with H₂O containing 2% of the lautmash, peptonized for 25 min. at 36° and then boiled for 50 min. The remaining lautmash is treated with a small amt. of H₂SO₄, HCl, H₃PO₄ or maltase which serves as a catalyzer and is boiled to convert starch, dextrin and maltose into glucose and ppt. amides; the acid in the product is neutralized, the cereal mash liquor added to the residue of ground malt and the temp. raised to saccharify the starch of the cereal wort. The 2 liquors are mixed, boiled with yeast and then with hops, acetic, lactic and succinic acids added in small amt. with EtOAc and the product carbonated.

Unfermented beverage. W. O. KAISER and G. F. STROEBEL. U. S., 1,164,287, Dec. 14. A peptonized mash of ground malt and H₂O is mixed with a fresh cereal mash and the mixt. is heated to saccharify the starch. Additional mash of ground malt is added and the mixt. is heated to stop diastatic action. The residue of the ground malt mash is added to the mixt. and the temp. raised to saccharify the additional starch present, the wort is sepd. and boiled successively with hops and yeast, aged, filtered and carbonated.

"Soy-milk." L. J. MONAHAN and C. J. POPE. U. S., 1,165,199, Dec. 21. Soy beans, ground to a coarse powder, are emulsified with an equal amt. of lime-water at a temp. above 25°, with the addition of a small amt. of NaHCO₃, the emulsion is

cooked and the insol. matter is removed by filtration. Small amts. of NaCl and coconut oil may be added.

Cereal food. W. A. RULLMAN. U. S., 1,163,175, Dec. 7. Granular cereal, *e. g.*, germinated barley and wheat, containing about 75 parts nutritive substances and bran 4 is mixed with agar-agar 21 parts while moistened and dried to cause the agar-agar to adhere to the granules.

Impregnating meat with preserving compositions. A. R. BULLOCK. Ger., 285,270, Aug. 13, 1912. See Fr., 448,191 (C. A. 7, 2077).

Preserving fruit and grape juices, fruit pulp. A. MARGOLIUS. Ger., 285,089, Sept. 26, 1913. Instead of benzoic acid, the various chlorobenzoic acids or their alkali salts are employed as preservatives. *p*-Chlorobenzoic acid, in spite of its harmlessness, exceeds many times the preserving action of benzoic acid. *E. g.*, fermenting cider may be preserved indefinitely by the addition of 0.1% of the Na salt of the mixt. of chlorobenzoic acids obtained by chlorinating benzoic acid. The fermentation is at once inhibited. The filtrate taken after 30 mins. is permanently stable. Fresh fruit juices, such as raspberry juice, fruit pulp, or the like, can be preserved by the addition of 0.1% of the Na salt of *p*-chlorobenzoic acid so that they neither ferment nor mold, and the color of the fruit juice is not affected. To 100 liters fresh grape juice, 100 g. Na *p*-chlorobenzoate dissolved in 2.5 liters H₂O are used. The grape juice so treated will keep permanently.

Substitute for fruit marmalades. F. SAUER. Ger., 285,152, Sept. 1, 1912. Albuminous vegetable flour is subjected to the action of diastase, whereby it is saccharified, and then the mass is fermented with lactic acid ferment, and finally evapd. Preferably, after the action of the malt peptase on the dissolved albumin, the insol. albuminous substances sepd. from the wort are partly converted into albumoses, whereupon, after the usual neutralization of any acid present, both constituents are united. Glycerophosphoric acid or its salts may be employed in forming the albumoses. The initial material rich in albumin may consist of a mixt. of malt, potato, and vegetable albumin, especially malt albumin. *E. g.*, 15 kg. barley flour (without hulls) are mashed cold with 90 liters of H₂O, 30 liters of clear ext. are drawn off and the remaining mash is saccharified as completely as possible by the infusion process and boiling. After cooling to about 40° the mash is mixed with the cold ext. and so much H₂O is added that the ext. content of the mash is about 10%. With the employment, then, of malt peptase, together with the rizing infusion process, a high degree of saccharification is effected which corresponds to about 80% sugar to 20% dextrin. The undissolved proteins are then sepd. from the malt wort, and the wort itself is subjected to a pure lactic acid fermentation by yoghurt bacilli which are then killed, after sufficient acidification, by heat. During this time the undissolved proteins are mixed with five times their amt. of H₂O and 0.2% glycerophosphoric acid, and maintained at about 80° under a pressure of 2 atm. for 10 hrs. with occasional stirring. After relieving the pressure, the neutralization of the acid, the mixing with the wort, and the evapn. in vacuo, are effected.

An imperishable essence for preparing non-alcoholic beverages. H. LASSAG. Ger., 285,090. Aug. 12, 1913. A soln. containing lactic acid, obtained by the fermentation of a liquid containing milk sugar, such as whey, is concd. with prevention of caramelization or condensation in the heat, preferably by freezing out, to about 5% lactic acid content, and this concd. soln. is mixed with an amt. of invert sugar sufficient to ensure preservation. The high content of lactic acid admits of the addition of the large amt. of sugar required to preserve the product, without obtaining an insipid taste. The invert sugar required may be produced, to advantage, in the lactic

acid soln. itself, by adding cane sugar, after concn., and inverting this in the known manner by heating. The excessive sweet taste is thereby masked. *E. g.*, lactic acid bacteria are added to whey, and the liquid is allowed to ferment at 35-45°. A serum containing about 20% lactic acid is obtained, and filtered. This serum is concd. by freezing to about 5% lactic acid content, and then about 4 kg. cane sugar are added to 3 liters of the liquid. The lactic acid-containing sugar soln. is then heated to about 100°, when inversion is effected. After filtration the product is ready for use with H₂O. Flavors, etc., may be added.

14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

Determination of hardness of water by Blacher's method. P. A. MEERBURG. *Chem. Weekblad* 12, 920-4(1915).—Comparison was made between the different methods for detg. the hardness of water. It was found that Blacher's method (cf. *C. A.* 7, 1394, 1938) gives more accurate results and gives them more quickly than the soap methods. M. detd. the hardness of 237 samples of water, the CaO and MgO of which were also detd. It was found that 5% of the samples with hardness less than 10° (German degrees) showed an error of more than 1%; 10% of those with a hardness between 10° and 20°; 20% of those between 20° and 30°; and 15% of those between 30° and 40°.

J. T. FLOHN.

Instructions for the rapid analysis of drinking water during a campaign. Intended for use by the corps of field hospitals. ANON. *Ann. fals.* 8, 212-5(1915).—Simple methods for testing potable water for nitrites, NH₃, reduction of KMnO₄, reaction with AgNO₃, and degree of hardness.

H. S. BAILEY.

Toxicological analysis of drinking water. E. KOHN-ABREST. *Ann. fals.* 8, 207-11(1915).—Concise directions for the detection in water of Cl, SO₂, Br, organic Fe salts, As, Ni, Co, Ba, Pb, CN, alkaloids, and glucosides. These directions, and the reagents, and app. required for carrying them out, are intended for the analysts of an army in the field.

H. S. BAILEY.

Sterilization of drinking water with chlorine. F. DITTHORN. *Deut. med. Wochschr.* 41, 1127(1915).—By means of 0.2 g. of a new Ca(OCl)₂ prepn. in powder form containing about 75% active Cl, 1 l. of strongly infected water can be sterilized in 10 min. The Cl is removed in 1-2 min. by adding 0.4 g. "Ortizon" (a stable compound of carbamide and H₂O₂). The water is slightly turbid but need not be filtered. S. A.

Ultraviolet ray sterilization of water. F. A. DALLYN AND N. F. PARKINSON. *Ann. Rept. Ontario Bd. Health* 1914; *Can. Engr.* 29, 686-92(1915).—Ultraviolet rays should preferably be applied to water free from turbidity or filtered. Expts. are detailed on sewage-infected tap water. With turbidity 5 to 20 parts per million, bacterial removal was over 97%; with turbidity 20-50 p. p. m. bacterial removal was from 94 to 97%. 110 and 500 volt lamps were used. D. concludes ultraviolet rays afford protection against irregularities of filters, with freedom from taste or odor in case of overdose.

LANGDON PEARSE.

Multiple filtration plant at Accra, Gold Coast Colony. ANON. *Engineering* 100, 461-2(1915).—The water which is high in org. matter passes through 4 series of strainers which contain crushed rock graded from 1 in. diameter in the 1st to 1/4 in. in the 4th. After each straining the water passes over a double-fall cascade for aeration. It then flows through 5 pre-filters of coarse sand, 1.5 ft. deep, on 8 in. of fine gravel. After pre-filtration, the water passes through slow sand filters.

W. D. HATFIELD.

Mixture of graphite and caustic soda for preventing scale. ANON. *Elec. World* 66, 1375(1915).—A mixture of graphite and caustic soda in the proportion of 50 oz.

to 30 lb. has been found effective in preventing boiler scale in a plant in Brooklyn. The conclusions have been drawn from experience with two 264-h. p. Babcock & Wilcox boilers operating at 110 lbs. pressure. The boilers are treated alternately, the mixt. being fed gradually to one boiler, and during that time it is not blown down. The other unit, however, is blown off to 80 lbs. every morning. C. G. F.

Use of aluminium as anti-incrustator in steam boilers. I. POUGET. *Compt. rend.* 161, 135-6(1915).—It was noted that the incrustation ordinarily formed on the walls of a water bath fed with hard water could be prevented by previous treatment with Al paint. The preventative action of powdered Al was confirmed by a sample expt. in which the containing vessels were weighed. The possibility that metallic Al could be used to advantage in steam boilers is suggested. W. F. LANGKELIER.

Results from better feed water in Wisconsin station. H. G. D. NUTTING. *Elec. World* 66, 1256-8(1915).—The water-treating plant consists of a 30,000 gal. steel settling tank and a chem. proportioning and feeding device. Operation of the softener is automatic. The av. daily amt. of soda ash required to treat 65,000 gals. creek-water is 35 lbs. and of lime 125 lbs. Cost per 1000 gals. is \$0.0163. Diagrams of the app. are given, also tables showing operating conditions before and after treating the boiler-feed water and an analysis of the raw creek-water used. I. C. M.

Pollution of California water supply well by discharge from sewage wells. C. G. HYDE. *Eng. Contr.* 44, 340(1915).—Wells sunk into water-bearing strata to dispose of sewage may contaminate water for drinking purposes even 600 ft. away.

LANGDON PEARSE.

Water-typhoid suit lost (Circleville, Ohio). *Eng. News* 74, 631-2(1915).—A suit to recover \$15,000 damages for a death from typhoid fever alleged to have been caused by polluted water due to a faulty check valve between a mill supply and a private water company supply was decided in favor of the company. The evidence showed the pollution of the water was common knowledge.

LANGDON PEARSE.

A septic tank decision. *Eng. News* 74, 667(1915).—The U. S. District Court has decided that the Cameron, Commin and Martin U. S. Pat. No. 634,423 expires on Oct. 3, 1916, in a suit against Winchester, Ky., for infringement by an Imhoff tank. Also in *Mun. Eng.* 49, 217(1915).

LANGDON PEARSE.

Garbage-reduction plant not a nuisance. *Public Health Reports* 30, 3473, 3507-11 (1915).—In *Toledo Disposal Co. vs. State*, 106 N. E. Rep. 6, the Supreme Court of Ohio held that a plant constructed and operated for the benefit of the public, and by legislative authority, could not be prosecuted as a public nuisance. Damages might be recovered.

LANGDON PEARSE.

Recent results of experiments on the purification of sewage by aeration in the presence of activated sludge, at the University of Illinois. EDWARD BARTOW AND F. W. MOHLMAN. *J. Ind. Eng. Chem.* 8, 15(1916); *Eng. Contr.* 44, 433-4(1915); *Eng. News* 74, 1096-7(1915); cf. *C. A.* 9, 1521.—A test plant of 4 tanks, each 3 ft. 2 in. square by 8 ft. 5 in. deep has been operated on domestic sewage, on the fill and draw plans. The sludge was accumulated on a 6-hr. cycle. Results show that 1 sq. ft. filtros in 10 sq. ft. tank area is not sufficient but 3 in 10 gives best results. About 1 cu. ft. air per gal. of sewage was used, but more was required on strong sewage. The free NH_3 and presence of nitrates were used as indicators. LANGDON PEARSE.

Rochester sewage disposal plant. ANON. *Mun. J.* 39, 915-6(1915).—The cost of Riensch-Wurl screens, grit chambers, and Imhoff tanks is about \$339,000.

LANGDON PEARSE.

New sewage disposal works at Wanstead. ANON. *Engineering* 100, 414-6 (1915).—Extensions of the old works comprize detritus-tanks with mechanical screens,

subdivision of old septic tank, new Dortmund tank, and percolating filters, storm-water tanks, sludge-pumping plant and sludge beds.

W. D. HATFIELD.

Changing sewage tanks to Imhoff type at Columbus, O. ANON. *Eng. Record* 72, 701-2(1915).—The conversion of the sedimentation tanks to Imhoff tanks is being done without shutting down the sewage disposal plant completely. One-half of the tanks are under reconstruction while the other half are in operation. Construction features are detailed.

FRANK BACHMANN.

Operating results of the Palo Alto refuse incinerator. *Eng. News* 74, 1125(1915).—An incinerator of a daily capacity of 30 tons of mixed refuse, treated 1872 tons in year ending June 30, 1915, at a cost of \$3117.81.

LANGDON PEARSE.

Garbage disposal in Dayton. J. E. BARLOW. *Mun. J.* 39, 913-5(1915).—Temporarily the garbage was buried. A reduction plant is under construction to use the cooking, pressing, drying and percolating system, with 125 tons' daily capacity. The cost is about \$440 per ton capacity.

LANGDON PEARSE.

Ozone for ventilation. S. T. POWELL. *Met. Chem. Eng.* 13, 975-7(1915).—Temp. and humidity have very little effect upon ozone production while the air velocity through the tubes has a direct bearing. High concns. acting for long periods have great germicidal action, efficiency being reduced with reduction of concn. Oxidizable odors may be completely removed. No detrimental effect of ozone on health was noticed.

W. D. HATFIELD.

Rapid method for detecting mineral poisons in water (FLEURY) 7. Activated, sludge as a fertilizer (BARTOW) 15.

FRANTZ, G.: *Dampfkesselschäden, deren Ursachen und möglichste Verhütung.* Kattowitz: Gebr. Bohm. 179 ss. 2.50 M.

Water-filter. A. L. GAMMAGE. U. S., 1,163,334, Dec. 7.

Apparatus for purifying water electrolytically. H. CLARK. U. S., 1,163,321, Dec. 7.

Apparatus for sedimentation and purification of sewage. T. J. BELFRANCI. U. S., 1,163,058, Dec. 7.

Incineration of garbage or other waste material. R. W. AMOS. U. S., 1,165,368, Dec. 21. Lime is mixed with garbage and it is heated to drive off vapors. The lighter vapors are led through a bed of lime and refuse nitrate and the heavier vapors are condensed and tapped off, without passing through the bed, to recover the alc. from them. The residue is mixed with S, lime and nitrate and burned.

Electrolysis of sewage. C. P. LANDRETH. *Brit.*, 18,564, Aug. 11, 1914. Sewage, effluents from tanneries or slaughter-houses, and other putrescible liquids to be electrolyzed, are treated with a hydroxide, as of lime, soda, or potash, in sufficient quantity to ensure alkalinity after the electrolysis. This alkalinity should be at least great enough to be indicated by phenolphthalein. Parallel electrode plates of C or Fe or other metal may be used. Fe electrodes are not attacked provided that sufficient alkali is present; the amt. of alkali required for this purpose increases with the c. d. High c. d. may, however, be used, so that hydroxide acting as a precipitant is formed from the anodes. The alkali, preferably milk of lime, is pumped or run from a tank into a preliminary settling-tank or a pipe through which the liquid to be treated passes

to the electrolytic vat; or the alkali may be run directly into this vat by a pipe opening above the bottom set of electrodes. In the last case, the lowest electrodes may be of C and serve for preliminary electrolysis to produce nascent O or hypochlorites, chlorides being added if required.

15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

The amino acid nitrogen of soil. R. S. POTTER AND R. S. SNYDER. *J. Ind. Eng. Chem.* 7, 1049-53(1915).—The work of Chardet (*C. A.* 9, 2683) who used the Soerensen method and found 49 to 68% of the soil N to be amino acid N was not confirmed. No amino acid N was found in dil. acid. ext. of soils, and none could be recovered when added by using dil. acid, but by extg. with dil. alkali all was recovered. Soils examd. were found to contain from 0.151 to 0.21% total N, 7.95 to 23.1 p. p. m. total amino acid N, 5.45 to 14.7 p. p. m. free amino acid and 30.9 to 31.5 p. p. m. total peptide. Amino acid did not accumulate in a limed and unlimed acid soil, nor in a manured soil in pots. Amino acid N was present in the soil in less amounts than $\text{NH}_4\text{-N}$. In the manured soil the amt. of NO_3 decreased at first, but it increased after 4 to 6 weeks. J. J. SKINNER.

The presence of proteoses and peptones in soils. E. H. WALTERS. *J. Ind. Eng. Chem.* 7, 860-3(1915).—Working with a sandy loam soil from Va., W. obtained, with an alkali and a H_2O ext., solns. which gave reactions with certain reagents which show that they contain a mixt. of the various proteoses and peptones resulting from the hydrolysis of proteins and that they exist and persist in the soil as such for a considerable period. An attempt to make further sepn. was not practical. The expts. indicate that proteins undergo hydrolytic decompns. in the soil in much the same way as on digestion by enzymes, acids, or alkalies in the laboratory. J. J. SKINNER.

Effect of vanillin as a soil constituent. J. J. SKINNER. *Plant World* 18, 321-30 (1915).—Cow peas, string beans and garden peas grown in the field on a clay loam soil at Arlington, Va., were checked in growth by vanillin applied to the soil in amts. of 284 lbs. per acre. With cow peas there was a reduction of 33% of green vines and 39% of cured hay. The garden peas were reduced 30% in vines and 20% in marketable peas. String beans were reduced 17% in vines and 69% in beans. Six months after vanillin was applied the soils were chemically examd., and vanillin was still found to be present. The soil used in pots after this lapse of time was found to be harmful to plants. The effect of vanillin on wheat plants grown in pots on 3 soils each having different properties and different geological origin was found to be different. On an unfertile sandy soil and a sandy loam, 400 to 500 p. p. m. vanillin reduced growth considerably, while on a rich productive loam, having good oxidizing power, the substance had no effect. J. J. SKINNER.

Petrography of some North Carolina soils and its relation to their fertilizer requirements. J. K. PLUMMER. N. C. Agr. Exp. Sta. *J. Agr. Research* 5, 569-82 (1915).—Very complete mineralogical analyses are given and ably discussed, and the following conclusions are drawn: Wide variations in mineralogical compn. are found between the soils of the Appalachian Mountains, Piedmont Plateau, and Atlantic Coastal Plain. There is unquestionably a greater supply of minerals which carry the inorg. plant-food constituents in the Mountain soils than are found in either the Piedmont Plateau or the Coastal Plain. Though many of the former soils are derived from the same rocks as those of the Piedmont province, the forces of erosion among the mountain soils cause them to contain minerals more nearly the same as the parent rocks than are found elsewhere. Definite information is required on the behavior

of the various soil-forming minerals to the forces of weathering before positive conclusions can be drawn on the availability of the plant food carried by the different minerals. Field results with the cotton plant indicate that there are some relationships existing between the mineral component of the soil and the requirements of this plant for the 3 inorganic fertilizer constituents, P_2O_5 , K_2O , and CaO . In addition to the above summarized results, this article is particularly valuable in its suggestiveness as to future lines of work and for its indication of present possibilities.

W. H. FRY.

The adsorption of potassium and phosphate ions by typical soils of the Connecticut Valley. R. H. BOGUE. *J. Phys. Chem.* 19, 665-95(1915).—The adsorptive capacities for K and P of 4 typical soils of the Connecticut valley were studied. The K content of the percolate from a sandy soil is quickly brought down to a concn. which is practically const., while with a sandy loam, a silt loam and a clay loam much more H_2O was required to pass through before this const. was reached. The same general tendency exists with P. The sandy soil reaches its state of satn. with respect to its K content in the shortest time and the clay soil takes the longest. The adsorption of P takes place much more slowly, the general tendency being the same. This study substantiates the results of former investigators in showing that when soils are subjected to the leaching action of H_2O the concn. of K and P in the soil ext. approaches a const. which appears to be fixed and definite for a given soil. Subjected to the action of sol. K and P salts, the concn. of these salts in the soil ext. is at first not materially increased, but as adsorption proceeds it becomes weaker and a point is finally reached where the amt. of sol. salts in the soil ext. is nearly equiv. to the amt. applied. The results substantiate the theory that the concn. of salts in the soil soln. is very largely dependent on the specific adsorptive capacity of the individual soil; they tend to disprove the theory that the compn. of the soil H_2O is detd. primarily by the chem. compn. of the soil, to prove this quality to be dependent on the mechanical texture of the individual soil.

J. J. SKINNER.

Phosphate rock and methods proposed for its utilization as a fertilizer. W. H. WAGGAMAN AND W. H. FRY. U. S. Dept. Agr., *Bull.* 312(1915).—The phosphate deposits of the United States are described, giving the extent and location of the beds and the character and quality of the deposits. Processes and methods are described of treating phosphate rock for producing phosphoric acid and phosphatic fertilizers by the use of heat, acids, alkalis or alkaline earths, also those used in the iron and steel industry, for volatilizing P or P_2O_5 , for production of two or more fertilizing elements, for producing available phosphate by electrolysis, for enriching phosphates, and for mechanically treating the phosphates. An appendix contains a classified tabular list of patented processes relating to treatment of phosphates.

R. O. E. D.

Fertilizer value of activated sludge. EDWARD BARTOW AND W. D. HATFIELD. *J. Ind. Eng. Chem.* 8, 17-20(1916); *Eng. Contr.* 44, 434-6(1915).—Pot studies and gardening expts. show that the N in activated sludge is in a very available form and that this sludge is valuable as a fertilizer, being comparable with dried blood.

LANGDON PRARSE.

The importance of fineness of subdivision to the utility of crushed limestone as a soil amendment. WALTER THOMAS AND WILLIAM FREAR. *J. Ind. Eng. Chem.* 7, 1041-2(1915).—Preliminary pot expts. with clover are described. Taking into consideration the cost of effecting the highest pulverization, and the fact that stone of $1/40$ to $1/60$ inch in fineness produced only about $2/3$ the effect secured with stone finer than $1/100$ inch, while stone of $1/60$ to $1/80$ inch caused more than $3/4$ of the effect secured from the finest stone, it is judged that compact limestone of high purity should be crushed to a fineness of not less than $1/60$ inch, to fit it for economical use as a soil amendment.

W. H. FRY.

The lime : magnesia ratio in soil amendments. W. THOMAS AND W. FREAR. *J. Ind. Eng. Chem.* 7, 1042-4(1915).—Experimenting with clover grown in an acid soil in paraffin pots it is shown that highly calcareous dressings were more beneficial than highly magnesian dressings. Yields from the hydrate applications exceed those from the corresponding carbonate applications. Dolomite was beneficial, but less so than the corresponding dressings of calcite and magnesite. From dolomite the plants took up less ash for each unit of dry matter increase than did those receiving the other dressings. From low Ca dressings the plants took proportionally more Mg than from high Ca dressings, and more Mg than Ca from the hydrate as compared with the carbonate dressings.

J. J. SKINNER.

Kalusz kainite. W. KOLSKI. *Wiener Landw. Ztg.* 65, 422(1915).—The deposits consist of 2 rich strata 5 m. thick, which contain about 60% of pure kainite, clay and NaCl being the chief contaminants. The material contains K 9-11, Na 8-20, Cl about 29 and SO₄ about 17.5%. On account of its lower Cl content the Kalusz kainite is superior to that found at Stassfurt and is shown experimentally to produce greater yields.

C. F. MILLER.

The effect of fertilizers on the growth of pineapples. CARLTON C. JAMES. *Forester Agriculturist (Hawaii)* 1911 (reprint).—Superphosphate, reverted phosphate, and steamed bonemeal showed good results when applied to pineapple plants; the first gave better results when applied together with lime. N is not the dominant element in pineapple fertilizing. Of the 3 forms of N studied, NaNO₃ was the least productive of good results. There was not much choice between (NH₄)₂SO₄ and steamed hoofmeal. Fertilized soil tends to bring the fruit to maturity from 2 to 4 weeks earlier than the unfertilized.

W. H. FRY.

BJORLYKKE, K. O.: Ueber frühere und gegenwärtige Bodenuntersuchungen in Norwegen. Berlin: Verlag f. Fachliteratur. 1.20 M.

ODEN, S.: Eine neue Methode zur mechanischen Bodenanalyse. Berlin: Verlag für Fachliteratur. 55 ss. 3 M.

SMETHAM, A.: Potash: Its Distribution, Sources, and Agricultural Value.

Fertilizer. J. H. CONNOR. U. S., 1,163,130, Dec. 7. Blast furnace slag containing Ca and Mg salts is mixed with 3-30% of Na₂CO₃, lime and phosphate rock all in fine condition and the mixt. is calcined at a temp. of about 925-1650° to render a portion of the phosphates citrate-sol. and a portion H₂O-sol.

Phosphate fertilizer. S. B. NEWBERRY and H. N. BARRETT. U. S., 1,162,802, Dec. 7. Pulverized natural Ca phosphate is mixed with sufficient Na₂SO₄, NaOH, KOH or other alkali metal compd. to yield a mixt. which on calcination will contain 5-12% total alkali metal oxide and the mixt. is heated in the form of porous masses to 1100-1500° in a rapid current of hot gases to expel volatilizable products such as SO₂ together with part of the alkali compds. formed. The phosphate is rendered citrate-sol.

Phosphate fertilizers. S. B. NEWBERRY and H. N. BARRETT. U. S., 1,162,944, Dec. 7. Pulverized natural Ca phosphate is mixed with H₂O and with about 10% its wt. of Na₂SO₄. The mixt. is dried in such a way as to give it a porous cellular form and is then calcined at a temp. of 1100-1400° in a rapid current of hot gases to render the phosphate citrate-sol. and volatilize a portion of the alkali compds. Cf. C. A. 10, 246.

Fertilizers. BADISCHE. Brit., 18,299, Aug. 7, 1914. Urea nitrate is used as a fertilizer for tobacco and other plants.

16. **FERMENTED AND DISTILLED LIQUORS.**

ROBERT WAHL.

Investigation of the turbidity in brandy. DANIEL. *Chem. Ztg.* 39, 928(1915).—The turbidity in rum, cognac, etc., is due to Al, Fe, and Mg salts in the H₂O used. Ca salts are harmless. It may also be caused by excessive acidity in the essences used. D. recommends softening the H₂O with Na₂CO₃ and settling cold. To test the essences, add to soft H₂O in a test tube enough coloring to give a slight brown, then a few drops of alc., then 2 or 3 drops of the essence. No turbidity should appear in 24 hrs. The coloring is tested by coloring soft H₂O a slight brown and adding a few drops of a dil. soln. of tannic acid. No turbidity should appear.

J. H. MOORE.

Acid ratio: A new method for determining the proteolytic strength of germinated grain in technical analysis. C. A. NOWAK. *J. Ind. Eng. Chem.* 7, 858-9(1915).—N. gives a modification of the Soerensen HCHO method devised by him which is especially suitable for technical work. By dividing the value of the amino acid titration by the value (in cc.) of the natural acidity he obtains a ratio which he designates as the *acid ratio* and considers an entirely new factor in malt valuation. The method can be used to advantage in detg. whether a certain malt has been prepd. from a specific type of barley or whether it represents a mix. Aside from its great simplicity it has the further advantage that one single detn. suffices for the estn. of both the preformed amino acids present in the malt and the proteolytic strength.

C. A. NOWAK.

Beer. C. RACH. U. S., 1,163,453, Dec. 7. Beer wort is prepd. from 2 or more mashies (formed of raw grain and malt), one of which contains considerably less H₂O and more malt than the others and in which the diastatic action has been stopped before much maltose is formed and from which the wort has been extd. in concd. form by filter-pressing. The different worts are mixed, boiled with hops, fermented and ripened.

Beer. C. RACH. U. S., 1,163,454, Dec. 7. A fermented beer rich in sol. albuminoids and peptones prepd. from a mash containing at least 50% of malt and a krausen-wort rich in dextrins but poor in albuminoids and peptones are mixed and ripened together.

Carbonating and delivering beer. W. FINCH, S. W. PARKHURST and T. S. MURRAY. Brit., 18,006, July 30, 1914. In carbonating and delivering beer, etc., at a bar, the beer is forced by a pump through a non-return valve into a vessel containing CO₂ under slight pressure. The gas is compressed by the liquid and serves to discharge the liquid through a tap.

17. **PHARMACEUTICAL CHEMISTRY.**

M. I. WILBERT.

Stability of the infusion of digitalis. R. A. HATCHER and CARY EGGLESTON. New York. *J. Am. Med. Assoc.* 65, 1902-4(1915); cf. C. A. 7, 2651.—Alc. and aq. infusions of digitalis, when kept in the ice box or in an incubator at 37° for 28 days, showed activity as compared with the fresh infusion as follows: alc. infusion in ice box 96, in incubator 78; aq. infusion in ice box 80, in incubator 67. Samples were prepd. and allowed to stand under various conditions represented by careless dispensing and keeping. It was found that the infusion of digitalis is fairly stable, no important change taking place within one week. Addition of alc. is unnecessary. Old and even moldy leaves or infusions retained 50% of their activity for 4 months. The infusion has qualitatively the same action as the tincture, but the latter is recommended as being less variable in its activity.

L. W. RIGGS.

Adulteration of saffron by carthamus. G. VICARI. Lugano. *Mitt. Lebens. Hyg.* 6, 195-7(1915).—The saffron powder to be examd. is carefully spread over a glass slide by a glass rod in a thin coating without lumps. A drop of sulfophosphomolybdic reagent (60 cc. concd. H_2SO_4 to 40 cc. 10% Na phosphomolybdate) is allowed to fall upon the prepn., then the powder is well mixed and wetted with the reagent, giving to the whole a slightly greenish blue color. After a minute of rest, it is covered with a cover glass which is gently pressed down with a piece of filter-paper to remove the excess of reagent. Under a microscope of 50 diam. magnification, the particles of carthamus are detected by their reddish color, in the midst of the blue particles of saffron. A magnification of 100 diam. suffices for observation of the structure and behavior of the different elements of the powder with the reagent. If the particles of saffron are somewhat voluminous, or if the prepn. of the powder for the microscope is not properly done, the coloration may be masked. A certain indication of the presence of carthamus is furnished by observation under the microscope (100 diam. magnification) of the pollenaceous particles. These, as with phanerogams in general, are composed of 2 membranes, the outer or Exina being hard, resistant and granulated exteriorly, while the inner or Intina is soft and delicate. The Intina is filled with a relatively dense, hyaline, protoplasmic liquid. The Exina is pierced with 3 openings arranged symmetrically, through which the Intina issues, forming 3 typical protuberances. Under the microscope and in presence of the reagent, the Exina becomes colored brown, while the protuberances of the Intina gradually elongate, turn a bright greenish blue, and at last take on sack-like formations, on account of the endosmosis of the reagent through the membrane increasing the tension of the internal protoplasmic substance. In time the reagent attacks the Exina also, exposing to view its structure, thickness and granulation. Sometimes the complete Intina will break intact, through the weakening Exina. The pollenaceous particles of saffron under the action of the reagent merely color blue, without any other modification or swelling. Small traces of carthamus should not be looked upon as an adulteration, but rather as an unavoidable impurity. S. LEVY.

Solidifying and melting point of anethole. R. MELDRUM. *Chem. News* 112, 259-60(1915).—By the thermometer bulb method 15.7° was obtained as the m. p. of anethole. By the opacity method 17° was obtained as the mean of 10 detns. The difference is probably due to the larger amts. of substance used in the second method, thus making it more difficult to obtain a sharp m. p. The solidification point was detd. by 3 methods: (1) by stirring in an air jacket, (2) by stirring in a cold water jacket, and (3) by melting at 17° until about 2% remained unmelted, and then stirring in an air jacket until solidification commenced. The results of 22 detns. fell between 14.5 and 15.7° . It was observed that melting above the m. p. induced supercooling, with low solidifying points, while melting at the m. p. yielded high solidifying points. Anethole kept in stoppered bottles, exposed to the light for 5 months, gave a solidification point of 5.5° ; this low value is probably due to the absorption of O. R. L. SIBLEY.

Thiophysem. KRÖNIG. *Boll. chim. farm.* 54, 5(1915).—This prepn. is an iodated compd. the compn. of which corresponds to the addition of allylsulfourea and EtI; it contains 46.5% I and m. $69-71^\circ$.
H. S. PAINE.

Hemostatic gelatin. PONCHET AND TRIOLLET. Verona. *Boll. chim. farm.* 54, 8(1915).—Contrary to the opinion in some quarters gelatin does not lose its hemostatic action upon solidifying after being heated to 120° in aq. soln. The following procedure is recommended: Dissolve 8 g. NaCl in 1000 g. H_2O by heating and add 100 g. gelatin. After cooling add the whites of 3 eggs and stir thoroughly; keep the liquid in an autoclave for $\frac{1}{2}$ hr. at 120° . Filter through paper and add 0.002 g. K tellurite per 100 cc. to the filtrate; pour this liquid into 1 cc. vials and sterilize in an autoclave for a few

mins. at 110° in the usual manner. Keep the vials for 10 days before using in order to ascertain if any flora develop. Gelatin thus prepd. remains clear and active.

H. S. PAINE.

Hexaiodine. ANON. *Boll. chim. farm.* 54, 135(1915).—This prepn. is the monohydriodide of hexamethylenetetramine; it occurs as a white, inodorous, cryst. powder, m. 170–1°, of slightly saline taste, very sol. in H₂O and almost insol. in the common org. solvents; it contains 47.4% I. It is exceedingly well tolerated even in large doses and does not produce iodism; the prepn. causes increase in appetite in many cases and is indicated in all cases in which iodides are prescribed. The compd. is prepd. commercially as a soln. and in the form of tablets; it may be administered hypodermically or by mouth.

H. S. PAINE.

A disinfecting and deodorizing liquid. MAURICE FRANÇOIS. *J. pharm. chim.* 12, 220–4(1915).—"Perolin" is a pale yellow, clear liquid, forming an aromatic emulsion with H₂O. Its compn. is approx. dry K soap 15 g., essences 56 g., EtOH 18 g., HCHO 4.5 g. F. gives the following compn. of the imitation prepd. by him: K soap (50% H₂O) from vegetaline (*C. A.* 9, 3328) 50 g.; EtOH of 96% 50 g.; essence of lemon 25 g., of bergamot 5 g., of spike 25 g., of thyme 10 g., of verbena citronella 30 g., of rosemary 5 g.; formol 1 g. to 10 g. A mixt. of 25 cc. of this liquid with 500 cc. of H₂O is used in form of a spray.

S. WALDBOTT.

Absorbability of potassium iodide by the skin in different ointment bases. K. BARTENBACH. *Berl. Tier. Wochschr.; Vet. Rec.* July 17, 1915; *Pharm. J.* 95, 107 (1915).—Tests with lard, paraffin and lanolin as ointment bases for KI, applied to the skin of the horse, dog, ox, sheep and rabbit, show that the intact skin of these animals is permeable to KI in combination with the bases named. Lard favors the passage of KI most; with lanolin very large amts. of KI were required to obtain a positive I test in the urine. With either of the bases, the test appears after an av. period of 2 hrs. With the doses used, the period during which the iodide continued being excreted in the urine, never exceeded 24 hrs.

S. WALDBOTT.

Composition and pharmacological action of spiritus aetheris nitrosi. C. A. MARSHALL AND E. GILCHRIST. *Brit. Med. J.* July, 1915, 125; *Pharm. J.* 95, 139(1915).—Six samples were prepd. by different pharmacopeial formulas. EtNO₂ (1.84 to 2.5%) was present in all but 1; EtNO₂ (3.0 to 10%) was present in all specimens including one freshly made. EtCHO (0.01 to 0.8%) and paraldehyde (trace to 0.32%) were present in all but the fresh and 1 other sample. If sweet spirit of niter is not acid, or if it is neutralized, it becomes quite rapidly acid on keeping, small amts. of HNO₃, HNO₂ and AcOH being formed (0 to 0.27 N). The vaso-dilating action of the prepn. is due chiefly to EtNO₂; that of EtNO₂ and of EtCHO is relatively slight. Owing to the rapid loss of EtNO₂ upon adding H₂O it is best to prescribe the undil. prepn. and dil. it just before administering it.

S. WALDBOTT.

The new Norwegian Pharmacopeia; comparison with the Swiss Pharmacopeia, edition IV. AXEL JERMSTAD. *Schweiz. Apoth. Ztg.* 53, 533–7, 549–54(1915). S. W.

The British Pharmacopeia. C. BÜHRER. *Schweiz. Apoth. Ztg.* 53, 537–40(1915).—A discussion of H. W. Gadd, British and foreign pharmacopeias. Cf. *C. A.* 9, 510, 1915.

S. WALDBOTT.

Sterilization, purification and improvement of medicinal and laboratory glass. A. G. BARLADAN. Bern. Bot. Inst. *Schweiz. Apoth. Ztg.* 53, 605–8, 617–20(1915).—The method adopted is treatment of the inverted vessel for 15 min. with live steam generated in B.'s modification of Abegg's app. A sketch of the latter is given. Parallel expts. with 6 infected flasks show that sterilization was complete when heated in a steam autoclave, or when treated by the modified Abegg's process. In the flasks not treated

by steam, sterile bouillon became turbid within 24 hrs. The condensing steam also washes away impurities, *e. g.*, dead bacteria, or aq. solns., *e. g.*, of CuSO_4 . The *Spirogyra* test (C. A. 8, 989, 2778) proves this washing to be as efficient as treatment with brush and running water and allowing to stand for 24 hrs. with dil. HCl , then rinsing with distd. H_2O . A list of references is given. They are quoted also to show that steaming increases the resistance of the glass towards H_2O . S. WALDBOTT.

St. Germain tea. C. B. *Schweis. Apoth. Ztg.* 53, 645 (1915).—The prepn. of the Swiss Pharmacopeia is not homogeneous, because of the dry mixing of the ingredients. The German and Austrian pharmacopeias impregnate the fruits of fennel and anise with a soln. of $\text{KHC}_4\text{H}_4\text{O}_6$ (*i. e.*, solns. of $\text{K}_2\text{C}_4\text{H}_4\text{O}_6$ and $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$ applied successively). After drying, the material is mixed with senna leaves and elder flowers. C. B. proposes to triturate $\text{NaKC}_4\text{H}_4\text{O}_6$ with twice its wt. of H_2O and to saturate with it the cut elder flowers. After drying, the rest of the ingredients are incorporated to a homogeneous mass. The proportions are those given by the Swiss Pharmacopeia. S. WALDBOTT.

Volatile oil from leaves of Yabunikukei. Y. SHINOSAKI. *J. Chem. Ind. Japan* 18, 913-9 (1915).—Yabunikukei, *Cinnamomum pedunculatum* Nees, is widely distributed in the southern islands of Japan. The volatile oil of this plant, distd. from its fresh leaves, in Ogasawara Islands, has been investigated by S. The oil yield was about 1%. The oil is brown in color, somewhat like camphor oil in odor, and its constants are: d_{15} 1.0603, n_D^{20} 1.5284, $[\alpha]_D$ -1.75°, acid no. 0, ester no. 5.6, sapon no. after acetylation 25.25. The oil contains approx.: hydrocarbons and cineole 9%, eugenol 3%, safrole 60%, other oxygenated compds. 28%. M. I. W.

Volatile oil from leaves of Karasu-zansho. Y. SHINOSAKI. *J. Chem. Ind. Japan* 18, 1077-81 (1915).—Karasu-zansho, *Zanthoxylum ailanthoides* S. et. Z (Rutaceae) is indigenous to the southern parts of Japan. Oils distd. from the mature leaf, semi-mature leaf and young leaf, had the same characteristic odor and were a light orange-yellow. The remaining characters from the mature leaf oil, the semi-mature leaf oil and the young leaf oil were as follows: d_{15} 0.8437, 0.8385, 0.8390, n_D^{20} 1.4474, 1.4408, 1.4440, $[\alpha]_D^{20}$ -6.35°, -5.75°, -6.63°, ester no. 2.81, 4.21, 1.83. sapon. no. after acetylation 20.53, 14.96, 1.68. The principal constituents in these oils are methyl *n*-nonyl ketone, and a considerable quantity of terpenes and phenols (about 1.5% in the mature leaf oil). M. I. W.

Volatile oil from the leaves of Formosan Yamakosho. Y. SHINOSAKI. *J. Chem. Ind. Japan* 18, 1081-4 (1915).—S. has examd. an essential oil from leaves of Formosan Yamakosho, the botanical name of which is yet unknown. The oil, which was obtained with a yield of about 1.2%, had a light yellowish brown color, a camphoraceous odor, and the following characteristics: d_{15} 0.9049, n_D^{20} 1.4635, $[\alpha]_D$ 18.8°, sapon. no. after acetylation 48.66, insol. in 70% alc. It contains about 82% of hydrocarbons and oxides as shown by repeated distn. *in vacuo* over Na. In this oil, cineole was detected by prepn. of the iodole additive compound (m. 112°). Its content was about 49% by the resorcinol method, and therefore the oil contains about 33% of hydrocarbons. M. I. W.

Loss of weight of musk in a current of dry air. CHARLES B. BAZZONI. *J. Frank. Inst.* 186, 463-9 (1915).—A record of 2 expts. with an illustrated description of the app. used. The results seem to justify the following conclusions: Musk does lose wt. when exposed in a current of dried air. This loss is not due to the evapn. of water. After the loss of weight has ceased the musk is no longer odorous. The odor is not restored by exposure to moist air. The loss of weight is recognized to be due merely to the loss by evapn. of the volatile constituents of this particular specimen of musk.

The percent of volatile constituents must almost certainly be different in different samples, since musk as it occurs commercially is a complex variable mixt.

M. I. W.

The essential oil of *Eucalyptus smithii* from various forms of growth. HENRY G. SMITH. *J. Proc. Roy. Soc. N. S. Wales* 49, II, 158-69(1915).—A review, with illustrations, of information regarding the rapidity of growth and reproduction of the species under natural conditions of soil and climate; with a report of an investigation of the oil of *Eucalyptus smithii* distd. from material collected under different conditions of growth. The constituents present in the oil, besides pinene and cineole, are phenol, a small amount of volatile aldehydes, dextrorotatory eudesmol melting at 79°, a solid paraffin melting at 64°, a small quantity of esters, partly a low boiling one, probably butyl butyrate, and a small amount of sesquiterpene. Neither phellandrene, piperitone nor aromadendral have so far been detected in the oil of this species. Eight samples of oil showed the following variation in constants: d_{16}^0 0.9098 to 0.9210, $[\alpha]_D$ from +9.2 to +4.2, solubility in 70% alcohol from 1.1 to 2.1 vols.; saponification number from 1.3 to 5.6; cineol percent 61.5 to 85.2.

M. I. W.

The oil of the wild grape seed, *Vitis riparia*. GEO. D. BEAL AND C. K. BEEBE. *J. Ind. Eng. Chem.* 7, 1054(1915).—The source of the oil was the seeds from the wild grape obtained during the manuf. of grape butter. The seeds, after being freed from the dried pulp, were ground in a mill and extd. with low-boiling petr. ether; after evapn. of the ether, the oil obtained amounted to 19.38% of the weight of seed taken. The oil had a greenish amber tint, tasted like castor oil, and had a peculiar acrid odor. Physical and chemical exam. of the oil gave the following data: d_{18} 0.8425, n 1.4781, sapon. no. 187.8, I value 76.47, acetyl value 61.29, insol. 90.00%, fatty acids neutralization value 173.4. The quantity of oil available was too small for further studies on its compn. The authors expect to obtain a further supply and to continue the investigation.

M. I. W.

The stability of nitroglycerin tablets. WILBUR L. SCOVILLE. *J. Ind. Eng. Chem.* 7, 1054-5(1915).—There is a decided loss of nitroglycerin in the manuf. of tablets. This loss is now allowed for, the final adjustment being made by assay on a preliminary sample of tablets. The ratio of loss is not const. and it is necessary to test each lot during the process of manuf. The question of permanence, however, has not yet been decided. About 3.5 yrs. ago a series of sample tablets freshly made and tested, was set aside for observation. The results of the observation are presented in the form of a table from which it appears that all tablets containing less than $1/100$ of a grain each have deteriorated, and also, all those made from soln. of nitroglycerin, while tablets made from the paste, of $1/100$ grain or over, have maintained their strength.

M. I. W.

Constituents of oil of cassia. FRANCIS D. DODGE AND ALFRED E. SHERNDAL. *J. Ind. Eng. Chem.* 7, 1055-6(1915).—The essential oil of cassia is obtained in China by steam distn. of the bark and leaves of *Cinnamomum cassia*, but despite the fact that it is commercially one of the most important oils, its compn. does not seem to have been thoroughly investigated. The chief constituent is the well-known cinnamic aldehyde, the amt. of which, in pure oils, appears to vary from 75 to 90%. The examn. showed that the oil of cassia contained at least 0.5% of material sol. in dil. alkali, consisting of a mixt. of about 25% salicylaldehyde, 60% coumarin, 8-10% cinnamic acid, and small amts. of salicylic acid, benzoic acid and a volatile liquid acid, not identified. No phenol other than salicylaldehyde could be detected.

M. I. W.

HOUGHTON, E. M.: Collected Papers from the Research Laboratory of Parke, Davis & Co. Vol. 3, 1915. Detroit, Mich.: Parke, Davis & Co.

PERZOLD, C. A.: *Chemie und Chemikalienkunde für Drogisten*. 4th ed. Berlin: A. L. Herrmann. 346 ss. 4 M.

Vitamines from cod liver oil. C. FUNK. U. S., 1,162,907, Dec. 7. A concd. ext. of cod liver oil, containing vitamins, is made by treating the oil with ligroin, ether or dil. alc. This ext. is concd. by pptg. with EtOAc or acetone. The ppt. is taken up with dil. acid, pptd. with phosphotungstic acid, the ppt. is treated with acetone, and the residue with Pb acetate and the filtrate obtained is pptd. with H_2S to remove Pb and the purified soln. thus obtained is concd.

Obtaining vitamins from yeast, rice-bran, etc. C. FUNK. U. S., 1,162,908, Dec. 7. Phosphotungstic acid is added to yeast ext. and the ppt. formed is treated with acetone and then decomposed with Pb acetate and the excess of the latter removed with H_2S . The filtrate is evapd. *in vacuo* and white needles, m. 223° , and probably having the formula $C_{22}H_{24}O_8N_8$, are obtained.

Mesityl oxide. H. HIBBERT. U. S., 1,164,647, Dec. 21. Diacetone alc. is condensed by heating it with 0.01% of I to its b. p. A quant. yield of mesityl oxide is obtained. Pinacol distd. with 0.2% of I gives dimethyl butadiene. Cyclohexanol with 2% I, heated to $170-175^\circ$ for 60 hrs., gives tetrahydrobenzene.

3,5-Dinitro-4-methylaminobenzenearsonic acid. L. ACH, A. ROTHMANN and H. HATZIG. U. S., 1,162,496, Dec. 7. 3,5-Dinitro-4-chlorobenzenearsonic acid is reacted upon with methylamine in alc. on a H_2O bath and HCl added to ppt. the product. It is a yellow cryst. powder sol. in hot alc., glacial HOAc and NaOAc soln., insol. in acids, acetone or ether. 4-Amino-3,5-dinitrobenzenearsonic acid is made by reacting on 4-chloro-3-nitrobenzene-1-arsonic acid with NH_4OH , pptg. the mononitroamino deriv. formed with HCl and converting it into the dinitro compd. by further nitration with HNO_3 and H_2SO_4 . 4-Glycyl-3-nitrobenzene-1-arsonic acid is made by dissolving 4-chloro-3-nitrobenzene-1-arsonic acid in NaOH soln., adding aminoacetic acid, heating for 30 hrs. at 50° and pptg. with dil. H_2SO_4 .

Obtaining an ovarian product from the enclosing sacs. G. M. and W. I. HIEATZMAN. U. S., 1,163,538, Dec. 7. The ovaries are successively subjected to a bursting pressure in a closed vessel to cause extrusion of their contents which escape freely into the vessel. Sepn. from the membrane is effected by straining through a fine wire network while subjected to the action of a stiff brush.

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

Potash from wood and plant ashes. HARLOW BRADLEY. *Met. Chem. Eng.* 13, 841-6(1915).—Since the European war stopped imports from Germany, considerable interest has been evinced in the possibility of producing potash from wood ashes, and the present paper deals with this phase of the subject. After a brief historical survey B. discusses the uses of potash, the manufacture of potash from wood ashes and the possible improvements in the method of manuf. The characteristic of potash produced from wood ashes, their practical utilization, some of the sources and the results of many analyses of plants and plant ashes, partly of European origin, are compiled in tabular form.

C. A. NOWAK.

Chemical analysis of the mother liquor from R. Salina di Comacchio. MARIO ASQUINI. Univ. Padua. *Atti reale ist. Veneto, sci., lettere ed arti.* 74, 534-51(1915); see C. A. 9, 2294.

E. J. WITZEMANN.

Decomposition of ammonia and the chances of explosions. FRANK L. FAIRBANKS. Boston. *Power* 42, 715-7(1915).—Expts. in a large refrigerating plant, carrying a charge at times as great as 100,000 lbs. of NH_3 , failed to produce an explosion of NH_3 , or other gases by detonation. Mineral oil at high discharge temps. becomes a gas highly explosive when mixed with certain proportions of air. Segregated gases taken from the condenser or the absorber are explosive when mixed with the right amts. of air and ignited. The presence of Zn or Zn alloys in contact with the NH_3 at high temps. results in a decompn. of the NH_3 . The presence of foreign gases in a refrigerating system is indicated by a rise in both temp. and pressure, especially the condenser pressure, which may be readily observed on the gages. L. W. RIGGS.

Technical and academic chemistry. JAMES WALKER. *J. Soc. Chem. Ind.* 34, 1122-4(1915).—An address. E. J. C.

GÖTTSCHE, G.: *Die Kältemaschinen und ihre Anlagen.* Hamburg: Verlag für Kälteindustrie. 824 ss. 20 M.

HARTWIG, A.: *Die Salpeterindustrie Chiles und ihre weltwirtschaftliche Bedeutung.* Berlin. 40 ss. 0.50 M.

LUNGE, G.: *The Manufacture of Sulphuric Acid and Alkali.* Vol. IV. London: Gurney & Jackson.

MARTIN, G.: *Chlorine and Chlorine Products.* London: C. Lockwood & Son. 100 pp. 7 s, 6 d.

MARTIN, G.: *Industrial and Manufacturing Chemistry.* Vol. 1. Organic. 2nd ed. London: H. K. Lewis. 21 s.

The World's Supply of Potash. London: The Imperial Institute. 47 pp. 1 s.

Concentrating nitric acid. F. RASCHIG. U. S., 1,163,174, Dec. 7. A mixt. of 50% HNO_3 1 and 92% H_2SO_4 2 parts is distd. at about 150° to obtain concd. HNO_3 and residual H_2SO_4 of about 60% strength. The latter is distd. at 150° under a high vacuum to reconcentrate to 92% so that the process may be carried on continuously by returning the H_2SO_4 to dehydrate fresh dil. HNO_3 .

Making ammonia from calcium cyanamide. W. S. LANDIS. U. S., 1,163,095, Dec. 7. A slurry is made of crude CaCN_2 , the slurry is heated by steam under 2-4 atm. pressure with $\text{Ca}(\text{OH})_2$ to initiate the reaction, and the latter is then allowed to continue with less application of heat, the heat of the reaction on evolution of NH_3 being sufficient to maintain the required temp. Cf. C. A. 9, 2699, 3333.

Copper oxide. S. G. MARTIN. U. S., 1,164,838, Dec. 21. A heated soln. of a Cu salt, e. g., CuSO_4 , containing KOH and KNO_3 is charged with air and then treated with steam under pressure to form CuO .

Aluminium chloride. B. T. BROOKS. U. S., 1,165,065, Dec. 21. A stream of Cl is passed through molten Al in a graphite vessel with sufficient rapidity to keep the metal agitated.

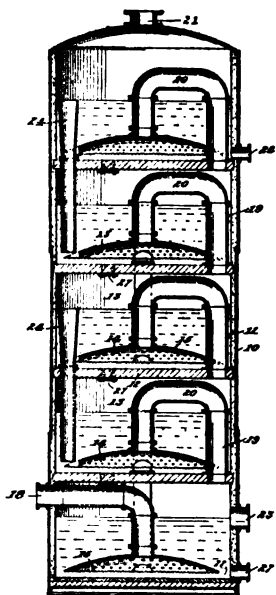
Soluble potassium and aluminium salts from silicate minerals. M. F. COOLBAUGH and E. H. QUINNEY. U. S., 1,165,154, Dec. 21. Powdered minerals such as feldspar or leucite are mixed with gypsum 2.8 parts for each part of SiO_2 in the mineral. The mixt. is heated to incipient fusion, quickly cooled, leached with dil. H_2SO_4 and K and Al sulfates are recovered from the soln. by crystn. Cf. C. A. 9, 696.

Basic magnesium carbonate. T. SILBERMANN. U. S., 1,163,475, Dec. 7. A dil. MgCl_2 soln. is mixed with a carbonated NH_3 soln. containing 8-10% NH_3 and 4-6% CO_2 so that the CO_2 is somewhat in excess of the amt. required to form basic Mg car-

bonate, the mixt. is heated until it assumes a curd-like consistency and the product is filtered and dried. It is a very voluminous granular material containing about 50% H_2O of crystn. Cf. C. A. 9, 360.

Apparatus for absorbing sulfur dioxide to form bisulfite solutions. P. A. PAULSON.

U. S., 1,165,281, Dec. 21. Milk of lime is supplied continuously at the pipe 22 and flows down from one chamber to another through the overflow pipes 24 while gases entering at 18 pass upward from one compartment to another through the pipes 20 and distributors 14.



Carbon dioxide and sodium sulfite. H. HOWARD. U. S., 1,164,649, Dec. 21. An aq. soln. of $NaHSO_3$ is reacted on with solid Na_2CO_3 , avoiding any excess of the latter over that required to form Na_2SO_3 . Less H_2O is used than would be required to maintain the product in soln. and a larger yield is thus obtained with an app. of equal size than when more H_2O is used.

Calcium cyanamide. E. GUI. U. S., 1,164,087, Dec. 14. N is allowed to react on CaC_2 while mixed with a much larger amt. of red-hot Ca cyanamide which prevents formation of a compact mass during the reaction.

Nitrogen compounds from distillers' washes. E. KOCHENDOERFER. U. S., 1,165,358, Dec. 21. Nitrogenous gases produced by carbonizing distillers' wash are conducted through hot tubes lined with quartz or ZrO_2 to produce CN compds. and NH_3 .

Reducing metals with hydrazine. N. SULZBERGER. U. S., 1,164,141, Dec. 14. Metals, such as Ni for use in hydrogenating oils catalytically, are reduced from their salts, e. g., Ni borate, by N_2H_4 in the presence of Pd or other catalytic metal (or Pt chloride) which serves to incite the reduction.

Heat-insulating material. F. J. JEWETT. U. S., 1,164,941, Dec. 21. A light, porous felt is made of asbestos paper stock and shredded sponge mixed with a small amt. of size and 25-40% of cattle's hair.

Electrical insulating material. J. FERLA. U. S., 1,165,164, Dec. 21. A mixt. of cement, hemp, HOAc, and glue is impregnated with linseed oil or other drying oil and baked.

Fire-proofed packing material. A. C. BORZNER. U. S., 1,165,062, Dec. 21. Waste cellulosic material such as corn stalks, or waste paper, is treated with an alk. soln. and reduced to pulp, fire-proofed, e. g., by treatment with borax, dried in sheet form and cut into shreds which may be used in the same way as excelsior.

Alginates from sea-weed. T. INGHAM. U. S., 1,162,926, Dec. 7. Alginates suitable for use in waterproofing or sizing fabrics are obtained by adding an excess of NH_4OH or other alkali to an alginate soln. obtained by extg. sea-weed with alkali and then an amt. of $CuSO_4$, $Al_2(SO_4)_3$ or $ZnSO_4$ or other metallic salt is added which in the absence of the NH_4OH or other alkali would be sufficient entirely to ppt. the alginic acid present. This forms a double alginate of alkali and other added metal. A small % of oil or wax may be added for waterproofing.

Iron oxide castings. L. SCHERBEL. U. S., 1,163,467, Dec. 7. Mixts. of Fe oxides containing over 3 times as much Fe_2O_3 as FeO and which may consist substan-

tially all of Fe_2O_3 are formed into castings by treating a melted bath of burnt pyrites with O under pressure while stirring, and casting in an oxidizing atm.

Alloy for dental fillings. T. J. DAVIS. U. S., 1,164,997, Dec. 21. An alloy of Au, Sn, Cu, Ag, Zn and Al is formed into granules, each of which is coated with Au. The granules are combined with Hg when prepd. for use.

Composition for impregnating or coating wood, leather, metals, etc. M. BUCHNER. U. S., 1,165,222, Dec. 21. Chlorinated mineral oil containing at least 30% Cl is mixed with a pigment such as Fe_2O_3 and a volatile solvent, *e. g.*, CCl_4 , alc. or turpentine. Chlorinated fatty oils or resin oils also may be used for acid-resisting coatings.

Preserving anatomical specimens, small animals, etc. P. DREGENER and W. BERNDT. U. S., 1,163,645, Dec. 14. See C. A. 9, 2298.

Sulfur dioxide; sulfites. F. J. STANES and G. S. ROGÉ. Brit., 18,605, Aug. 12, 1914. SO_2 is prepd. by heating S with NaHSO_4 or other acid sulfate in the absence of free O. A residue of mono-sulfite remains, and this may be converted into bisulfite by treatment with SO_2 .

Purifying salts. J. A. NEWBY and C. J. MONTGOMERY. Brit., 18,601, Aug. 12, 1914. Salts are purified by treating with a satd. soln. of the salt to be purified, and during this treatment, the salt is subjected to the action of surface tension by injecting air.

Salt pans. J. TODD. Brit., 18,701, Aug. 15, 1914.

Dust preventing compositions. H. F. T. LINDBALLE. Brit., 17,952, July 29, 1914. Roads are made dustless by treatment with hygroscopic salts, a substance containing sugar, and H_2O , applied consecutively or together and in such quantities that the salts substantially exceed the sugar material. A soln. of 100 lbs. of NaCl and 35 lbs. molasses in 600 lbs. H_2O is preferred.

Emulsifying. S. H. BLICHFELDT. Brit., 18,048, Oct. 18, 1913. Margarine and other emulsions are prepd. by a disk and a casing between which there is relative motion, the liquid being supplied to both sides of the disk, as by forming it with slots, so that the pressure thereon is balanced. Cf. C. A. 9, 1229.

Lubricants; distilling resin. PENSACOLA TAR AND TURPENTINE CO. Brit., 18,235, Aug. 1, 1914. A lubricant grease consists of mineral oils, set by milk of lime or other alkali, and the acid substance obtained when resin is distd. under reduced pressure or with superheated steam. The acid is said to be an isomer of abietic acid, and its proportion in the acid substance varies from 68 to 92%, according as the conditions vary from a 5 in. vacuum and temp. of 280–345° to a vacuum of 28 in. and a temp. of 270–305°. The acid substance resembles rosin in appearance, but may be soft or cryst.

Pure iron-free zirconium oxide. K. LEUCHS. Ger., 285,344, Mar. 7, 1914. To obtain pure ZrO_2 from the impure, especially Fe-containing solns., H_2SO_4 is added to the HCl Zr soln. in about the mol. proportion of $7\text{ZrO}_2:4\text{H}_2\text{SO}_4$, and the mixt. is boiled. Without the application of pressure a readily filterable, crystalline, Fe-free ppt. of a basic Zr sulfate is obtained, having the constitution $7\text{ZrO}_2, 3\text{SO}_3, 14\text{H}_2\text{O}$ (dried over H_2SO_4 of sp. gr. 1.64). The H_2SO_4 may be removed from the resulting ppt., even in the cold, by NH_3 or fixed alkalies, which is not the case with other basic sulfates of Zr. The pulverulent, finely divided product is obtained in this manner. It is especially suitable for use in enamelling. *E. g.*, 10 kg. Zr ore are finely ground and calcined with 5 kg. soda. The incandescent product is extd. with H_2O , HCl is added to the insol. residue, and the silicic acid is sepd. in the usual manner. Some undecomposed ore and silica remain, and these may be decomposed with a fresh amt. of soda. Fe_2Cl_6

present in the soln. of the $ZrCl_4$ is reduced, and then H_2SO_4 is added in the proportion stated above. The soln. is then heated to boiling, and the free acid is wholly or partly neutralized. The dense cryst. ppt. is washed out until no more H_2SO_4 is exhausted.

Stable colloidal metal solutions. ELEKTRO-OSMOSE AKT.-GES. (GRAF SCHWERIN Ges.) Ger., 285,025, Apr. 15, 1913. The stabilizing effect is produced by sol. silicic acid. This acid is mixed with a metal salt soln. and the latter is then reduced. Hydrazine hydrate is used as the reducing agent. *E. g.*, a dil. Au or Ag salt soln. is added to a sol. silicic acid of about 2.5% SiO_2 content, and this is then reduced in such manner that the metal seps. in the colloidal state. With hydrazine hydrate, a perfectly clear, brown Ag sol or deep blue Au sol is obtained.

Regulating the temperature of superheated steam. A. MUSMANN. Ger., 285,140, Apr. 29, 1914.

Separating water from steam. SCHMIDTSCHER HEISSDAMPF-GES. M. B. H. Ger., 285,141, Oct. 15, 1913.

Stirring liquids. M. WENDRINER. Ger., 284,577, Dec. 18, 1913.

Separating substances according to specific gravity. A. GRÜNDLER. Ger., 285,133, Oct. 30, 1912. Cf. C. A. 10, 102.

Heat-treating cork. GRÜNZWEIG & HARTMANN, G. M. B. H. Ger., 285,106 Nov. 3, 1907. Addition to 267,733 (C. A. 8, 998). The principal process is modified in that the heating and the compression is effected in 2 successive stages. The effectiveness of the heat treatment can be enhanced by the continued mechanical movement of the cork in free uniformly thick layers. The heating and the shaping are sep operations.

Porous pressed articles. H. RAMMLER. Ger., 285,148, Nov. 8, 1913. Instead of the heretofore employed alc., as a volatile addition to the material, solid volatile substances, such as $(NH_4)_2CO_3$, hartshorn salt, NH_4 carbamate, or NH_4 percarbonate are used.

Securing pulverulent, granular, or other material to paper or fabric. W. GOLOMBEK. Ger., 284,682, Nov. 16, 1913. As a binder is employed the intermediate product resulting from the production of caoutchouc regenerates by the soln. process. This product consists of caoutchouc regenerate, H_2O , and solvent residues. After drying the binder, the pulverulent material adheres firmly, and the adhesive properties are not influenced by heat or cold, or by H_2O and atm. changes.

19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

A new glass; and an application of low reflectivity of glass for radiant heat. E. C. SULLIVAN AND W. C. TAYLOR. Corning Glass Works. *J. Ind. Eng. Chem.* 7, 1064- (1915).—A new borosilicate glass of high SiO_2 content and free from heavy metals and those of Mg-Ca-Zn group, shows very low thermal expansion and high resistance toward reagents. Its properties are: sp. gr., 2.25; mean linear coeff. expansion (19–350°), 0.0000032. Culinary ware made from this glass bakes more rapidly than metal wares due to much lower reflectivity to radiant heat. The glass withstands shock better than enamelled earthenware or crockery. Some data are given. C. H. KERR.

Copper-plate engraving for earthenware decoration. ANON. *Pott. Gaz.* 4 965-6(1915).—A brief description of the engraving of the plate and the reproduction of the design by printing on tissue paper and applying this to the ware.

R. K. HURSH.

The enamelling of cast-iron vessels. H. VOGEL. *Keram. Rundschau* 23, 109-10 (1915).—Hard, white cast iron gives a better surface for enamelling than soft gray iron, but is brittle and warps easily. Surfaces to be enamelled are chilled in casting, or hardened by S. Graphite in the iron affords a poor surface for enamel. Castings are cooled quickly to avoid sepn. of C as graphite. Castings should be of uniform thickness, about 2.5-3 mm. The raw iron should be dense, fine grained and not too soft. In general, the Si should be high, 2.3-2.7%, P about 1-1.8%, Mn about 0.6% and S as low as possible. Higher Mn makes iron too brittle. Thorough cleaning of castings by the sand blast without acid treatment is best, followed by dipping in NaHCO_3 soln. (1-1 $\frac{1}{4}$ kg. per 100 l. H_2O) and drying in air. The ground coat must be harder than the cover coat, about 70-75% SiO_2 being allowable, and must not be overburned. It should not be thoroughly fused in fritting and should be finely ground. The furnace should be at least at 950°. A single application of a cover coat containing about 10% SnO_2 is best.

R. K. HURSH.

SINGER, F.: Ueber den Einfluss von Tonerde auf die Schmelzbarkeit von Gläsern. Berlin: *Keramische Rundschau*. 75 Pf.

Molds for glassware. B. C. GILLIGAN. U. S., 1,165,003, Dec. 21. Press forms and dies for molding glassware are formed of coke, mixed with sufficient calcined lamp-black to fill the pores of the coke, and a binder of sugar or tar.

Uniting nickel alloy pipes to vitreous ware. R. G. MILLER. U. S., 1,164,840, Dec. 21. An alloy of Ni 65, Mn 22 and Fe 13% is used for making pipes, etc., which are united with vitreous ware before the latter is burned and, having about the same coeff. of expansion, remain firmly attached.

Refractory substances; silicon carbide. W. W. CRAWFORD. Brit., 18,439, Aug. 8, 1914. Refractory articles, such as bricks, tiles, crucibles, furnace linings, etc., are made by mixing SiO_2 , e. g., in the form of kieselguhr or washings from China-clay, with a substance such as refuse oil which will yield C on burning, heating to about 2000° till clinkered, and molding the ground clinker with Na silicate. W oxide may be added at any stage of the process. The clinker is stated to be a carbide of Si or similar thereto.

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

Microstructure of concrete. N. C. JOHNSON. *Proc. Am. Soc. Testing Materials* 15, II, 171-229(1915); see C. A. 9, 1380.

A. A. KLEIN.

Action of sulfates on concrete. A. SARTORI. Breslau. *Chem. Ztg.* 39, 957(1915).—Three analyses are given of a concrete flower pot, showing the destructive action due to sulfates contained in the earth in the pot. Cf. C. A. 5, 1811; 8, 3107.

J. H. MOORE.

Effect of finer grinding and higher sulfur trioxide content on physical properties of portland cement. P. H. BATES. U. S. Bur. of Standards. *Proc. Am. Soc. Testing Materials* 15, II, 126-52(1915).—Physical tests were conducted with 10 cements (1) as received, (2) when ground so that about 12% more passed a 200-mesh sieve, (3) when the SO_3 content of the cement as received was increased to 2.5%, (4) when both the SO_3 was increased and the cement reground. Finer grinding produces a quicker set; additional SO_3 produces a quick initial but slower final set, although few of the changes are such as to place the treated cements beyond specification limits. Either

fine grinding, the SO_2 addition, or both, generally improves the strength of neat specimens, although the results are not consistent. The tensile strength of the mortars shows the advantage of all 3 treatments; the addition of SO_2 to the coarse cement causes a falling off in the rate of gain of compressive strength. With the "combined storage" method of aging, the tensile test on neat specimens does not show that the cements are improved by either of the treatments used, and the compressive results of these specimens are not conclusive. The sand tension tests are also not conclusive, whereas the sand compression tests do show the value of finer grinding with or without SO_2 addition. Tests on concrete show that finer grinding is very advantageous for early strength and that the addition of more SO_2 to such more finely ground cements more properly to control the set is not disadvantageous at this period. Expansion tests on neat H_2O -stored specimens show large increases in length for the specimens made from the cements containing more SO_2 , whereas in the mortars this is not so apparent.

A. A. KLEIN.

Weight-volume proportioning of concrete aggregates in testing. J. A. KRITS. *Proc. Am. Soc. Testing Materials* 15, II, 153-70(1915).—Arbitrary proportioning in mortar and concrete gives inconsistent results. It is necessary to know the sp. gr. and the % of voids of a material, in detg. the vol. of that material by weighing. A wt.-vol. method of progressive proportioning both for mortar and concrete is given.

A. A. KLEIN.

Strength and elastic properties of concrete-filled pipe columns. F. W. SWAIN AND A. F. HOLMES. *Proc. Am. Soc. Testing Materials* 15, II, 230-44(1915).—Tests made on concrete-filled pipe columns, filled by a jolting process, showed the columns to have a definite elastic limit and up to this load to be perfectly elastic, the steel pipe preventing permanent set from taking place in the enclosed concrete.

A. A. K.

Report of sub-committee C-1 on accelerated tests of cement. R. L. HUMPHREY *et al.* *Proc. Am. Soc. Testing Materials* 15, I, 147-8, Discussion 149(1915).—The autoclave test for soundness should not for the present be adopted because the investigations that have been made of this method do not show that it is in any way superior to the present test for soundness.

A. A. KLEIN.

Report of committee C-1 on standard specifications for cement. G. F. SWAIN *et al.* *Proc. Am. Soc. Testing Materials* 15, I, 144-6(1915).—Chapman's app. for consistency when operated in accordance with the method recommended by C., does not give sufficiently concordant results on 1:3 cement-sand mortars or on neat cement paste to warrant recommending its use as a reliable test for consistency. No further action is to be undertaken on the standard screen scale.

A. A. KLEIN.

Investigation on the test of portland cement for time of setting. TAKESHIKU HATTORI. *J. Chem. Ind. Japan* 18, 37-40(1915).—H. investigated to what degree detn. of setting time is affected by quantity, quality and temp. of gaging H_2O , temp. and hygrometric degree of atm., amt. of heat developed, aeration, etc. He recommends a test based on the amt. of heat developed, especially for quickly setting cements. In using the Vicat needle, he suggests applying it at 3 points to be vertices of a regular triangle on the surface of the pat, initial set being reached when all three needles are arrested 1 mm. above the level of the base and final set when all 3 needles are arrested 0.5 mm. from surface. Variations of humidity beyond 60% do not affect setting time. Setting tests should be made at the temp. of the atm. of the place when the cement is to be used. H. recommends, in making setting time tests, dividing the sample placing one portion in sealed bottles and spreading the other in a thin layer exposed to the air for a week or 10 days. If the aerated portion develops a quick set it should be

rejected. He also proposes making the test on mortars composed of very fine sand, as he finds that different cements show different setting times when mixed with sand.

C. N. WILBY.

Influence of prolonged infiltration of brine on construction materials. S. CAMILLA. Torino. *Ann. chim. applicata* 4, 145-50(1915).—Materials of building constructions that crumble on account of brine infiltration contain many substances lacking in the normal materials, as common salt and organic substances. Chlorides react with the CaO of mortars, forming deliquescent CaCl_2 , which keeps the masonry in a continual state of humidity, interfering with its setting and hardening. Nitrates similarly produce $\text{Ca}(\text{NO}_3)_2$.

S. LEVY.

Report of committee D-4 on standard tests for road materials. L. W. PAGE, *et al.* *Proc. Am. Soc. Testing Materials* 15, I, 325-31, Discussion 356(1915).—Rept. of proposed revised definitions. The Jackson sp. gr. app. is recommended for use in detn. of the sp. gr. of sand and fine aggregates. The cone sp. gr. method is recommended in detn. of voids in mineral aggregates. It is recommended that products of rock-crushing plants be covered in specifications by stating that the product shall conform to limitations given in terms of mechanical analyses made with lab. screens.

A. A. KLEIN.

Report of committee C-7 on standard specifications for lime. J. S. MACGREGOR, *et al.* *Proc. Am. Soc. Testing Materials* 15, I, 167-70, Discussion 171-2(1915).—**Specifications for quicklime:** There are 2 grades: (a) selected, shall be a well burned lime picked free from ashes, core clinker or other foreign material; (b) run-of-kiln, shall be well burned without selection. Quicklime is shipped in 2 forms: lump lime, shall be the size coming from the kiln; pulverized lime, shall be lump lime reduced in size to pass $\frac{1}{4}$ in. screen. Quicklimes are divided chemically into 4 types: high-Ca (over 90% CaO), Ca (not under 85% and not over 90% CaO), magnesian (10-25% MgO) and dolomitic (not under 25% MgO). Selected quicklime shall contain not under 90% CaO and not over 3% CO_2 . Run-of-kiln quicklime shall contain not under 85% CaO and MgO and not over 5% CO_2 . **Specifications for hydrated lime:** Hydrated limes are divided chem. into the 4 types specified for quicklime. The sample for testing shall be a fair av. of the shipment and shall be taken from the surface to the center of the packages, of which 3% shall be sampled. A 2 lb. sample should be immediately stored in an air-tight container. The non-volatile portion of hydrated lime shall contain not under 92% CaO and MgO. Hydrated lime shall contain not over 5% CO_2 and sufficient H_2O to fully hydrate the CaO present. The type and chem. properties shall be detd. by standard methods of chem. analysis. A 3-in. pat, $\frac{1}{2}$ in. thick at the center, tapering to a thin edge, shall be made on a clean glass plate, from a paste composed of equal parts by wt. of hydrated lime and vol.-constant portland cement, gaged with only sufficient H_2O to make the mixt. workable. This pat after hardening 24 hrs. in moist air shall, when exposed in a convenient manner to steam above boiling H_2O in a loosely closed vessel for 5 hrs., show no signs of popping, checking, cracking, warping or disintegrating.

A. A. KLEIN.

Report of special joint committee D-4 on definitions of road materials. P. HUBBARD, *et al.* *Proc. Am. Soc. Testing Materials* 15, I, 332-4(1915).—The rept. contains proposed standard definitions of non-bituminous road materials (crusher-run, dust, flour, matrix, spawl, stone chips), of bituminous road materials (solid bituminous materials, liquid bituminous materials, semi-solid bituminous materials, asphalt cement, native asphalt) and of terms applicable to materials relating to roads and pavements (blown petroleum, oil-gas tars, water-gas tars).

A. A. KLEIN.

Report of sub-committee D-4 on ductility tests. A. W. DOW, *et al.* *Proc. Am. Soc. Testing Materials* 15, I, Appendix IV, 349-51(1915).—Ductility of a bitumen is the distance in cm. that a briquet will stretch before breaking, when the chips containing the briquets are pulled apart under H_2O at $70^\circ F.$ at a uniform rate of speed of 5 cm. per min. The results on some bitumens by different operators were not concordant, a fact which is probably due to some physical change taking place in the sample.

A. A. KLEIN.

Report of sub-committee D-4 on the softening point. G. P. HEMSTREET, *et al.* *Proc. Am. Soc. Testing Materials* 15, I, Appendix III, 341-2(1915).—Softening points of different materials were detd. at 6 different laboratories using the ring-and-ball method and the cube method. While the former method showed itself to be more convenient and to give the more concordant results, its adoption as standard is not recommended until further refinements have been devised and other methods investigated.

A. A. KLEIN.

Report of sub-committee D-4 on penetration. L. M. LAW, *et al.* *Proc. Am. Soc. Testing Materials* 15, I, Appendix V, 352-5(1915).—The following penetration test is proposed: The normal penetration of bitumen shall be the distance in cm./100 that a standard needle will penetrate into it vertically and without appreciable friction in the apparatus at 25° under a load of 100 g. applied for 5 sec. The container shall be a flat-bottomed cylindrical dish 55 mm. in diam. and 35 mm. deep. The needles shall be R. J. Robert's Parabola "Sharps" No. 2. Carefully selected needles shall be compared with a standard needle and rejections made of those which vary more than 1 point from the penetration obtained with the standard needle on a sample having a penetration of approx. 60. The H_2O bath shall be maintained at a temp. not varying more than 0.1° from 25° . The vol. of H_2O shall be not less than 10 l. and the sample shall be immersed to a depth of not less than 10 cm. and shall be supported on a perforated shelf not less than 5 cm. from the bottom of the bath. The sample should be completely melted at the lowest possible temp. and stirred thoroughly. It shall then be poured into the sample container to a depth of not less than 30 mm. and allowed to cool in dust-free atm. not lower than $65^\circ F.$ for 1 hr. It shall then be placed in the H_2O bath along with the transfer dish for 1 hr. prior to making the test. At least 3 tests shall be made at points not less than 1 cm. from the side of the container and not less than 1 cm. apart. The penetration shall be an av. of the 3 tests whose values shall not differ more than 4 points between max. and min. When necessary to vary temp., time and wt. and in order to provide for a uniform method of reporting results when variations are made, the following combinations are suggested: at 0° , 200-g. wt., 1 min.; at 46° , 50-g. wt., 5 sec.

A. A. KLEIN.

The effect of leaking illuminating gas on bituminous pavements. GEORGE C. WARREN. *Proc. Am. Soc. Municipal Improvements* 21, 304-18(1915).—In expts. made by passing the gas for several weeks through vessels containing asphalt and asphalt sand mixts. the asphalt increased in wt., became liquefied and lost its binding power. The expts. show that leaking gas mains may cause very serious damage to bituminous pavements.

GEO. M. HUNT.

Experiments on the bleeding and swelling of southern yellow pine paving block. C. H. TRESDALE. U. S. Forest Products Lab. *Proc. Am. Soc. Municipal Improvements* 21, 267-86(1915); see C. A. 9, 240.

GEO. M. HUNT.

Fungus bed test of wood preservatives. C. M. CHAPMAN. *Proc. Am. Soc. Testing Materials* 15, II, 267-73(1915).—The specimens 12 in. long are placed upright in fungus bed with 3 in. above and 9 in. below ground. The bed is prepd. by mixing a quantity of pulverized sheep manure with screened loam. The preserving materi-

used include foreign and domestic coal-tar creosotes, water-gas creosotes, wood-tar creosotes, mineral oil, vegetable and animal oils and inorganic salts in soln. The methods of application are: cold dip, hot dip, and continued boiling followed by cooling in the preservative. It is an accelerated test, simple and easily carried out, giving comparative results of the behavior of the preservatives in exposures where the wood comes in contact with damp ground.

A. A. KLEIN.

CASLER, M. D.: *Simplified Reinforced Concrete Mathematics*. New York: Van Nostrand Co. 66 pp. \$1.25.

DONCASTER, E. A.: *Limes and Cements: Their Nature, Manufacture, and Use*. London: C. Lockwood & Son. 212 pp. 5 s.

RUDLOFF, M.: *Erfahrungen bei der Herstellung von Eisenbetonsäulen. Längenänderungen der Eiseneinlagen im erhärtenden Beton*. Berlin: W. Ernst & Sohn. 240 M.

Mortar for laying brick, stone, etc. C. M. LONG. U. S., 1,162,790, Dec. 7. Burnt molders' sand which contains particles of Fe and slag is mixed with about 10-12% its wt. of $\text{Ca}(\text{OH})_2$.

Artificial stone. G. ATTERBURY. U. S., 1,163,060, Dec. 7. A building material into which nails or screws may be driven is formed of cement 100, asbestos fibers 23, cinders 160, and sand 133 parts. Cf. C. A. 9, 1837.

Glazing natural or artificial stone. P. FENAROLI. U. S., 1,164,710, Dec. 21. The stone is varnished with a soln. containing alkali silicate dissolved in H_2O and after drying in air the coating is successively treated with H_2O for several hrs., then with dil. fluosilicic acid and with an acid soln. of $\text{Al}_2(\text{SO}_4)_3$ or other sol. Al salt, to form a hard impervious coating.

Waterproofing wood. D. H. BIBB. U. S., 1,165,355, Dec. 21. Railroad ties or other wood is impregnated with waste sulfite liquor and then is heated to 300-350° for 20 min. to render the constituents of the waste sulfite liquor insol.

Fireproofing wood. G. B. SHIPLEY. U. S., 1,163,271, Dec. 7. Wood (*e. g.*, shingles) is treated under pressure with a bath of ZnCl_2 soln. in which cement and powdered sand or infusorial earth are maintained in suspension by agitation during the treatment.

Impregnating wood with preservatives. G. B. SHIPLEY. U. S., 1,163,270, Dec. 7. Wood is subjected to air pressure and, without releasing the air pressure, is treated with ZnCl_2 soln. or other preservative liquid under a greater pressure, then the liquid is withdrawn and the wood is subjected to a partial vacuum to ext. H_2O and excess preservative from it and finally is treated with a H_2O -proofing substance, *e. g.*, petroleum hydrocarbons, under pressure and the excess of H_2O -proofing agent is also withdrawn by a partial vacuum. Cf. C. A. 9, 2302.

Colored cements. J. C. PELTON. Brit., 18,520, Aug. 10, 1914. Portland or other cement, whiting, or Paris white is colored by first making a paste of H_2SO_4 and ordinary com. FeS , dilg. this paste with H_2O according to the tint required, adding this mixt. to the cement, etc., drying the product, reburning, and regrinding.

Asbestos-cement tiles. R. E. GOLIGHTLY. Brit., 18,005, July 30, 1914. The tiles are subjected to pressure and subsequently treated with steam in an autoclave. To prevent any of the press-expelled H_2O or H_2O of condensation in the autoclave from working back into the tiles, the edges of the tiles are dusted, while under pressure and after most of the excess H_2O has been expelled, with portland cement, slag

cement, hydraulic lime, etc. In carrying out the invention, the pile of tiles in the press is screened by a box and the cement dust is forced into the space between the tiles and box by an air or steam blast. To facilitate their subsequent separation, the tiles may be provided with 2 shoulders projecting through the cement layer, such shoulders engaging with a suitable frame to which a shock or blow is imparted.

Artificial stone from infusorial earth. J. A. ELLGASS. Ger., 285,350, July 22, 1913. Clean infusorial earth is mixed with xanthic acid prepd. from cellulose, then with viscose, and dried. The conversion of the cellulose into xanthic acid can be effected by means of NaOH or KOH. By employing KOH a greater degree of hardness is obtained, and this can be increased by increasing the content of alkali. The period of action of the alkali upon the cellulose required to bring this into soln. is 4 days at 20°. After soln., CS₂ is added to the alkali cellulose, and after 1-3 hrs. this is converted into the H₂O-sol. state. The 10% soln. obtained by the addition of H₂O is mixed with the infusorial earth, whereupon the alkali reacts with the SiO₂ to form water-glass which can be removed by rinsing. The binding agent seps. out as cellulose. After the mass has been shaped as desired it is subjected to a drying process which effects the coagulation of the dissolved cellulose. During coagulation the H₂O used is split off and evapd. The particles of infusorial earth remaining are united by the sepd. cellulose. Since this is insol. in H₂O, the resulting stone is therefore resistant to weather conditions. The insulating properties of the stone are said to be greatly increased by this treatment.

Continuous production of artificial stone slabs and conduits. L. HATSCHKE. Ger., 284,755, July 13, 1913.

21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

Industrial fuels and the European war. DOMENICO MENEGHINI. Padua. *Ann. chim. applicata* 4, 182-201(1915).—A review. Cf. C. A. 9, 365. S. LEVY.

Recent experiments in surface combustion. L. J. BRADFORD AND C. D. CORWIN. Cornell Univ. *Power* 42, 787-8, 855-8(1915).—Combustion is assisted when mixts. of gas and air are forced through an incandescent substance. The burning becomes flameless and much more rapid than under ordinary conditions. Apparently all combustion occurs on the surface of the granules composing the porous material, hence the name surface combustion. It is characterized by high temps. and great efficiency, complete combustion being obtainable with practically no excess of air. The application of surface combustion to the heating of steam boilers resulted in the attaining of very high efficiencies, which varied with the rate of combustion, increasing with the amt. of gas burned per hr. The max. temp. difference between the flue gases and the steam was only 41°, and the sensible heat lost in the waste gases varied from 3.5 to 4%. The main loss in the flue gases occurs as latent heat in the water vapor formed by the burning of H in the fuel. It is therefore best to use a gas low in H, such as producer gas from anthracite. L. W. RIGGS.

Cheapest fuel and most economical load. R. H. KARL. St. Louis. *Power* 42, 792-4(1915).—Ten very complete boiler tests made under working conditions showed that while the cost per ton of screenings was 44% less than that of high grade nut coal, its value as a steam producer was only 9% less. Increasing the load or flue gas temp. decreases the efficiency. A boiler should be worked at its rated capacity to secure the most economical results. L. W. RIGGS.

The heating and nitrogen problems after the war. EDUARD R. BESEMFELDER. *Chem. Ztg.* 39, 925-7(1915).—Instead of coking the coal, as advocated by Uhlmann (*C. A.* 9, 3124), B. recommends using the "mixed gas" process. J. H. MOORE.

Natural gas. D. HAGER. *Eng. Mining J.* 100, 959-61(1915).—A summary of our knowledge concerning the occurrence and origin of natural gas. E. T. W.

How much carbon dioxide to expect. VICTOR J. AZBE. St. Louis. *Power* 42, 712-4(1915).—Three tables are given showing the compn. of the fuel and percentages of CO₂, N, O, and SO₂ in the gaseous products of combustion for varying quantities of air when soft coal, anthracite, and fuel oil, resp., are used as fuels. It is shown that in order to make the CO₂ percentage high, there is danger of reducing the air supply so that incomplete combustion results. A chart shows that as the % excess of air used increases from 0 to 100, the % of O in the flue gases increases from 0 to 10.6; while an increase in excess of air from 100 to 200% is accompanied by an increase in the % of O in the flue gases from 10.6 to 13.7. L. W. RIGGS.

The continuous determination of the calorific value of fuel gases with Junker's calorimeter. F. B. LARKIN. *Chem. Eng.* 22, 208-9(1915).—L. gives the following equation for calculating the B. t. u. per cu. ft. of gas as detd. in a Junker calorimeter: $(\text{cc. of water} \times \text{range in } ^\circ\text{C.}) / (252 \times \text{cu. ft. of gas}) = \text{B. t. u. per cu. ft.}$ If 2520 cc. of water are used in the calorimeter the B. t. u. per cu. ft. is detd. simply by dividing the range in $^\circ\text{C.}$ by the cu. ft. of gas used and moving the point one point to the right. The detn. is made continuous by noting the temp. of the incoming and outgoing water and reading the gas meter every period (a period being the time necessary for 2520 cc. of water to pass through the calorimeter). The B. t. u. per cu. ft. detd. during each period will show any transient fluctuations in the calorific power of the gas, and the av. of many consecutive periods will give an accurate final value. F. L. GROVER.

Coppée regenerative ovens at Liege. *Gas World* 63, No. 1633, *Coking By-Product Section* 15-16(1915).—A description is given of the plant which consists of 112 ovens. According to the moisture in the coal the distn. period is from 24 to 27 hrs. The hydraulic mains are arranged for fractionation of gas of 550 B. t. u. or higher from the remainder 450-500 B. t. u. The by-product plant includes 3 rotary exhausters driven by an 80 h. p. motor, 3 vertical tubular H₂O condensers, 3 Pelouze tar extractors, 3 saturator and 3 vertical drying condensers. As gas is supplied for lighting purposes, there is no recovery of benzene. The complete records of trials of a 72 hr. continuous run are given. M. L. TROWBRIDGE.

Modern carbonizing systems in America. SOCIETY OF GAS ENGINEERING OF N. Y. CITY. *Trans. Intern. Gas Congress 1915* (advance copy), 5 pp.—A comparison of the carbonizing system of 19 different plants is made upon data based on actual operation. The unit of comparison is 2,000,000 cu. ft. per day. The data as well as plans and elevations of benches and retort houses are given. Analysis of the data shows the following facts: (1) The area required for a horizontal retort house of 2,000,000 cu. ft. daily capacity is from 9,433 to 16,416 sq. ft.; for inclined retort house 8,848 to 10,871 sq. ft.; for vertical retort house 4,800 to 6,945 sq. ft. (2) The cubical contents of the houses are 392,490 to 872,000 cu. ft., 491,164 to 578,212 cu. ft., and 300,000 to 400,000 cu. ft., resp. (3) The wt. of refractory material is 3,396,000 to 6,119,000 lbs. for horizontal, 5,356,400 to 6,690,400 lbs. for inclined, and 4,690,000 to 7,360,000 lbs. for vertical retort houses. (4) The total wt. of structural iron is 372,000 lbs. for horizontal, 394,500 to 498,600 lbs. for inclined, and 623,300 to 1,440,000 for vertical. (5) The labor required for 24 hrs. is 125 to 266 hrs. for horizontal, 147 to 200 hrs. for inclines and 57 to 106 for verticals. (6) The candle feet per lb. of coal vary from 62 to 95 for horizontals,

74 to 87 for inclines, and 83 to 97 for verticals. (7) The recovery of tar in gallons per ton is 10.80 to 13.65 for horizontal retorts, 11.06 to 13.29 for inclined, and 14.40 to 15.15 for vertical retorts. The free C in tar from horizontals and inclines averages over 24%, while less than 3% for verticals. (8) The max. NH_3 recovery per ton coal for a period of 6 months is 5.80 lbs. for horizontal and inclines, and 6.1 lbs. per vertical. (9) The furnace fuel per 100 lbs. coal carbonized averages 14.43 lbs. for horizontals, 12.32 lbs. for inclines, and 14.00 lbs. for verticals. From the tables it would appear that horizontals are low in first cost, easy to operate, and accessible; inclines require no mechanical stoking, permit of more inexperienced labor and are flexible in labor operation; while verticals require least ground space, operate on less labor, do away with smoke nuisance, and give higher yields of coke, tar and NH_3 . Vertical retorts are difficult to design so as to compensate for expansion of refractory material.

F. L. GROVER.

The composition of gas in relation to the performance of the Bunsen burner. R. S. McBRIDE. *Am. Gas Light. J.* 103, 353-5 (1915).—A critical study of the articles by Pierce (*C. A.* 9, 2305).

P. J. COLE.

Increasing the yield of hydrocarbons in gas and tar. ANON. *Gas World* 63, No. 1633, *Coking and By-Product Sec.* 14 (1915).—There has been promulgated lately a large number of processes for increasing the yield of light oils, etc., from coal, but the majority of these have been confined either to purely low temp. distn. or to the cracking of heavy oil. In the Rollason process, exploited by the Synthetic Gas Processes Co., limestone is added to the crushed coal before distn. and is said to increase the amt. of hydrocarbons, especially toluene. Certain essential facts are not mentioned, as to the class of coal, the amt. of limestone used, the amt. of ash in the coke or the action of lime on the brickwork of the ovens. It is claimed, however, that by the process the quality of the coke is improved, that it is especially suitable for a poor quality coking coal. Comparative results are given which show that by the addition of limestone to the coal the distillate can be increased from 4.28 gals. to 6.55 gals.; toluene in the distillate from 2.96 lbs. to 3.8 lbs.; toluene recovered from tar from 0.14 to 0.41 lbs.; B. t. u. per cu. ft. of gas after washing 537 to 555; cu. ft. of gas after washing from 11,510 to 11,928; also that the S in the gas was decreased, the yield of $(\text{NH}_4)_2\text{SO}_4$ was increased and the tar improved in quality.

M. L. TROWBRIDGE.

Loss of ammonia in storage of ammoniacal liquor. W. S. CURPHEY. *Gas World* 63, 539 (1915); *J. Gas Lighting* 132, 424 (1915); *Chem. Trade J.* 57, 496 (1915).—Attention is called to the serious loss of NH_3 which is likely to occur when liquor is stored under conditions which admit of air circulation above the surface. The suggestion is made that a layer of oil covering the surface of the liquor when in the storage tank might be found serviceable in preventing this loss and it is further pointed out that oxidation changes which result in the formation of fixed salts of NH_3 would, at the same time, be retarded with the ultimate saving of CaO and alkali in the fixed NH_3 still. Tests show that the loss of free NH_3 where oil has been used was from 0.3% to 0.5% and without the use of oil the loss was from 20% to over 40% in 80 days. 0.1 in. of mineral oil should afford complete protection.

M. L. TROWBRIDGE.

The development of refined tars for use in road construction and maintenance. PHILIP P. SHARPLES. *Met. Chem. Eng.* 13, 918-20 (1915).—The physical properties and compn. of six classes of raw tars are compared, and also the influence of the nature of the raw tar upon the physical properties and compn. of the refined soft pitch. The sp. gr. and the amts. of free C and fixed C in the soft pitches advance in the same order as in the original raw tar. Refined tars are used for construction of macadam roads, road-blanket treatment, cold-surface treatment, and as a filler in block pavement.

The proper specifications covering materials for these uses are discussed with respect to sp. gr., % distillate below 315°, m. p., free C, and viscosity. F. L. GROVER.

By-product coke. ANON. *Iron Age* 96, 935-6(1915).—A discussion of the recent report by the Geological Survey on the coke industry for 1914. F. L. GROVER.

Development of the by-product and coking industry of Great Britain. GEO. CHRISP. *J. Gas Lighting* 132, 539-41(1915). E. J. C.

The effect of leaking illuminating gas on bituminous pavements (WARREN) 20.
Progress in illuminants (MILLAR) 4.

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Gas producer. G. M. S. TAIT. U. S., 1,165,347, Dec. 21.

Carbureted producer gas. T. F. FITZSIMMONS. U. S., 1,164,081, Dec. 14. Air is passed through a bed of fuel to form producer gas and the gas is burned in a chamber where the gas is to be carbureted until the chamber is sufficiently heated. Then oil and gas are supplied to the chamber to produce a fixed carbureted gas and the operation is repeated intermittently.

Method of blasting fuel charges in making producer gas. P. G. SCHMIDT. U. S., 1,164,408, Dec. 14.

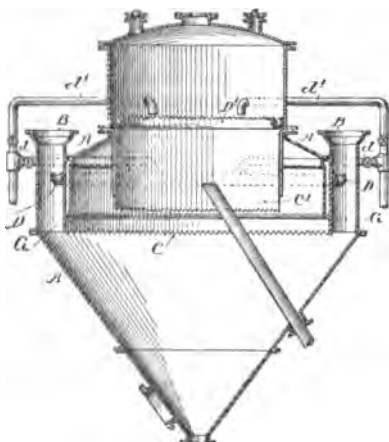
Gas scrubber. G. M. S. TAIT. U. S., 1,165,348, Dec. 21.

Making ammonium sulfate. A. F. HILLEKE. U. S., 1,163,752, Dec. 14. Ammoniacal gas is washed with H₂O condensed from the gas to remove tar and fixed ammoniacal compds. and the excess of condensed moisture is reheated and continuously circulated in contact with the gas to vaporize and return to the gas the H₂O of condensation and free NH₃. The gas is then passed through a bath of acid to form (NH₄)₂SO₄ and the H₂O condensed in the bath is vaporized and returned to the gas to prevent diln. of the sulfate bath.

Determining the amount of benzene in gas. C. L. O. GRAUL. U. S., 1,163,654, Dec. 14. A continuous test of the gas as produced may be made by removing C₁₀H₈ from a test portion by treatment with picric acid, dividing the test portion into 2 parts and removing C₆H₆ from one of them, *e. g.*, by absorption in oil, and then burning the 2 parts at separate burners and comparing the illuminating value of the flames.

Saturator for absorbing ammonia in acid. A. F. HILLER. U. S., 1,163,753,

Dec. 14. Ammoniacal gas is supplied through the inlets and acid is delivered into the app. through the pipes *d, d'*, and the gas is brought into contact with the acid by passing under the serrated edge of the baffle *C*, which extends below the surface of the acid. Fresh acid from the supply through *D, D'* flows down over the surface of the baffle *C* and cuts away any salt that has formed upon the baffle.



Carbon monoxide from carbon dioxide.

C. B. HILLHOUSE. U. S., 1,163,922, Dec.

14. Powdered C is forced with a swirling motion by gas under pressure into a stream of CO₂ and the mixt. is heated to a reducing temp. A flux may be added to the C.

Gas from peat. N. TESTRUP, T. RIGBY

and O. SÖDERLUND. U. S., 1,164,429, Dec. 14. A fluid pulp of peat is heated under pressure to above its normal b. p. (the pressure being sufficient to prevent boiling, immediately filter-pressed and dried in a current of hot gases, briquetted and converted into fuel gas, from which NH₃ may be recovered.

Treating coal. F. BERGIUS. Brit., 18,232, Aug. 1, 1914. Coal and similar substances produced by natural or artificial carbonizing are treated for the production of hydrocarbon and other bodies by reaction with H or substances giving off H. By heating coal with H, e. g., at 400°, and under a pressure of 200 atms., liquid products suitable for use as burning or motor oil are obtained. The operation may be effected in the presence of benzine or other solvent for the products. The N of the coal is obtained as NH₃, or the NH₃ may previously be distd. off at 300–500°. The hydrogenation may be effected simultaneously with the carbonization of wood, peat, and other vegetable substances.

Preparing peat. WETCARBONIZING, LTD. Brit., 18,030, May 10, 1913. In processes for heating peat, with or without the use of acids or other auxiliary means, and subsequently removing H₂O, the latter operation is effected in filter presses at temps. of 60° and over, and part of the hot effluent is mixed with raw peat, from which some of the natural H₂O may be first removed by draining, air-drying, or pressing. The percentages of H₂O before and after addition of the effluent may be 85 to 94–95%, resp. A suitable app. is specified. Cf. C. A. 9, 2812.

Destructive distillation. H. G. HILLS. Brit., 18,576, Aug. 12, 1914. Carbonaceous material such as coal, the dust of bituminous fuel, etc., without agglutinants and in a movable container, is introduced into a vacuum chamber and thence transferred into one or more distg. chambers, where it is distd. at a temp. below or but slightly exceeding that at which tar is formed, and is then passed in a plastic condition into a cooling chamber, where it may be compressed.

Furnaces for destructive distillation. W. W. CRAWFORD. Brit., 18,437, Aug. 8, 1914. A rotary retort furnace for the continuous destructive distn. of carbonaceous substances comprizes a series of vertical retort chambers and intermediate heating chambers arranged radially around a central vertical axis about which the whole series of retorts and heating chambers rotate, the charging and discharging of the retorts being effected automatically during rotation.

Ammonia; fertilizers. T. RIGBY and WETCARBONIZING, LTD. Brit., 18,558, Aug. 11, 1914. NH_3 is absorbed from gases such as those obtained in peat gasification, as by the processes described in 17,610, 1911, and 25,146, 1912, by means of peat which has been subjected while wet to a heat treatment which renders its H_2O readily expressible as described, *e. g.*, in 10,834, 1903, 17,610, 1911 (C. A. 7, 411), 17,427, 1912 (C. A. 8, 416), 5,873, 1913 (C. A. 8, 2939), 9,392, 1913 (C. A. 8, 3359), and 11,133, 1913 (C. A. 8, 3499). The peat containing NH_3 is suitable for use as a fertilizer.

Ammonium sulfate. T. RIGBY and WETCARBONIZING, LTD. Brit., 18,559, Aug. 11, 1914. In the treatment of producer and like gas for the recovery of NH_3 as sulfate, discoloration of the sulfate is prevented by treating the sulfate liquor with oil such as is contained in the lighter fractions from distn. of the tar produced in making the gas.

Coking. F. L. SLOCUM. Brit., 18,215, Aug. 1, 1914. In a continuous coking oven or retort, the upper part of a retort, or an extension of the retort below the hopper, is contracted to form a shoulder to prevent the semi-plastic mass from rising and choking the feeding channel when the pressure ram is raised.

Firing furnaces. B. STOUGHTON. Brit., 18,499, Aug. 10, 1914. See C. A. 9, 51.

Apparatus for thoroughly mixing gases in gas holders. M. NIEMANN. Ger., 284,538, May 22, 1913.

Cleaning, cooling, and mixing gases. H. E. THEISEN. Ger., 284,858, Feb. 8, 1914. Addition to 265,639 (C. A. 8, 818).

Producing generator gas in revoluble tube furnaces. ALPINE MASCHINENFABRIK-GES. M. B. H. v. HOLZHAUSERSCHE MASCHINENFABRIK G. M. B. H. Ger., 285,311, Jan. 11, 1913. Any organic matter, regardless of its physical properties, may be treated by this process automatically. The necessary amt. of gas containing CO_2 , for effecting gasification of the material, is introduced at such temp., and with such a composition, that the slags do not melt. This is effected by carrying out in an auxiliary chamber of the revoluble tube furnace, to which the hot gases are conducted, the oxidation process carried out heretofore in the furnace itself and which was accompanied by fusion of the slag. The prevention of fusion of slag permits the process to be made continuous.

Removing tar from hot distillation gases. BERLIN-ANHALTISCHE MASCHINENBAU-ART.-GES. ABTHEILUNG CÖLN-BAYENTHAL. Ger., 284,971, Sept. 29, 1912.

Operation of coke ovens. BERGWERKSGES. TRIER M. B. H. Ger., 284,863, Aug. 26, 1913. The low temp. of the distn. gas, after the sepn. of the tar, serves to cool the heated cooling H_2O .

22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

Committee report on penetration (LAW) 20. Committee report on the softening point of materials (HEMSTREET) 20. Committee report on ductility tests (Dow) 20. Petroleum in Colombia (MANNING) 8.

KEAN, F. J.: *Petrol Engine*. London: E. & F. N. Spon. 140 pp.

Distilling petroleum. L. STEWART. U. S., 1,163,570, Dec. 7. Crude asphaltic petroleum is progressively heated in different chambers as it is passed from one to the

other and vapors are taken off by relief valves between the heating chambers and the last portion of vapors is led back to heat the first chamber.

Refining petroleum. F. W. MANN and M. L. CHAPPELL. U. S., 1,163,025, Dec. 7. Petroleum is treated with alc. and liquefied SO_2 at a temp. below 0° to dissolve aromatic hydrocarbons.

Refining petroleum oils. J. C. BLACK. U. S., 1,164,162, Dec. 14. Petroleum is treated with SO_2 under pressure and allowed to sep. into 2 layers. The bottom layer is withdrawn and its gas pressure reduced which causes it to sep. into layers. The second bottom layer thus formed is removed and relieved of its gas pressure. The first and second top layers also are freed from absorbed SO_2 and then are mixed together and further freed from residual SO_2 , and the top layer mixt. and 2nd bottom layer are separately collected, the SO_2 being reused in treating fresh crude oil. Cf. C. A. 9, 2814.

Refining asphalt. C. N. FORREST. U. S., 1,163,593, Dec. 7. Loss of S from the asphalt is prevented during refining by the addition of linseed, soy bean, tung, fish or petroleum oils or other S-absorbing oil to obtain the desired balance of cohesion and adhesion of the asphalt cement produced, for use in paving mixts.

Petroleum oils. W. O. SNELLING. Brit., 18,419, Aug. 7, 1914. Products resembling a high-grade petroleum, yielding substantial proportions of gasoline and lamp-oil fractions, are obtained from low-grade crude oils and petroleum products such as gas oil, by heating them to a temp. such that the vapors evolved will produce an added pressure of at least 400 lbs. per sq. in., the quantity of liquid in the container being such that it occupies not less than one-tenth and not more than seven-tenths of the total capacity of the container. The operation may be effected in the presence of a catalyst such as colloidal graphite, colloidal C (formed by producing an arc between C points immersed in the oil), or Ni or other metal in the colloidal form, or in the presence of gases and vapors such as H, natural gas, ethylene, oil gas, water-gas, or steam. Temps. in excess of 380° and below 600° , preferably between 400 and 500° , are employed. Pressures between 600 and 800 lbs. per sq. in. are preferred, though a pressure of 2400 lbs. per sq. in. may be employed. According to one method of treatment, the oil is heated until the pressure reaches 800 lbs. per sq. in., and is then allowed to cool. The permanent gases are allowed to escape, and may be used for heating or for making propane or butane. The oil is fractionated up to 150° , and the residue is subjected to a further treatment. Certain oils, after being treated and cooled rapidly, polymerize to an "asphalt" at ordinary temps. in 24-48 hrs.; such oils, whether the gasoline and kerosene fractions have been removed or not, may be used for impregnating wood. In another form of treatment, after the oil has been heated up to the requisite temp., a valve communicating with a condenser is opened, and the gases and vapors are allowed to escape until the pressure falls to 400-500 lbs. per sq. in.; the valve is then closed, a fresh quantity of oil is added, and the treatment is repeated. An app. for continuous operation is specified.

Obtaining light oils. A. ROLLASON. Brit., 18,490, Aug. 10, 1914. In the manuf. of light oils having d. between 0.90 and 0.98 from carbonaceous substances such as crude oils, coal, cannel or coal shale, approx. 4 to 6% of limestone, proportionate to the d. of the oil required, is added to the charge, which is distd. slowly at a temp. below 400° . The retorts employed may be of cast Fe and, when heated from two sides, may be from 3 to 6 in. in width. They are set in brickwork, etc., to store heat, which is absorbed by the charge at the period of distn. at which H_2O and hydrocarbon vapors are formed. The temp. may be maintained between 175 and 400° according to the d.

of the oil required. The water vapor acts as a carrier for the hydrocarbons and prevents their decompn. Cf. *C. A.* 9, 711.

Motor spirit. T. FRANKS. Brit., 18,226, Aug. 1, 1914. A fuel for internal-combustion engines consists of aliphatic carbinols produced from raw peat, *e. g.*, as described in 28,072, 1913, mixed with an equal quantity or less of benzene, crude or refined. The benzene and carbinols are preferably mixed as gases during distn.

Cracking high-boiling hydrocarbons. GES. FÜR VERWERTUNG VON KOHLENSTOFF-VERBINDUNGEN M. B. H. Ger., 284,118, July 20, 1912. The hydrocarbon vapors rising from the distn. vessel are conducted first through a vessel, the temp. of which is regulable and independent of the heating of the distn. vessel, and then to the condenser. A suitable app. is detailed.

Ceresin (ozokerite), paraffin and other hydrocarbons. J. M. AZ. Ger., 284,045, Apr. 25, 1912. These products are obtained from mineral oil residues and tar. Cf. Brit., 10,256, 1912 (*C. A.* 7, 3539).

23. CELLULOSE AND PAPER.

A. D. LITTLE.

Making paper pulp from cotton stalks. W. H. CROLL. U. S., 1,165,323, Dec. 21. The stalks are soaked in H_2O to cause them to expand, cooked in lime H_2O containing a small amt. of NaOH and more lime is added to replace that consumed by combination with the resinous and fatty constituents of the stalk until all the latter have been combined with the lime.

Paper-pulp from flax straw. J. H. MELCHERS. U. S., 1,162,797, Dec. 7. Flax straw fiber after sepn. from the woody portion is cooked under pressure in a soln. of K_2CO_3 , pressed and washed.

Waterproofing paper. G. R. WYMAN. U. S., 1,165,367, Dec. 21. Before applying asphalt or similar waterproofing material to paper it is heated nearly to its flash point, while out of contact with air, to render the material very fluent and give more rapid impregnation.

Resin glue substitute for paper sizing. H. BURCKHARDT. Aust., 5,124, June 14, 1912. Vegetable size, together with other paper-sizing agents, is used. The resin soap obtained by boiling resin with alkali is mixed at 90° with vegetable size obtained by cold stirring of potato flour with NaOH soln., and finally animal glue is incorporated with this mixt.

Paper. C. G. SCHWALBE. Brit., 18,199, Aug. 1, 1914. In mfg. cellulose or half-stuff from wood or similar crude vegetable material by means of bisulfite soln., the material, suitably cut up, is impregnated with one of the usual $Ca(HSO_3)_2$ solns., either hot or cold, and with or without the aid of a vacuum; the impregnating liquid is then drawn off, SO_2 gas is added in sufficient quantity to double the amt. present in the wood, and the material is then steamed. The treatment is continued until it is possible to sep. the bundles of ligneous fibers while partly destroying the binding substance, *e. g.*, in an edge-runner, or until the material is opened up into cellulose or half-stuff. The introduction of SO_2 and steam may be effected together.

Acylcelluloses and their permanent solutions. KNOLL & CO., CHEM. FABRIK. Ger., 284, 726, Feb. 2, 1912. Addition to 203,178 (*C. A.* 3, 493). These solns. are obtained from cellulose and org. acid anhydrides in the presence of acid sulfates and an indifferent solvent or diluent. The bisulfates or their mixts. with neutral salts, with exclusion of free H_2SO_4 in the reaction product, are employed in amts. less than 0.5

part of the cellulose. The reaction must be stopped before the production of acetone-sol. products. By employing bisulfates of the alkali series or their mixts. with alkali sulfates, temps. above 80° must be employed.

Thick parchment tubes. G. H. SACHSENRODER. Ger., 284,470, Aug. 3, 1913. The parchment paper is rendered pliable by impregnation with a hygroscopic agent, and then led through a parchmentizing fluid in the desired number of strips; these are then pressed together and led through a water-bath.

Wood pulp for paper manufacture. F. FRIEDSAM. Ger., 284,420, Oct. 5, 1913. A mineral filling (kaolin, talc, blanc fixe, or the like) is added to the pulp during its working on the pulping stone. The filling material is forced into the fibers of the wood by the pulping pressure, so that the splitting and sepn. of the fiber structure is hastened and a fine slimy product is obtained. An economy in power is realized inasmuch as the added earths serve both as a lubricant for the pulping stone and as a disintegrating agent for the wood.

Wood pulp for paper manufacture. F. FRIEDSAM. Ger., 285,123, Jan. 1, 1914. Addition to 284,420 (*supra*). The pulp resulting from the treatment specified in the principal patent is placed directly in the pulping cylinder and from there it is conducted to the paper machine. In order that other fibers, such as cellulose, may be incorporated with this wood stock without sepn. during dyeing, these are first worked up in the pulper and impregnated with the filling.

24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

The explosive pressure of unenclosed explosives. A. HUBERTH. *Z. ges. Schiess-Sprengstoffw.* 10, 281 (1915).—An app. is described for detg. the explosive pressure of free lying bodies. An iron plate is supported between two vertical rods partly by rollers placed against them and partly by a guiding rod extending from the center of the plate and passing through a plate which connects the two iron rods at the top. On the top of the guiding rod at right angles to it is fastened a flexible pencil with its point against a rotating drum by which means the course of the plate is marked. In performing the expt. the cartridge is fastened to the bottom of the movable plate and exploded. The plate is driven up to a point s by the expansion of the gases and from there on it goes upward by the impetus it has received. After the inertia of the plate has been overcome the plate rises with increasing velocity to the point s and then the velocity decreases to zero. By drawing tangents to the curves for increasing and for decreasing velocity, the point of greatest velocity and the time at which the effect of the expanding gases ceases are found. The time interval between any two points on the curve may be calcd. from the distance between them and the rate of rotation of the drum. If Pk is the pressure working through the distance S and forcing the plate of weight G to the height H , then $Pk = GH/S$ and the mean velocity is h/t . O. L. THOMAS.

Tetra- and pentanitrodimethylaniline. *Z. ges. Schiess-Sprengstoffw.* 10, 295 (1915).— $(NO_2)_4C_6H_2NMe_2$ or tetralita No. 1 is formed by dissolving 1 pt. by wt. of $PhNMe_2$ in 10 pts. by wt. of concd. H_2SO_4 and pouring the cooled mixt. slowly into 5 pts. by wt. of concd. HNO_3 at a temp. of $30-40^{\circ}$. After the completion of the nitration, the product is centrifuged to remove the excess acids, then washed, and completely dried. It m. $125-8^{\circ}$. $(NO_2)_5C_6H_2NMe_2$ (Pentalita No. 2 or Pentalita) is formed by

dissolving PhNMe_2 in H_2SO_4 and pouring into HNO_3 previously heated to 120° . It is freed from acid as described above.

O. L. THOMAS.

New Swedish explosive for shells. IRA N. NORRIS. *Commerce Reports* No. 270, 675(1915).—It is styled Kausolit and its characteristic ingredient is NH_4ClO_4 .

CHARLES E. MUNROE.

The explosibility of acetylene. G. A. BURRELL AND G. G. OBERFELL. Bureau of Mines, *Tech. Paper* 112(1915).—The smallest proportion of acetylene capable of propagating flame in a mixt. of acetylene and air is 2.53%. The largest proportion of acetylene capable of propagating flame in a mixt. with air is 73%. Acetylene, not mixed with air, is explosive under a pressure of 3 to 5 atms. when an elec. spark is passed through the mixt. or when a Pt spiral is heated in it. The danger connected with the handling of CaC_2 in a mine is remote if reasonable care is observed in handling.

CHARLES E. MUNROE.

Military explosives. T. S. WILKINSON. *Proc. U. S. Nav. Inst.* 41, 1925-32 (1915).—This is a popular review but it embodies a calcn. of disruptive pressure of picric acid arriving at a result of 100+ short tons per sq. in. at the moment of detonation.

CHARLES E. MUNROE.

The Ardmore, Oklahoma, explosion. B. W. DUNN. Bureau of Explosives, *Special Bulletin* No. 2 (1915).—The explosion on Sept. 27, 1915, which killed 39 and injured 30-150 persons, and which destroyed \$500,000 to \$1,000,000 of property was primarily due to the shipping of casing head gasoline, having a large coeff. of expansion, in a tank car which was so overfilled with the material at a low temp. as to cause its vaporization and escape from the tank car when it was later exposed to higher natural temps. The condition was aggravated when the dome cap was unscrewed before the car and contents had been cooled down according to recognized practice because the vapors, mixed with air, then reached out to a source of ignition, of which several were about. A characteristic feature of this explosion was that the vapors appeared to mix with the air at a temp. sufficiently high to bring about an explosion in the air. This has previously been observed in other instances of conflagrations where tank cars containing gasoline were involved.

CHARLES E. MUNROE.

Decomposition of ammonia and the chances of explosions (FAIRBANKS) 18.

MARTIN, G. AND BARBOUR, W.: **Industrial Nitrogen Compounds and Explosives.** London: C. Lockwood & Son. 125 pp. 7 s, 6 d.

Blasting gelatin. A. T. COCKING. U. S., 1,164,170, Dec. 14. Wet nitrocellulose is incorporated with nitroglycerin and the mixt. after being warmed and shredded is subjected to reduced pressure to remove the moisture and then is consolidated into the desired shape.

Forming approximately spherical grains of explosive. E. DU PONT. U. S., 1,162,757, Dec. 7. A pasty mass of black gunpowder or similar explosive mixt. is divided into particles which are partly dried and then rolled upon a heated surface.

Explosives. E. VON HERZ. Brit., 17,961, July 29, 1914. The use of normal Pb salt of trinitroresorcinol in percussion caps and similar percussion and friction primers. This salt is obtained as a ppt. by mixing multiples of equiv. wts. of a Pb salt of a strong acid such as $\text{Pb}(\text{NO}_3)_2$, and an alkali or alk.-earth salt of trinitrore-

sorcinol in hot aq. soln. in the presence of a weak organic acid, such as HOAc, in very dil. soln.

Hexanitrodiphenyl. SPRENGSTOFF AKT.-GES. Brit., 18,333, Aug. 7, 1914. Use of hexanitrodiphenyl alone or mixed with other ingredients as an explosive for shells, mines, torpedoes, primers, and detonators. The hexanitrodiphenyl is prepd. by treating chlorotrinitrobenzene dissolved in 3 to 4 times its quantity of toluene or nitrobenzene with about a quarter of its wt. of Cu. After the reaction is over, the solvent is expelled by means of steam; the Cu_2Cl_2 is removed by washing with dil. HCl; and the hexanitrodiphenyl is recrystd. from HNO_3 .

Storage of explosives. SPEZIALGES. FÜR BETON- UND MONIERBAU SCHLÜTER. Ger., 285,105, Feb. 21, 1913.

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

The dyestuff situation in England. L. A. OLNEY. *Trans. Nat. Assoc. Cotton Manufacturers* 98, 425-40(1915).—Historic and economic review of dyestuff industry of Gt. Britain with special references to present irregular conditions and means taken to relieve them.

R. B. STODDARD.

Report of committee D-13 on standard tests and specifications for textile materials. W. D. HARTSHORNE, *et al.* *Proc. Am. Soc. Testing Materials* 15, I, 440-2(1915).—This committee, which has so far limited its activities to tests and specifications of bags, bagging materials and tire fabrics, reports that further investigation is necessary on the subject of bags and bagging materials before standards can be formulated. Extensive tests upon tire fabrics made it possible to draft "tentative tests for automobile tire fabrics" to be used during the coming year in order to obtain information upon which to establish standard specifications (cf. tentative standards, 1915 year-book of the Society). The discussion closes with a description of "a 10-inch steel count scale."

L. W. RIGGS.

Waterproofing of military fabrics. G. A. LE RÔY. *Compt. rend.* 161, 602-4 (1915); cf. *C. A.* 9, 382.—A method in general use consists in treating the fabric with a bath of an Al salt, followed by a bath in a soap soln., whereby palmitates, stearates, etc., are pptd. on the fiber. The astringent action of the Al bath tends to prevent penetration by the soap soln., and to overcome this objection Le R. uses one bath containing a mixt. of aq. solns. of NaAlO_2 and a Na soap, to which, if desired, various adjuvants such as casein, gelatin, or resinous substances may be added. The goods are treated in this bath and dried in the air, after which they are placed in a very dil. soln. of HCOOH , AcOH , or some acid salt such as $\text{Al}(\text{AcO})_3$. The deposit thus formed is very adherent, stable, and waterproof, yet sufficiently permeable to air. The concn. of the bath will vary with the kind of fabric, and should be detd. by trial and a microscopic examn. of the treated goods. A military cloth known as "blue horizon" should receive the equiv. of 20 g. pptd. Al_2O_3 per meter of cloth.

L. W. RIGGS.

Various methods of modifying starch for sizing purposes. PERCY BEAN. *J. Textile Inst.* 6, 223-30(1915).—For pure sizing wheat flour is best and should be prepd. by fermentation for 3-6 months; for heavy sizing the flour is steeped with ZnCl_2 , thus retaining the gluten, which with its adhesive properties assists in fixing the china clay. By the ZnCl_2 method there is less loss through decompn. of starch, acids and offensive odors are not developed, mildew is avoided and a greater uniformity of the size is obtained. Farina (potato starch) gives a size lighter in color than flour or sago. Its

tendency to become soft on the weaver's beam is prevented by the addition of NaOH. Farina size does not stand prolonged boiling and should be prepd. fresh for each day's use. Sago will strengthen yarn more than any other starch and will stand prolonged boiling without losing strength; it should be boiled at least 2 hrs. before use. The addition of NaOH reduces the time of boiling. Size to which NaOH has been added forms a hard crust overnight, which may be prevented by covering the surface with a film of tallow to exclude the air. Tapioca is rarely used for sizing but frequently occurs as an adulterant of sago. Maize starch is cheapest and may be used for all kinds of sizing, especial care being taken that it is thoroughly gelatinized. Any method of modifying starch can only be considered successful if the starch is strengthened by the treatment.

L. W. RIGGS.

Foreign fabrics. German-made worsted cloths analyzed at the Bradford Technical College. EBER MIDGLEY. *J. Textile Inst.* 6, 212-8(1915).—Over 60 patterns were examd. as to the kind of raw materials, structure of yarns, structure of cloth, and finishing. In addition to the usual mechanical methods of finishing, chem. methods were employed to obtain improved handle, appearance, firmness and permanency of finish. Chem. analyses of the patterns by L. L. Loyd indicated the employment of starch, $MgSO_4$, sol. oil substitute, glue, and free oil emulsion in various combinations as finishing agents. In 9 patterns reported the filling did not exceed 3%. Two patterns showing 10 and 14%, resp., were regarded as adulterated by filling. Suggestions for further investigation are given in order to ascertain if German worsteds may be produced under Bradford conditions.

L. W. RIGGS.

An oxidation product of indigo blue (FRIEDLÄNDER) 10.

BRAUTMONT, R.: *The Theory and Technology of the Manufacture of Woolen, Worsted, and Union Yarns and Fabrics.* New York: Van Nostrand Co. 676 pp. \$12.00.

ZART, A.: *Farben und Farbstoffe; ihre Erzeugung und Verwendung.* Leipzig. 1 M.

Fabric for making belts, aprons or roll-coverings for textile machinery. C. W. ROYCE. U. S., 1,163,262. Dec. 7. A fabric such as woven cotton having a wool napped surface is coated with a mixt. of linseed oil, clay and pigment to give it a springy or resilient character.

Bleaching cotton, etc. R. MULLER. U. S., 1,163,438, Dec. 7. The material to be bleached is immersed in a dil. aq. soln. of NaOH, borax or other alk. compd. under 2 atm. steam pressure and air under pressure is blown through the soln. until the desired bleaching action is effected.

Mechanical method of uniting and spinning artificial silk fibers as formed. P. GIRARD and J. SONNERY. U. S., 1,164,084, Dec. 14.

Removing stains from fabrics. G. E. DARROW. U. S., 1,164,705, Dec. 21. Stains are removed from fabrics by successive treatment with a soln. of oxalic acid and SO_2 and a soln. of $Ca(OCl)_2$.

Waterproofing cord. J. E. H. HYDE. U. S., 1,165,179. Dec. 21. Cotton or other cord is treated with an adhesive waterproofing mixt. formed of acetylcellulose, dichlorohydrin, MeOH, castor oil or other non-drying fatty oil sol. in alc., amyl acetate and $MgCO_3$. The products are suitable for fish lines or nets.

Degumming fibers. J. MEISTER. Brit., 17,941, July 29, 1914. In removing gum from textile fibers by means of pancreatin and enzymic substances, the material is first treated in a dil. alk. bath containing borax and NH_4OH , and then in a second bath with a soln. containing borax, NH_4OH , and NaCl , and an enzymic prepn. such as oropon. H_2O_2 may be added. The process may be used for treating double cocoons, floss silk, perforated cocoons, tussah, and wild silks.

Damping and conditioning yarns. T. HALLIWELL. Brit., 18,573, Aug. 12, 1914. App. for damping or conditioning yarns or threads by the circulation through them of air carrying H_2O in a finely divided state.

Production of azo dyes on the fiber. AKT.-GES. FÜR ANILIN-FABRIKATION. Ger., 284,695, Jan. 1, 1914. Diazo compds. are combined with 1-nitroaryl-3-methyl-5-pyrazolones. The resulting shades are in general yellow, and very clear.

Fixing iron oxide on silk. W. BUSCHHÜTER and M. VOIGT. Ger., 284,853, Feb. 7, 1914. The fibers, treated with Fe mordant, are satd. with bast soap solns. or soap solns. with the addition of albuminoid substances or grape sugar, steamed, and washed. Satisfactory results have been secured with a soln. containing, per liter, 50 g. Marseilles soap, and 5 g. gelatin or glue.

Gray dyeings on pelts, hair, feathers, admitting of white etching. FARBW. v. M. L. & B. Ger., 284,854, Jan. 3, 1914. The material, mordanted in the usual manner with Fe salts, is dyed with nucleus-acylated pyrogallols, such as trihydroxyacetophenone.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

Tests on lithopone. H. A. GARDNER. *Drugs, Oils and Paints* 31, 252-3(1915).—Results of chem. analysis and practical tests on 14 samples of lithopone. The methods of testing are given. E. W. BOUGHTON.

Turpentine oil and resin of *Boswellia serrata* from India. ANON. *Bull. Imp. Inst.* 13, 351-6(1915).—Gum from *Boswellia serrata* was distd. with steam in a still with a false bottom; the volatile constituents passed off while the resin and oil passed through the false bottom. The oil was sepd. from the resin by steam distn. and the resultant oil fractionally distd. up to 155° ; a turpentine oil consisting of *d*-pinene and a second portion consisting of limonene were obtained. This turpentine closely resembles the American product in solvent power and as a drying agent. Two samples of resin were analyzed and their commercial possibilities discussed. The resin when distd. behaves differently from ordinary resin and yields a different set of products (not described). R. L. SIBLEY.

Some little known resins. ANON. *Bull. Imp. Inst.* 13, 356-75(1915).—The exudation of the euphorbias may contain over 90% of resin and only 2 or 3% of material which is either caoutchouc, or has some resemblance to that substance. Some of these resins cannot even be utilized by combining with PbO , ZnO , or MnO to form resinates for use in paint material, as they are neutral substances, and contain no resin acid. Samples of resins from 8 different species of *Euphorbia* were examd. chemically, and their soly., acid value, m. p., and sapon. value detd. R. L. SIBLEY.

DOELTER, C.: Ueber natürliches und künstliches Ultramarin. Wien: A. Hölder.

MITCHELL, C. A. AND HEPWORTH, T. C.: The Production and Properties of Printing, Writing, and Copying Inks. New ed. London: C. Griffin & Co.

Varnish, paint or printing color. N. W. TURKIN. U. S., 1,164,036, Dec. 14. A colloidal soln. of a color pigment, such as Biebrich scarlet, in a base (insol. in H_2O) formed of alizarin oil and Al acetate is mixed with a varnish containing resins, toluene and fish oil.

Heat- and acid-resisting paint. E. R. STOWELL. U. S., 1,164,670, Dec. 21. A pasty mixt. of carborundum powder and Na silicate soln. is heated to $30-40^\circ$ to hasten the generation of H which takes place by reaction of the free alkali of the silicate on free Si or Si compds. present in the carborundum; then H_2O is added to the pasty mixt. to reduce it to the desired consistency and it is packed into sealed containers, danger from generation of H in the latter being avoided by the preliminary heating.

White lead. C. WHITE and J. W. PATTERSON. U. S., 1,163,052, Dec. 7. Calined soda is added to a soln. of basic Pb acetate satd. with PbO at about boiling temp. and after pptn. of white lead has been effected $NaHCO_3$ is added to prevent discoloration of the product.

Primer for use before painting. H. M. ASHBY. U. S., 1,164,324, Dec. 14. Kauri gum, linseed oil, PbO and toluene are mixed in the proportions of 20:5:0.5:74.5 and used as a primer on wood to prevent peeling and cracking of paint. The primer is especially applicable to yellow pine or other resinous woods.

Surface for color printing. N. W. TURKIN. U. S., 1,164,037, Dec. 14. A colloidal soln. of a pigment such as Biebrich scarlet is made by heating the pigment with alizarin oil, basic Al acetate and $C_{10}H_8$ and allowing the mixt. to solidify on cooling to form a printing surface. A solvent such as toluene may be added as a softening agent.

Paint- and varnish-remover. H. BIRCHALL. U. S., 1,165,148, Dec. 21. Alc. 5 gals. is mixed with turpentine 1 gal., oil of mirbane 1 gal., $HOAc$ 2 qts., gum camphor 2 lbs. and beeswax 2 lbs.

Varnishes; coating processes. B. D. BAKER. Brit., 18,268, Aug. 7, 1914. Articles e. g., wheel rims and door handles, are coated with celluloid by first coating with a lacquer-like soln. of celluloid in a mixt. of acetone and American turpentine as by brushing or spraying, and then immersing in a viscous soln. of celluloid in acetone, amyl acetate, and American turpentine, which has preferably been allowed to stand until free from air bubbles. The withdrawal of the article from the coating-bath takes place quickly at first and slowly towards the end so that runners or beads are not formed on it as it leaves the soln. For this purpose, the soln. may be run out of the coating-bath quickly at first and then more slowly, or the articles may be lifted from the bath so as to leave the liquid in a similar manner. The proportions of the ingredients of the varnish may be varied so as to render it suitable for coating articles of metal, concrete, and other material.

Anti-fouling composition for ship hulls. W. SCHÖLLER and W. SCHRAUTH. Ger., 285,225, Dec. 10, 1913. Mercurized fats and fatty acids, especially, however, mercurized resins and resin acids, are used instead of unmercurized products, in the prepn. of spirit, oil, and varnish colors. Resin and resin acids are mercurized as specified in 228,877 (C. A. 5, 2307) for mercurizing fats, oils, and fatty acids. E. g., 5 kg. shellac dissolved in 10-15 kg. MeOH are mixed with a concd. soln. of 1 kg. $Hg(OAc)_2$ in MeOH. After standing for several hrs., Hg ions are no longer present in the soln., and after distg. off the MeOH the mercurized shellac can be recovered as resin, or the resulting soln. can be employed directly for the production of the coating mass. The mercurization of mastic, sandarac, dammar resin, colophonium, copal, etc., is effected in like manner. The oil or resin in the product may also be mercurized before mixing. E. g., 30 parts of a 50% soln. of $Hg(OAc)_2$ in MeOH are added to 100 kg. of a coating compn. con-

sisting of 30 parts MeOH, 9 parts shellac, 9 parts resin, 3 parts gallipot, 2 parts soft gallipot. Even after a few hrs. the Hg is combined and the mass is ready for use after the addition of the usual color additions (oxides, etc.).

Resin cement for tools. CHEFKA-GES. M. B. H. Ger., 284,701, Nov. 28, 1913. This product, which resists protracted boiling in H_2O , weak soda- and soap-solns., is obtained by fusing hardened resins, especially Ca resinate, the m. p. of which is considerably above 100° , or their mixts. with colophonium, with a resin as neutral as possible or difficultly saponifiable and having low m. p., and then working into the product a suitable filler, such as chalk, sand, talc, etc. The m. p. of the products can be regulated as desired, and they are not affected by protracted boiling in H_2O , soda-, soap-, or salt-solns. E. g., 100 g. colophonium are neutralized gradually with 20 g. of finely pulverized $Ca(OH)_2$ at about 180° and 20 g. gum resin and 10 g. coumaron resin are added to the mass while it is still liquid. The mixt. is heated at 200° until a test shows a m. p. of about 102° . If the m. p. is higher, it may be lowered by adding colophonium and coumaron resin, and finally stirring into the hot liquid resin mass 40 g. of a mixt. of chalk and pumice stone powder.

27. FATS, FATTY OILS AND SOAPS.

H. SCHERUBEL.

Illipe nuts and sources of Borneo tallow. ANON. *Bull. Imp. Inst.* 13, 335-44 (1915).—Four samples of nuts were analyzed and the fats, which composed from 43 to 61% of the kernel, were investigated and compared with those of other nuts. The fats most closely resemble cacao butter in analytical constants. R. L. SIBLEY.

Production and utilization of rape seed. ANON. *Bull. Imp. Inst.* 13, 452-60 (1915).—The amt. of oil in rape seed varies from 33 to 45%. The low sapon. value of the oil is due to the predominant constituent trierucin. Rapeseed cake and meal contains 33 to 38% crude proteins. The meal contains 4.9% N, 1.5% K_2O and 2.5% P_2O_5 , and forms an excellent fertilizer for wheat or barley. R. L. SIBLEY.

"Owere" seeds (*Monodora myristica*) from the Gold Coast. ANON. *Bull. Imp. Inst.* 13, 346-50 (1915).—The seeds upon steam distn. yielded 5.9% of a colorless volatile oil possessing a lemon-like odor and taste. The oil consisted largely of terpenes. The residue from the distn. yielded a quantity of fixed oil amounting to 36% of the original wt. of the seeds. This was of a dark reddish brown color. The residual meal left after the extn. of the oils contained 17.6% crude proteins and gave 80 food units. It possessed too much fiber to be used even as feeding stuff. R. L. SIBLEY.

***Madia sativa* seed from South Africa.** ANON. *Bull. Imp. Inst.* 13, 344-6 (1915).—Seeds of *Madia sativa* were found to yield 36.5% of a yellowish brown, liquid oil. This was examd. chemically. The results practically agree with figures previously given by Lewkowitsch. The residual meal had no alkaloids nor cyanogenetic glucosides and contained 7% fat, 28.2% crude proteins and an excessive amt. of fiber (24.4%). Results showed that this meal contained more food units than sun-flower seed cake or undecorticated cotton seed cake, and it may prove of value in cattle feeding.

R. L. SIBLEY.

Electricity in soap manufacture. ANON. *Elec. Rev. West. Elec.* 67, 1139-41 (1915).—Describes the process of soap making and gives a table of approximate h. p. requirements for the machines used in the industry. C. G. F.

Method of obtaining melting points (KNAPP) 7.

KOPPE, S. W.: *Glycerine: Its Production, Uses and Examination.* Trans. by W. H. Simmons. London: Scott, Greenwood & Sons. 258 pp. 7 s, 6 d.

Extracting oil from seed by steam and pressure. W. McC. NEALE. U. S., 1,164,383, Dec. 14.

Treating carcasses. F. FAHL. Brit., 18,360, Aug. 7, 1914. Carcasses and animal or fish offal are treated to ext. fats and to form a meal suitable as a food for animals or as a fertilizer, first with steam under pressure, then mechanically to sep. H_2O , and then with benzene or other spirit, and are finally dried by treatment with vapors of benzine or other spirit. Suitable app. is specified.

29. LEATHER AND GLUE.

LLOYD BALDERSTON.

History of the replacement of dung bates in the leather industry. JOHANNES PARSSLER. *Chem. Ztg.* 39, 893-5(1915). J. H. MOORE.

A study of the changes in skins during their conversion into leather. ANTON A. SCHLICHTER. *J. Am. Leather Chem. Assoc.* 10, 526-58, 585-612(1915).—(Thesis, Univ. of Mich.) Various methods of cutting sections for microscopic study were tested. S. concludes that none of the methods of imbedding in paraffin can give satisfactory sections. Dehydration with EtOH and infiltration with celloidin was found satisfactory, the whole process taking from 4 to 5 weeks. Sections as thin as 7 microns were cut. Freezing also gave good results, but the sections were 2 to 3 times as thick as with celloidin. Microscopic examn. of a skin at various stages in the process of tanning gives no certain indications that the process is going on well or the reverse. By means of special app., the vol. of pieces of skin was measured at intervals during the liming process. Results are tabulated and curves given showing changes in weight, vol. and density, these including also changes in the subsequent processes of bating, pickling and tanning. Efforts to find means for preventing thinness of flank in the finished product were fruitless. Skins sterilized by the formic-mercury process of Seymour-Jones (*C. A.* 8, 3513) were placed in sterile limes; the hair could be removed after 2 weeks or more. Tests of the sterility of the hide and of the liquor were made after the completion of the process, and the expts. seem to show that it is possible to unhair hides in sterile limes. L. B.

Japanese white leather. MAX RAY. *Shoe Leather Rep.* 120, No. 7, 27-9(1915); *J. Am. Leather Chem. Assoc.* 11, 22-5(1916).—Japanese white leather is probably the toughest leather in existence. Attempts to redress these inexpensive hides were unsuccessful. When exposed to moisture they become "pelty." The process of curing is described. J. S. ROGERS.

Waterproof sole leather. HENRY R. PROCTER. *Leather Trades' Rev.* 48, 648 (1915).—To make a waterproof vegetable sole leather, the leather must be dried at 115° to 120° F., then immersed in a waterproofing bath which is kept at as low a temp. as will keep the bath a liquid (120° to 140° F.). A suitable mixt. consists of 2 parts rosin and 1 part paraffin scale with a little tallow if the leather is too hard without it. The rosin must be melted and thoroughly mixed or it will not penetrate the leather properly. The immersion lasts until bubbles cease to come from the leather—perhaps

20 min. The bends should then be hung to drip above the hot bath, and wiped with a rag or finished in any desirable way. Other waxes may be substituted. For black leather, pitch may be added.

J. S. ROGERS.

Sole leather values. M. I. A. L. T. C. *Leather Trades' Rev.* 48, 642-4 (1915); *J. Am. Leather Chem. Assoc.* 11, 15-21 (1916).—The author gives analytical data on 4 American and on 3 English leathers. He finds that since the war began, English tanners are producing inferior leather. He suggests that the absurd demand for light colored leather should cease, that leathers should be rolled as wet as the color will stand, that more pressure might be used, and that some form of finishing as with oils and greases might help in waterproofing the leather.

J. S. ROGERS.

The tanning content of Pacific Coast conifers. H. K. BENSON AND THOS. G. THOMPSON. *J. Ind. Eng. Chem.* 7, 915-16 (1915).—The bark of the Western hemlock is thinner than that of Eastern hemlock, but it has a higher tannin content. Analyses show 14 to 17% tannin. The prepn. and extn. of samples is described in detail. Several skins were tanned in an ext. made from the fir chips from the bark and slabs. A desirable leather was produced having a color similar to that of oak-tanned leather.

J. S. ROGERS.

Decolorizing tanning extracts. G. A. KERR. U. S., 1,163,827, Dec. 14. A homogeneous paste is formed of peas, beans or other legumes by boiling with H_2O and this paste (or the fresh raw legumes) may be used to decolorize tanning exts.

Tanning materials. DEUTSCHE KOLONIALE GERB- UND FARBSTOFF-GES. M. B. H. Aust., 3,193, Apr. 4, 1914. The product is obtained by condensing 1 mol. $HCHO$ with 2 mols. of a 1- or 2-hydroxynaphthalenesulfonic acid in aq. or weakly acid soln., with prevention of elevated temps., preferably at the ordinary temp.

Tanning extracts. W. E. HORROCKS and J. K. TULLIS. Brit., 18,332, Aug. 7, 1914. A tanning ext. is produced by treating wood pulp exts. obtained as a waste or by-product in the manuf. of paper pulp or other cellulose material, in a heated condition with one or more neutral sol. salts. The ext. thus obtained, which is practically entirely sol., may be used as a liquid, paste, or powder.

Soluble tanning preparations. BADISCHE. Ger., 284,119, Oct. 17, 1912. The products are readily sol. in cold H_2O and are prepd. from tanning exts. which contain insol. or difficultly sol. constituents.

Condensation products of phenols and formaldehyde. BADISCHE. Ger., 282,850, June 27, 1913. These products, having tanning properties, as distinguished from those obtained according to 87,335, are obtained by treating aromatic hydroxy compds., or derivs. or salts of these compds.; with sulfites and $HCHO$, or agents evolving $HCHO$, under pressure and at temps. above 100° . An alk. reaction is maintained preferably to end of the condensation. E. g., 94 parts phenol (1 mol.) are heated with a concd. aq. soln. of 252 parts neutral cryst. sulfite (1 mol.) and 94 parts of a 40% soln. of $HCHO$ (1.25 mols.) in the autoclave for 8 hrs. at $140-150^\circ$.

Revoluble tanning or washing drum. BAYERISCHE MASCHINENFABRIK REGENSBURG F. J. SCHLAGETER. Ger., 284,227, Nov. 25, 1913. Cf. C. A. 9, 2466.

Softening and stretching leather. A. JOH. Ger., 284,703, July 12, 1913. A suitable machine is specified.

Flexible leather substance. L. HEIMANN. Ger., 283,673, Jan. 22, 1914. The leather is craped or crimped transversely, and a coating of gum is applied to its inner side.

Artificial leather. F. HESSER. Ger., 284,876, Oct. 21, 1913. Addition to 250,029 (C. A. 6, 3543). The process of the parent patent is modified in that, after the application of the solvent to the material, and before drying, the wet material is kept cool for some time in order to secure an intensive action of the solvent upon the binder while avoiding as much as possible the evapn. of the solvent. Between the app. for applying the solvent and that for drying is arranged a low narrow flat canal of 100–200 m. in length which is kept cool by air, which encloses the drying chamber.

Drying patent leather. C. HEYL. Ger., 284,604, Sept. 13, 1912. Artificial light is used.

Treating patent leather. C. HEYL. Ger., 284,605, Mar. 23, 1913. The drying by means of artificial light (cf. 284,604, *supra*) is improved materially by introducing some NH_3 , so that the patent leather is subjected simultaneously to the action of light and NH_3 . The acid constituents of the lacquer substance resulting from the strong oxidation due to the light action are in this manner neutralized, whereby the elasticity of the leather is greatly increased.

Ornamenting and rolling leather. C. VOSS. Ger., 284,606, Aug. 1, 1913. A machine is specified.

Sand-blasting the grain side of leather. C. RAUSCH. Ger., 284,239, Dec. 4, 1913. One or more body colors or coatings of varnish are applied to the surface of the leather and removed with the aid of a stencil or by sand blast. The depressions formed are filled with a varnish of another color.

Preserving leather. A. J. GODRON. Holl., 1,908, Jan. 13, 1913. Animal fat and resin are heated together. S is added to the mixt. and the resulting mass is allowed to cool. The resulting product is dissolved, *e. g.*, in benzene, and the leather is impregnated with this soln.

30. RUBBER AND ALLIED SUBSTANCES.

R. T. STOKES.

Isoprene from β -pinene. A. W. SCHÖRGER AND R. SAYRE. *J. Ind. Eng. Chem.* 7, 924–6(1915).—Under the same conditions turpentine and β -pinene yield about the same amount of isoprene, approx. 10%. S. and S. agree with Herty and Graham (C. A. 8, 3865) that isoprene obtained from turpentine is not due to dipentene originally present, as asserted by Harries, and advance the opinion that the isoprene results indirectly from dipentene, formed by heating pinene. It is not considered probable that either α -pinene or β -pinene can be made to yield directly sufficient isoprene for the commercial production of rubber, but as good yields are possible from dipentene, an attempt to obtain an approx. quant. conversion of pinene into dipentene is believed worthy of further consideration. The β -pinene used in the experimental work was obtained from the oleoresin of Western yellow pine. A modified Harries isoprene lamp (C. A. 5, 3583) used in this work is described in detail. RAXLEY F. WEBER.

The preparation and chemical properties of chemically pure rubber. F. HEIM AND R. MARQUIS. *Chem. Trade J.* 57, 360(1915).—H. and M. have produced pure rubber from wild Para rubber from the Amazons, coagulated by smoke, and from plantation Para rubber from Indo-China, coagulated by AcOH . They have not yet detd. whether pure rubbers of different botanical origin have identical properties. The method of prepn. of pure rubber consists of maceration, followed by washing in cold water in a tube covered with black paper, washing with acetone, evapn. of the acetone,

dissolving in ether or benzene and filtering through a Büchner porcelain filter, pptn. with alc. or acetone, digestion with alc. (to eliminate traces of benzene), and drying in the dark over H_2SO_4 . Caoutchouc thus prepd. from unsmoked rubber is perfectly white, while that from rubber coagulated by smoke is slightly yellow; the two are, however, of equal chemical purity, for the color is due to quantities of impurities too small to be measured. The pure caoutchouc is free from resin and proteins, and elementary analysis showed a compn. corresponding to $(C_5H_8)_n$, a polymer of isoprene. It behaves towards solvents like impure rubber except that its solns. are less viscous. Its chem. properties are similar to those of impure rubber; it oxidizes more readily in the air, especially when dissolved in $CHCl_3$.

EDWARD J. KELLEY.

The influence of the solvent on the viscosity of rubber solutions. F. KIRCHHOFF. *Caoutchouc gutta-percha* 12, 8649-52(1915).—K. gives the results of expts. showing (1) the relation between viscosity and rate of flow in the capillary viscosimeter, (2) the relation between viscosity and the nature of the solvent and (3) the difference in viscosity of various kinds of rubber. The coefficients of viscosity of solns. of rubber of the same concn. in the chlorinated hydrocarbons are approx. double those of benzene and benzene solns.; the viscosities of all kinds of rubber, after heating, approximate the same figure, thereby agreeing with the results obtained by Bernstein. E. J. KELLEY.

The velocity of dissolution of liquids in caoutchouc. P. BARY. *Compt. rend.* 161, 589-91(1915).—From the figures obtained by Flusin (doctorate thesis, Grenoble, 1907) on the absorption of liquids by vulcanized caoutchouc, B. deduces the formula, $p = t p_s / (A + t)$, in which p is the wt. of liquid absorbed and p_s the value for satn. The coefficient A varies with the conditions of the expt. A table is given showing the values of A and p_s for 16 different liquids.

E. W. BOUGHTON.

Vulcanization of solutions of rubber by ultraviolet rays. HELBRONNER AND BERNSTEIN. *Caoutchouc gutta-percha* 12, 8720-21(1915).—H. and B. state that vulcanization results from depolymerization of the rubber, followed by polymerization under the action of the S. This polymerization which takes place in the second phase of vulcanization is a catalytic reaction, and the combination of S with the rubber is only a secondary reaction. Solns. of rubber and S submitted to the action of ultraviolet rays were not only vulcanized, but the rubber, instead of pptg., after some time, because of its insolubility in the vulcanized state, gave a gel of remarkable stability.

EDWARD J. KELLEY.

A study of factice and its analysis. *Mat. grasses* 8, 4339-42(1915).—Compn. and methods of analysis are discussed.

EDWARD J. KELLEY.

Vulcanization experiments on plantation Para rubber. The cause of variability. B. J. EATON AND J. GRANTHAM. Dept. of Agr. Federated Malay States. *J. Soc. Chem. Ind.* 34, 989-99(1915).—The results obtained by E. and G. may be summarized as follows: (1) Considerable variation occurs in plantation Para rubbers, even in the case of "first latex" rubbers, both among rubbers from the same estate and from different estates. (2) This variation is connected principally with the behavior of the rubber on vulcanization, i. e., its rate of cure, and not in respect to its strength, elasticity, and general mechanical properties, especially in the case of properly prepd. "first latex" samples. (3) If the rate of cure be known or ascertained under spec. conditions vulcanized rubber having similar mechanical properties can be made from all good samples of "first latex" rubbers. (4) A difference in mechanical properties does exist, even among so-called first quality rubbers, but these differences are greater between high and low grade plantation rubbers; some rubbers never attain the max. mechanical properties reached by others, whatever period of cure is adopted. These differences,

in the case of "first latex" rubbers, however, are not so important to the manufacturer as the differences in rate of cure, and are not of the same order. Indeed, the remarkable uniformity in type of curve points to the fact that the variation of mechanical properties in the samples taken, at any rate, is of an accidental nature, for at points below the breaking point the mechanical properties are the same. (5) The rate of cure is affected by the presence of some non-caoutchouc substance in the latex, possible protein or some other organic constituent, or by some degradation product derived from these substances, which acts as a catalyst, and accelerates the rate of cure. (6) This substance may be already present in the latex, and its amt. in the raw rubber detd. by the mode of prepn. and coagulation; or it may be subsequently formed in the latex by decompn. and taken up by the rubber in variable quantity, according to mode of prepn.; or alternatively, it may be formed in the coagulum in variable quantity, depending on the amt. of serum (or moisture) left in the coagulum, or the presence of preservatives which hinder or prevent its formation. The alternative theories await investigation. (7) Smoking, removal of excessive serum in the washing and milling processes, and preservatives are among the artificial factors which either hinder the formation of this substance or, if it already exists in the prepd. rubber, partially destroy it. (8) The catalytic substance is probably not affected greatly by heat, since in the process of mixing and vulcanization, the rubber is subjected to relatively high temp. Whether heat destroys it or prevents its formation in the latex or freshly coagulated rubber awaits investigation. (9) The rate of cure of a rubber under specific conditions is not indicated in any way by the apparent mechanical or any other apparent properties of the raw material, hence the present methods for the valuation of rubber are worthless. (10) Other things being equal, a manufacturer probably prefers a rapidly curing rubber, since it represents economy in heat, labor, and time costs; and secondly, a rubber which cures rapidly is said to have better keeping qualities after vulcanization. (11) Uniformity between "first latex" rubbers from different estates will probably be very difficult of attainment under present methods, owing to the numerous factors involved, but should not be so difficult in the case of "first latex" rubbers from the same estate. (12) Two alternatives are suggested: (a) the issue of certificates giving correct rate of cure and mechanical properties at this cure; (b) the attainment of more uniformity by the method suggested in this paper and elsewhere, in which rubber from latex collected during a series of days forms part of one ball or block, which may be described as the method of averages.

H. B. SLUSSER.

The government inspection of rubber goods. ANON. *India Rubber J.* 50, 304 (1915).—The examn. of materials for the Brit. War Office includes analysis, mechanical, physical, and for some goods electrical tests, gaging, measuring and weighing, and visual inspection. A sample from the first delivery of each contract is submitted to chem. analysis. Some of the common reasons for rejection are porosity of rubber, insufficient or excessive vulcanization, defects due to gritty chemicals, errors in dimensions.

EDWARD J. KELLEY.

DITMAR, R.: *Die Technologie des Kautschuks*. Wien: A. Hartleben. 597 ss. 22 M.

Apparatus for smoking rubber latex and forming it into sheets. L. NORZAGARAY. U. S., 1,164,850, Dec. 21.

Non-porous rubber goods. W. E. PIPER. U. S., 1,164,860, Dec. 21. Rubber sheets such as used in forming the bottoms of shoes are formed of calendered rubber

and then are heated before vulcanization to about 55° for 36 hrs. at atm. pressure to remove occluded gases from the rubber.

Vulcanizing rubber. A. D. WARNER and R. B. PRICE. U. S., 1,163,050, Dec. 7. Preparatory to vulcanization the rubber is heated to about 100° for 1 hr., compacted under a pressure of about 25 lbs. per sq. in. and then vulcanized at a temp. of 125°.

Apparatus for vulcanizing rubber tires. J. R. GAMMETER. U. S., 1,164,639, Dec. 21.

Apparatus for vulcanizing rubber shoes, etc. J. W. ARTHUR. U. S., 1,164,054, Dec. 14.

Apparatus for reclaiming rubber waste by treatment with solvents. C. S. HELLER. U. S. reissue, 14,027, Dec. 7. Cf. U. S. original, 978,583, C. A. 5, 999.

Chemical Abstracts

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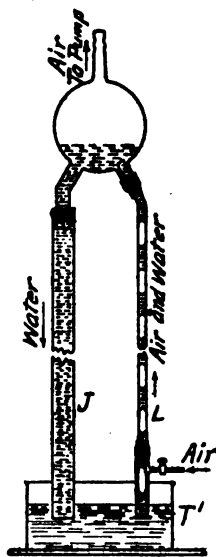
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I. APPARATUS.

L. C. JONES.

A laboratory circulating pump. J. S. MORGAN. *J. Chem. Soc.* 107, 1710-1 (1915).—T' (see fig.) is a thermostat and J the jacket surrounding the app. To the top of J a bulb with 3 inlets is fixed, as shown. One of these inlets is connected to J, one to the water pump, and the third to the tube L, which just dips into the thermostat. Over the end of L a somewhat wider tube, fitted with a T-piece, is fixed by means of a rubber connection. This T-tube serves as a means of adjustment. By completely closing the stopcock on the T-tube, H₂O only is raised by the pump; on opening the cock, a mixt. of air and H₂O is drawn up, and when the bulb is reached this mixt. separates into H₂O, which returns through J to the thermostat, and air which passes through the pump. The device can be readily caused to maintain a flow of H₂O around most complex app. at almost any desired rate. By increasing the number of intake tubes, very large jackets may be used, and the temp. gradient becomes almost negligible. Polariscopes, barometer tubes, and any parts of an app. that project can be dealt with quickly and effectually. The pump may be constructed out of materials in every lab., and serves the same purpose as rotary pumps.



F. W. SMYTH.

Apparatus for separations (Rothe's method for iron). L. BERTIAUX. *Ann. chim. anal.* 20, 213-4 (1915).—The app. consists of 2 water-jacketed, vertical, cylindrical bulbs of 200 cc. capacity, set the one above the other, and connected with a stopcock. At the bottom there is a stopcock and at the top a funnel-stopcock. The lower bulb has a side stopcock to evacuate it. The app. is so mounted as to permit it to be shaken and turned upside down.

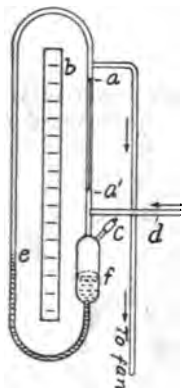
P. M. GIESY.

Instruments for measuring the velocity and the pressure of gases. E. STACH. *Z. Ver. deut. Ing.* 59, 832-7, 856-9 (1915).—An illustrated review.

C. G. F.

Apparatus for producing and maintaining a known mixture of sulfur dioxide and air. A. E. WELLS AND L. H. DUSCHAK. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 192-5 (1915); cf. *C. A.* 10, 446.—By means of this app. a measured current of SO₂ was continuously supplied to a known current of air drawn into a fan, where the 2 were thoroughly mixed and discharged into a room or booth, thus giving a known concn. of SO₂. The construction and use of the meter is based upon the principle that the difference in pressure between the 2 ends of a capillary tube through which a stream of gas is flowing is a measure of the rate of flow of the gas. A regulated flow of SO₂ is conducted by the glass tube *d* (see fig.) to the capillary *a-a'*, which is joined by T-tube connections to the manometer. The difference in pressure between the 2 ends of the capillary is shown by the difference in level of the menisci *e* and *f*.

which is measured on the meter stick *b*. The capillary tube was "calibrated" by allowing the gas to flow through it for a definite period of time, and with a const. pressure difference, into a soln. containing a known vol. of standard caustic alkali or I, and detg. volumetrically the SO_2 delivered. The vol. of SO_2 delivered corresponding to 4 or 5 different pressure differences was detd. for each capillary used. In plotting the pressure differences or manometer readings, as abscissas, and the corresponding rates of flow, in cc. per min., as ordinates, the curve for each capillary was obtained; for the range of vols. delivered in the tests, this was practically a straight line. After leaving

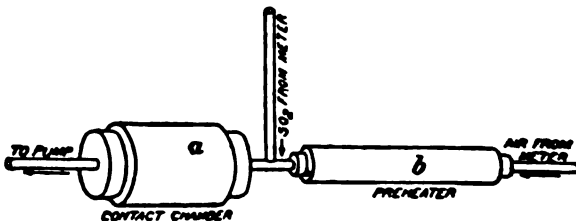


the capillary the SO_2 was conducted by glass tubing to the intake of a direct motor-driven forge blower. The air and SO_2 mixt. was then discharged into a mixing box of No. 18 galvanized Fe, 36 in. long and 12 in. in diam., containing 11 baffles (5 in. high, 3 in. apart, arranged to zigzag the mixt.). The mixt. was then conducted through a galvanized Fe pipe 48 in. long and $3\frac{1}{4}$ in. inside diam., then through a galvanized Fe box 12 in. sq. by 18 in. long, from which the gases were discharged into the booth. The booth, 6 ft. long, 4 ft. wide, and 6 ft. high, was framed with wood and covered with a close-mesh duck cloth. At one end of the hood was a curtain flap, serving as an entrance. As the vol. of air discharged into the hood by the fan was about 110 cu. ft. per min., there was maintained an excess pressure inside the booth, which prevented pure air from diffusing inward. Six in. back from the discharge end of the $3\frac{1}{4}$ -in. pipe Pitot tubes (constructed by

the Bur. of Mines and checked against an 80-light gas meter, the measurements being made in a pipe 1.04 in. in diam.) were inserted for detg. velocity, and thus the vol. of the mixt. being discharged. The manometer used was of the U-tube type, placed on a slope of 1 in 10; this allowed a considerable movement of the manometer liquid (alc.) for a small velocity head. Records showed that for velocities up to 1800 ft. per min., by applying a factor of 0.95, the velocities calcd. from the Pitot tube readings were within 2% of the actual velocities as calcd. from the vol. measured by the gas meter. With velocities ranging between 1200 and 1800 ft. per min. the velocity in the center of the pipe was found to be 1.05 times the av. velocity. Through the baffle box and pipe, the fan discharged an av. of 112 cu. ft. of air per min. To get a mixt. of 1 part SO_2 per million parts of air, it was necessary to add 3.2 cc. of SO_2 per min. By allowing several min. to elapse after starting to blow the mixt. into the booth, the concn. of the SO_2 in the air of the booth would be within 10% of the calcd. concn. for the most dil. mixt. (1 to 5 parts per million) and within 5% for stronger mixts.

F. W. SMITHER.

Apparatus for converting sulfur dioxide to sulfur trioxide. A. E. WELLS. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 264-5 (1915); cf. C. A. 10, 446.—A porcelain tube 2.5 cm. in diam. is placed in the center of 2 electrically heated furnaces *b* and *a* (see fig.), *b* being the preheater and *a* the conversion furnace. The furnaces are built with asbestos, and wired with Ni-Cr wire. They are heated from the 110-v. line, rheostats being placed in series to control temps. A thermocouple is inserted in *a* and connected with a galvanometer for measuring the temp.



The desired vol. of air, measured through a capillary meter, is blown in at one end of the tube and passed through the preheater. The metered vol. of SO_2 is added at the other end of the preheater, the resultant mixt. being passed through the contact mass (10 g. of asbestos wool containing 4% Pt) in the conversion furnace. The air and gas mixt. contained 7 to 10% SO_2 ; temp. of contact mass was 430–450°. The app. was constructed for producing a known amt. of SO_2 for fumigation expts. The efficiency of the conversion was detd. by the analysis of the SO_2 in the vol. discharged from the blower (used to drive the mixt. into the fumigating cabinet). A very small amt. of SO_2 in the air produces a visible fume; in cloudy weather the presence of 0.0032 g. per cu. m. (= to the conversion of 1 part of SO_2 per million parts of air) was visible at some distance.

F. W. SMITHER.

Apparatus for the culture of yeast used for the determination of various sugars by fermentation. J. TRAMBICS. Budapest. *Z. Nahr.-Genussm.* 30, 293–4(1915).—The app. consists of a small round-bottomed culture flask furnished with a side outlet tube near the bottom but slightly above the level of the yeast deposit. When in operation this tube is closed with a rubber tube, glass bead valve and glass tip similar to that employed for buret, the glass tip being immersed in EtOH to prevent the invasion of foreign organisms. One arm of a glass Y-tube is sealed into the upper part of the culture flask, the remaining 2 arms being connected respectively by means of rubber tubes containing glass bead valves with the lower ends of glass siphons leading from 2 glass bottles containing, respectively, a sterile culture medium and sterile distilled water for washing the product when the culture is completed. All the flasks mentioned are furnished with vents containing cotton filters to prevent the invasion of foreign organisms. Fresh culture medium can be introduced into the culture flask by means of the siphon and glass bead valve, the exhausted liquor being drawn off from the side tube in the culture flask. When the culture is completed the yeast may be washed with sterile water in the same manner, the yeast being finally withdrawn by tilting the culture flask until the culture flows out of the side tube. Illustrated.

A. F. SEEKER.

Apparatus for determining concentration of hydroxyl ions (FRANCIS) 7. Comparison of the pressure balance of Schäffer and Budenburg with the open standard gage (CROMMELIN) 2. Methods and apparatus used in the cryogenic laboratory (ONNES) 2.

Acetylene burners. A. WEBER & Co. Ger., 285,376, May 7, 1913. The burners are stamped from a plastic mass.

Gas lighter. B. JEIDEL, GEB. HENDL und SOHN. Ger., 283,141, Mar. 20, 1913 and addition 284,732, May 20, 1914. An electrically preheated wire of catalytic material.

Pyrophoric fire lighter. GASZÜNDER, G. M. B. H. Ger., 284,612, July 7, 1912.

Pyrophoric fire lighter. GASZÜNDER, G. M. B. H. Ger., 284,613, June 27, 1912. The sparks are produced simultaneously with the first flow of gas.

Pyrophoric fire lighter. GASZÜNDER, G. M. B. H. Ger., 284,614, June 27, 1912. A spring serves the double purpose of actuating the friction member and controlling the cut off.

Pyrophoric gas lighter. W. LEHMANN. Ger., 284,615, July 26, 1913.

Automatic gas lighter. B. BRAMMER. Ger., 285,351, May 31, 1913.

Rotating cooling and heating apparatus. H. HAILER and H. HOFMANN. Ger., 285,183, Feb. 14, 1913. A liquid or gaseous pressure fluid is used as the operating means.

Nozzles for revoluble furnaces. G. POLYSIUS. Ger., 285,455, July 19, 1913.

Boiler for absorption refrigerating machines. A. ZELLNER. Ger., 285,027, Apr. 25, 1914.

2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS AND E. B. MILLARD.

The need of a large government institution for chemical research. C. A. JACOBSON. *J. Ind. Eng. Chem.* 8, 70-2(1916).—An address. E. J. C.

The naval consulting board of the United States. L. H. BARKELAND. *J. Ind. Eng. Chem.* 8, 67-70(1916).—An address. E. J. C.

Magneton theory of the structure of the atom. A. L. PARSON. *Smithsonian Inst. Pub.* 65, No. 11, 80 pp.(1915).—A discussion based on the following assumptions: (1) the atom is made up of a positive part and *magnetons*, which are ring-shaped negative charges (hitherto called electrons) having, in addition to the negative charge properties, a current circuit whose radius is estd. at 1.5×10^{-8} cm., i. e., less than the radius of the atom, but of the same order, and rotating with a peripheral velocity of the order of that of light. Their rotation is independent of any positive attracting charge. (2) The positive part of the atom is a sphere of uniform positive electrification, with the properties of an elastic solid, and with a vol. normally proportional to the number of magnetons it contains. It is surrounded by an atm. or envelope of very low charge density, which is also elastic. (3) The formation of a group of 8 as a stable configuration for magnetons over the surface of a charged sphere is demonstrated for a system of 8 magnets arranged symmetrically around a cube, and is assumed to take place in atoms contg. more than 8 magnetons as well as in those contg. 8. (4) To explain the occurrence of long periods in the periodic system, and at the same time the properties of the elements in these periods, it is necessary to assume that there is in certain cases a hindrance to the formation of a group of 8 when it is normally due. On the basis of these assumptions, P. has discussed the simple magnetic attraction between 2 magnetons, the tendency to form the "group of 8," the residual magnetic forces exerted by all the combinations of magnetons, their attractive and inducing actions, the elec. polarization set up by the extn. of a magneton and its attracting and inducing actions, the pressure and vol. relations that are possible in the positive sphere, and more particularly in the envelope of the atom. It is shown that the magnetic moment of the magneton is beyond the range of present exptl. methods to detect. A rough calcn. of the heat of dissociation of H_2 into atoms, based on the work done in this paper, gave as the most probable value 5.6×10^{11} ergs; the value found by Langmuir was 77,000 cal., or 3.2×10^{12} ergs. The paper closes with a discussion of the magnetic properties of elements and compds. E. B. MILLARD.

Application of the principle of dynamic similitude to molecular physics. W. B. HARDY. *Proc. Roy. Soc. London (A)* 92, 82-100(1915).—Mathematical. The principle is developed and applied to the case of the internal latent heat of vaporization. If temp. be proportional to the mean energy of progressive motion of the mols., the internal latent heats of dynamically corresponding states should be given by the equation $LM = aT$, where L is the latent heat, M the mol. wt., a a const., and T the temp. This equation may be used either to identify corresponding temps. or to test some assumption as to the corresponding temp. The assumption here made is that the critical states are dynamically corresponding states, and that the corresponding temps. are equal fractions of the crit. temp. The equation for internal latent heats was then found to have the form $LM + b = aT$ for normal paraffins and for certain

halogen derivs. of C_6H_6 . Subject to the correctness of the assumption, the conclusion is drawn that the potential energy of repulsive forces acting between the mols. contributes to the process of evapn. An examn. of the alternative view that corresponding temps. may be identified by the relation $LM = aT$ is deferred for the present.

E. B. MILLARD.

Relation between the thermal conductivity and the viscosity of gases with reference to their molecular complexity. J. A. POLLOCK. *J. Proc. Roy. Soc. N. S. Wales* 49, 249-52(1915).—In the equation $k = f\eta c$, expressing the thermal cond. of a gas in terms of the viscosity and specific heat, the coeff. f is a numerical factor which is approx. const. for gases of the same atomicity. This suggests a relation between f and γ , the sp. heat ratio, which can be expressed by $f = a(\gamma - 1)/\gamma^n$, where a and n are consts., or in a simplified form $f = 7.32(\gamma - 1)/\gamma^{1.3}$. Except for monoatomic gases the equation quite well represents the exptl. results if n is placed equal to unity, and this leads to the relation $m\gamma k/\eta = \text{const.}$, where m is the mol. mass. The paper is a calcn. of the values of these 2 functions and a comparison of the calcd. results with observed data on several gases, taken from existing detns. In many cases the agreement is fair; in others there is quite a wide variation. The value of f is about 1.9. Also in *Phil. Mag.* 31, 52-4(1916).

E. B. MILLARD.

Arrangement of the atoms in crystals. A. JOHNSON. *Physik. Z.* 16, 269-72 (1915).—It follows from the work of Laue and the Braggs that a crystal must have a "minimal symmetry," i. e., it must have one and only one of the 230 Schoenflies space groups. It must be identical with one of the 32 crystallographic groups of symmetry as well. A table is given of symmetry groups and space groups and the groups of minimal symetry for several substances. The atomic symmetry of a given element in different compds. is generally different. Points of resemblance and difference of the atoms are mentioned, from which some negative conclusions may be drawn. For example, the 7 O atoms of the H_2O of crystn. of $FeSO_4$ cannot be equivalent, and all of the Cl atoms in PCl_5 cannot be equivalent, for no space arrangement is possible for them which is symmetrical. The 3 O atoms of aragonite are not alike, etc.

E. B. MILLARD.

Question of electric charges smaller than the electron. HARVEY FLETCHER. *Physik. Z.* 16, 316-9(1915).—Discussion of the data in *Phys. Rev.* 4, 440(1914); cf. *C. A.* 9, 1413. From the data obtained by the Millikan oil-drop method, there is no reason to consider the existence of charges smaller than 4.78×10^{-10} e. s. u. The equations for the Brownian movement, when applied to the oil-drop data, lead to values for N and e which are in complete harmony with those derived from resistance laws.

E. B. MILLARD.

Applications of the conception of positive and negative valence. VI. The existence and the properties of "free radicals." H. S. FRY. *Univ. Cincinnati. Z. physik. Chem.* 90, 458-80(1915); cf. *C. A.* 5, 2452; 7, 2899.—Free radicals are in many respects comparable with elec. neutral atoms. The instability or reactivity of free radicals depends upon their development of positive or negative valence in consequence of loss or addition of negative electrons. In other words, free radicals can exert either an oxidizing or reducing influence. The ability to give up or to take on electrons is the property of definite atoms in the free radicals. Not only triphenylmethyl and other triarylmethyls, but also NO_2 , $Na_2N_2H_4$, $(CH_3)_4N$, and other compds., as well as certain elements, may be considered as free radicals. Many facts are brought forward in support of the conception that there exists restricted analogies between the elec. cond. of triphenylmethyl in liquid SO_2 and that of Na in liquid NH_3 . In the first case the ions are probably Ph_3C^+ and SO_2^- , and in the latter Na^+ and NH_3^- . In soln. these latter ions form the free radical $NaNH_2$. H. JERMAIN CREIGHTON.

Time-change of the grouping of particles and the reversibility of diffusion processes. M. v. SMOLUCHOWSKI. *Physik. Z.* 16, 321-7(1915).—Mathematical.

E. B. MILLARD.

The significance of light for the stability of colloidal solutions. H. NORDENSON. Upsala. *Z. physik. Chem.* 90, 603-27(1915).—It has been found that light exerts upon metal colloids a slow coagulating influence which is similar to that of a weak electrolyte. The disperse phase (Au) undergoes no chem. change under the influence of light, the action being purely physical. The influence of light is independent of chem. changes in the dispersion medium. The influence is similar for different kinds of radiations. The influence is independent of the charge of the particles. Ultra-violet and β -rays act equally well on positive and negative particles. In all cases the light coagulation is accompanied by a decrease in the total charge of the colloid.

H. JERMAIN CREIGHTON.

The course of adsorption. O. ARENDT. *Kolloidchem. Beihefte* 7, 212-50(1915).—The influence of stirring on the adsorption of starch from a starch soln. by SrCO_3 was studied. The expts. were carried out in a special metal app. in which the intensity of the stirring could be controlled and measured and samples could be extd. for very short time intervals. The analyses of the solns. were made by means of the Lowe-Zeiss interferometer. It was found that the rate of adsorption is proportional to the rate of stirring and that the adsorption equil. at very high rate of stirring can be reached after 5 sec. For different concns. of starch solns. it was found that the % of adsorbed substance in a given time interval was the same for the same intensity of stirring. For all concns. it was found that after 2 secs. of stirring 90% of the total adsorbed substance was adsorbed. To get the influence of temp. and stirring a special glass app. was used. The temp. coeff. of the rate of adsorption was found to be very small, about 1.1. The equil. was reached more quickly at higher temp. than at lower temp. The total adsorption at lower temp. was greater than at higher temp. At greater intensity of stirring the influence of temp. was less. Expts. using powdered charcoal as adsorbent confirmed the above results with SrCO_3 . However, the equil. set in very much more slowly, due to the capillary spaces in the charcoal particles. All the curves plotted show that the course of adsorption is not changed by stirring. The character of the curves remains the same. The results of the expts. show a relatively good agreement with a formula developed by R. Marc. $(X^{(\pi+1)}/t)(2X_e^\pi + KX^\pi) = \text{const.}$, where X is the amt. of adsorbed substance for time t , X_e is the amount adsorbed when equil. is reached, π is a number greater than 1, and k is a const.

WILLIAM D. ZIMMERLI.

Very small mercury droplets. (Their mechanical and optical properties, and their electric charges.) F. EHRENHAF. *Physik. Z.* 16, 227-37(1915).—The Stokes-Cunningham law is valid for spheres as small as 10^{-8} to 10^{-9} cm., for the radius as calcd. from this law agreed with that detd. from the selective radiation of light for these particles, in case of both Hg and Au. The statement that Hg droplets slowly evap. when suspended in air (Schidlof and Karpowicz, *C. A.* 9, 2029), is quite wrong, no evidence for it being obtained in these expts. The statement that charges smaller than those of the electron are capable of independent existence (Ehrenhaft, *C. A.* 9, 411, 1000) is again made. The independent existence of charges as small as 10^{-12} e. s. u. is to be considered as proved, and no objection to the method of expt. or its significance is to be found.

E. B. MILLARD.

Theory of the capillary tube. LORD RAYLEIGH. *Engineering* 100, 553(1915).—The 2 problems which are to be solved are (1) how to allow for the wt. of the meniscus in the capillary tube, (2) to find what diam. of the large tube is required in order that elevation due to curvature of the liquid surface may be neglected. In the best exptl.

arrangement a wide and a narrow tube are connected below, and the difference in levels is measured (cf. Richards and Coombs, *C. A.* 9, 2025). The Poisson formula for correcting for the wt. of the meniscus has been confirmed and extended. An approximation formula is given: $2T/g\rho r = h + (r/3) - (0.1288r^2/h) + (0.1312r^2/h^2)$, where r is the radius of the tube, h the measured height of the meniscus above the true plane level, T the surface tension, g the acceleration of gravity, and ρ the density of the fluid; it should serve for exptl. purposes. The first 2 terms on the right correspond to the assumption of a spherical meniscus, which is sufficient when r is "small enough." It is easy to show theoretically that tubes of 2.5 or 3 cm. diam. are too narrow for the "wide tube," as found by Richards and Coombs, and the widest tube used by them (3.8 cm.) was also too small to take advantage of the achieved delicacy of reading. An approx. calcn. of the necessary diam. (not given in detail) gave 4.7 cm.

E. B. MILLARD.

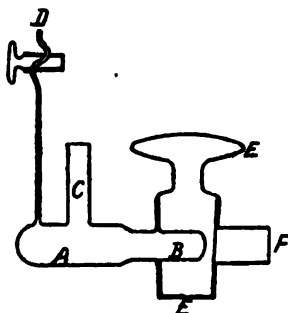
Comparison of the pressure balance of Schäffer and Budenberg with the open standard gage of the Leiden Physical Laboratory between twenty and one hundred atmospheres, as a contribution to the theory of the pressure balance. C. A. CROMMELIN AND E. I. SMID. *Proc. Akad. Wetenschappen* 18, 472-83(1915).—A comparison of a pressure balance with a standard manometer up to 100 atms. The measurements showed that the sensitiveness of the pressure balance far exceeds its accuracy, so that a calibration is necessary. The "functional section" appears not to be independent of pressure.

GEORGE W. MORSEY.

Methods and apparatus used in the cryogenic laboratory. XVI. The neon cycle. H. K. ONNES. Leiden. *Proc. Akad. Wetenschappen* 18, 507-15(1915).—Previously no const. temp. bath has been available in the interval between 20 and 55° K.; by the use of Ne this interval can now, in a large measure, be covered. The purification of a quantity of Ne is described, the methods and app. used for the Ne cycle being essentially the same as previously used for He. The b. p. of Ne is about 27° K., the triple point 24.5° K.

GEORGE W. MORSEY.

The determination of the concentration of hydroxyl ions. F. FRANCIS, F. H. GRAKE AND J. W. ROCHE. *J. Chem. Soc.* 107, 1651-73(1915).—The authors describe an improvement in the method previously employed (cf. *C. A.* 7, 1351; 8, 37). By measuring the pressure of the evolved N results were obtained, for the unimolecular const., of a much higher degree of accuracy without seriously diminishing the rapidity of the method. The reaction vessel used in the previous expts. was found unsuitable for pressure measurements and a new form was designed (see fig.), equally convenient for measurements by either the old volume method or the new pressure method. The tap of the reaction app. contains a cup, *B*, of 7 to 10 cc. capacity, into which the alkali or soln. of nitrosoamine can be introduced through *F*, and this soln. can then be shut in by turning through a right angle. When desired, this cup becomes a part of the reaction chamber *A* by again turning the tap through a right angle. The tap (of considerable size) is made gas-tight by binding it into the socket with rubber bands, and using the lubricant recommended by Travers ("Study of Gases," p. 24). The reaction vessel fits into a wooden cradle which is immersed in the thermostat H₂O and shaken during the whole expt. by means of an elec. motor. The holes *E*, *E'*, in the tap enable the soln. in the cup to attain thermal equil. at the same time as the contents of the reaction chamber. A const.-vol. buret is connected to *C*, and the evolved N is collected under



atm. pressure; this pressure is only altered by raising the Hg reservoir when readings have to be taken. These readings are made as rapidly as possible, after which the pressure is at once reduced to that of the atm. to minimize the difficulty of keeping the app. gas-tight. The final, or infinity, reading was always taken after a period had elapsed equal to 10 times that required for the reaction to proceed half-way to completion. In most cases the reaction is sufficiently slow for 2 expts. to be made simultaneously; in this case, the app. is duplicated, set in the same cradle, and the 2 pressure tubes of the const.-vol. buret placed side by side on the scale, in order that readings may be taken by the same cathetometer. The whole app. may be washed out with N through *D* when the expt. is to be made in the absence of O, *e. g.*, with the nitrosoamines of vinyl- and isobutyl-diacetoneamine. The unimolecular equation, using the pressure method, is: $k = (2.303/t) \log (P_{\infty} - P_0)/(P_{\infty} - P)$, where P_0 = pressure reading at the time taken as zero, P the reading at time t (in secs.), and P_{∞} the infinity reading. The mean of 12 expts. (decompn. of nitrosotriacetoneamine by alkalis) gave for $[\text{OH}^-]$ up to 0.05 *N* the ratio k/OH^- at $30^\circ = 1.92$; max. deviation not greater than about 0.7%. An investigation of the catalysis of nitroso-vinyl- and isobutyl-diacetoneamines showed that in these cases the "drift" in the velocity consts. does not commence until $[\text{OH}^-] =$ about 0.4 *N*, enabling one to bridge that region which cannot be measured by nitrosotriacetoneamine and to use the method for measuring all values of $[\text{OH}^-]$. With these derivs. the expts. have to be made in an atm. of N; the velocity of decompn. is slower, and at lower concns. the expts. are best made at 50° (about $[\text{OH}^-] = 0.2$ *N*, 40°). The values for k/OH^- are: nitrosovinyl diacetoneamine = 0.171 at 40° , 0.553 at 50° , temp. coeff. = 3.21; nitrosoisobutyl diacetoneamine = 0.241 at 40° , 0.714 at 50° , temp. coeff. = 2.96. A redetn. of the temp. coeff. at 30° of nitrosotriacetoneamine using the ratio $k/\text{OH}^- = 1.92$ gave 2.35. In a few expts. on the hydrolysis of Na_2CO_3 , the new method gave data for $[\text{OH}^-]$ in good agreement with those deduced from cond. and *e. m. f.* measurements. Results are given and discussed on the action of neutral salts on the course of the catalysis. It is concluded that: no satisfactory explanation of the mechanism of the catalysts described is to be obtained by further kinetic measurements; there is formed some type of complex between base and nitrosoamine in concd. solns., followed probably by a decompn. in a new direction, giving phorone or analogous derivs. In dil. solns. of OH^- no evidence for this view could be obtained by cond. measurements; the cond. of the alkali was unaltered by the addition of the nitrosoamine and showed the same value before, during, and after the reaction was complete. Expts. in higher concns. are not complete. Tables, curves, and details are given.

F. W. SMITHER.

Hydrolysis of sodium phenoxides in aqueous solution. D. R. BOYD. *J. Chem. Soc.* 107, 1538-46(1915).—The exptl. method was that of Shields (*Z. physik. Chem.* 12, 167(1893)) in which the velocity of hydrolysis of MeOAc was used to measure the concn. of alkali formed. The compds. studied and their degrees of hydrolysis are guaiacol 5.58%, PhOH 5.60%, *o*-, *m*-, and *p*-cresol 7.54, 6.08, 7.27%, resp., *o*-4-xylenol 8.28, *p*-xylenol 8.37, carvacrol 8.83, *m*-6-xylenol 10.07, thymol 10.34, ψ -cumecol 10.96, and mesitol 13.83. The acidity of phenol is reduced by the introduction of alkyl groups; the alkyl is most effective in the ortho-position with respect to the OH group, slightly less effective in the para-position, and much less in the meta-position. This rule applies to dialkyl and trialkyl derivs. of PhOH as well as to the cresols. An *iso*-propyl group in the *o*-position acts much more strongly than a Me group in the same position, but there is very little difference between the effectiveness of the 2 groups when they occupy meta-positions with respect to OH. Introduction of a methoxy group in the ortho-position scarcely alters the acidity of phenol. Values of the % hydrolysis calcd. for the di- and trimethyl-substituted phenols may be calcd. from the

figures for *o*-, *m*- and *p*-placed Me groups in the case of cresols, but they are always less than those actually observed. Mesitol dissolves in an equiv. quantity of dil. NaOH in the cold to give a colorless soln., but after the dil. (0.01 *N*) Na mesityloxide soln. had been kept at 25° for an hour it showed a distinct pink color. If such a soln. is heated to boiling, it gradually becomes an intense rose, like alk. phenolphthalein, and on cooling the color is diminished in intensity, but persists for some time. The coloration again becomes strong if the soln. is boiled once more. Purifying the mesitol further did not remove this effect. Some chem. transformation accompanies the production of the red color, for if the dil. soln. is boiled until no more mesitol escapes, the red color is not destroyed, and if the soln. is concd., acidified, and extd. with Et₂O, an oily product is obtained which is not mesitol.

E. B. MILLARD.

Conductivity and viscosity of some rubidium and ammonium salts in ternary mixtures of glycerol, acetone and water at 15, 25 and 35°. P. B. DAVIS, W. S. PUTNAM AND H. C. JONES. Johns Hopkins Univ. *Z. physik. Chem.* 90, 481-509(1915).—It is evident from the cond. of the ternary solvent that H₂O and (CH₃)₂CO exert a dissociating influence upon glycerol. The decrease of the dissociation of an associated liquid through another is much greater in a ternary mixt. than in a binary mixt., and thereby the values of the cond. and fluidity are decreased. The differences between the cond. and fluidity curves in this ternary solvent are explained through the consideration of the fluidities of the three components, in the light of the hypotheses of Dutoit and Aston and of Thompson and Nernst. The temp. coeffs. of fluidity are greater than those of cond., as in the case of binary solvents. These differences are possibly due to the formation of solvents. The values for the cond. and fluidity of the solvent with the greatest glycerol content lie furthest below those calcd. from the mean values. The temp. coeffs. of cond. agree approx. with those calcd. from the mean.

H. JERMAIN CREIGHTON.

Allotropy of the ammonium halides. I. F. E. C. SCHEFFER. Amsterdam. *Proc. Akad. Wetenschappen* 18, 446-58(1915).—Certain evidence in the literature indicates the existence of 2 polymorphic forms of NH₄Cl, but the subject has never been investigated, and if such forms exist it has not been known whether they are enantiotropic or monotropic. The question is of additional interest because of the fact that Wegscheider has shown (*C. A.* 3, 603) that the existence of such polymorphic forms would account for the apparent contradiction of the laws of heterogeneous equil. observed by Johnson in the case of NH₄Cl. Heating and cooling curves made with NH₄Cl indicated that an inversion does take place between the limits 187° (heating) and 174° (cooling), but because of the sluggishness of the reaction the exact temp. could not be detd. by the thermal method. The 3-phase pressure curve for the system NH₄Cl-H₂O was detd. from 160 to 199.6°, but the accuracy was not sufficient to detect a break. The *T*—*X* curve was then detd. by the closed tube method making allowance for the H₂O in the vapor space. The results obtained lie on 2 curves; the equation of the lower temp. curve is: $-\log x = (464.5/T) - 0.5400$; that of the higher temp. curve, $-\log x = (327.8/T) - 0.2412$, in which *x* is the mol. fraction of NH₄Cl. The intersection of these curves is at 184.5°, which probably represents the inversion temp. to within a few tenths of a degree. Heating curves made in the presence of a catalyzer, *e. g.*, glycerol and mannitol, gave results in harmony with the above.

GEORGE W. MORREY.

Solution and separation of substances, especially liquid crystals. O. LEHMANN. *Ann. Physik* 47, 832-52(1915); cf. *C. A.* 8, 38, 2288, 2978, 3140.—General discussion of the subject. In general, the following forces are concerned in the sepn. of solid or liquid substances from soln.: expansive force, self-purification, cohesion or adhesion pressure and (especially in liquid crystals) the directive force, which influences the other

Chemical Abstracts.

The formation of crystals, especially mixed crystals, is not due to the fact that an't Hoff osmotic pressure exceeds the soln. pressure, but is essentially a consequence of the same forces which govern adsorption. Crystals grow on account of the presence near them of mols. which are able to add themselves to the crystal. The mols. of different polymorphic modifications of a substance and the "state of aggregation" are not identical. E. B. MILLARD.

Relative affinity of metals in non-aqueous solutions, and their reactivity in insulating media. I. JNANENDRA C. GHOSH. *J. Phys. Chem.* 19, 720-33(1915).—Expts. have been made on the sp. resistance of solns. in 8 org. solvents, and of the power of metals to displace each other from such solns. The resistances were detd. from the throw of a galvanometer in series with the soln. relative to the throw in series with a megohm box when the resistance was high, and by the usual Kohlrausch method when it was low. In nearly every case the resistance of the soln. was less than that of the solvent. The solutes were FeCl_3 , HgCl_2 , $\text{Hg}(\text{CN})_2$, CdI_2 and Pb oleate . A piece of metal was sealed up in a tube of soln. and allowed to stand for several days at room temp.; then the tube was opened and samples of the liquid analyzed. A series was obtained which was not identical with the usual e. m. f. series, for the "series" is not independent of the solvent, and the solvent present in any given combination. The velocity of the displacement may be very slow in a soln. with a sp. resistance of 500,000,000 ohms, but is never zero, and the change in velocity when passing from one solvent to another is not comparable to the change in elec. resistance. E. B. MILLARD.

Thermodynamic integrator. R. GANZ AND A. P. MIGUEZ. *Physik. Z.* 16, 247-51(1915).—Theoretical. The details of an integrator similar in construction to a pantograph have been given, and its use suggested in the calcs. in the Nernst heat theorem. E. B. MILLARD.

Graphical and mechanical calculation of chemical affinities from thermal data. W. DRÄGER. *Physik. Z.* 16, 295-8(1915); cf. preceding abstr.—Discussion of the above. E. B. MILLARD.

Electrical conductivity of certain salts in pyridine. E. X. ANDERSON. *J. Phys. Chem.* 19, 753-89(1915).—Conds. of about 6 concns. each of 15 salts in pyridine have been made by the usual method at 0, 25 and 50°, using cells of the Jones and Lindsay type (*Z. Physik. Chem.* 56, 129(1906)). The electrolytes divided themselves into 2 classes, those for which the cond. increased with diln. throughout, and those which showed minimum values of equiv. cond. The temp. coeffs. were smaller between 0 and 25° than between 25 and 50°. Polymers are thought to exist in soln., and the cond. of cond. solns. is largely due to ions from these polymers, e. g., Hg^{++} and HgCl_4^{--} in HgCl_2 . As diln. proceeds, there is more and more tendency toward the formation of simple ions; hence the mol. cond. increased. The anomalous behavior in equiv. cond. is due entirely to the presence and properties of the ionizable polymerized solute, which predominates in concd. solns. E. B. MILLARD.

Dielectric constants of some compounds of vanadium. A. G. LOOMIS AND H. J. DRAYTON. *J. Phys. Chem.* 19, 734-8(1915).—The app. was that used before (C. A. 4, 1914). V_2O_5 was mixed with sugar charcoal and ignited in a stream of H, then a stream of Cl was passed over the V_2O_5 which had been formed, and the resulting VOCl_3 was purified by distn. VOBr_3 was prepd. in a similar manner. VOCl_3 was made by passing Cl over ferro-vanadium and fractionally distg. the liquid product. The av. consts. at room temp. were, in the order above, 3.42, 3.62, 3.05. According to Thomson's rule the dielectric power of these liquids should be small.

but no expts. were made to test this statement. The elec. cond. of the liquids is very low.

E. B. MILLARD.

The boiling points of aqueous solutions of nitric acid at different pressures. II. The influence of water-retaining agents on the composition of the mixture of maximum boiling point. H. J. M. CREIGHTON AND H. G. SMITH. Swarthmore College. *J. Franklin Inst.* 180, 703-9(1915); cf. *C. A.* 9, 744.—The influence of the presence of KHSO_4 and H_2SO_4 on the b. ps. of aq. solns. of HNO_3 has been studied at different pressures. It has been found that, while the presence of KHSO_4 brings about little or no change in the compn. of the mixt. of max. b. p., additions of H_2SO_4 to aq. solns. of HNO_3 cause a decrease in the HNO_3 content of the mixt. of max. b. p., the decrease being greater the greater the amt. of acid added. Diminishing the pressure, in the case of these mixts., of HNO_3 and H_2SO_4 , has also been found to cause a slight further decrease in the HNO_3 content of the mixt. of max. b. p. The results obtained show clearly why aq. solns. of HNO_3 can be concd. to over 90% by distn. with H_2SO_4 .

H. JERMAIN CREIGHTON.

Physico-chemical studies of copper. II. E. COHEN AND W. D. HELDERMAN. *Z. physik. Chem.* 89, 638-9(1915); cf. *C. A.* 8, 2295.—In their former work C. and H. observed by dilatometric methods a transition point in Cu at 71.7° . The object of the present investigation was to det. the effect on this transition point of the previous thermal history of the metal. The sample of Cu studied before was placed in contact with CuSO_4 soln. for several days and then showed a transition point at 70.65° . Other samples, whose previous thermal history varied widely, showed transition points between 69.2° and 71.7° . Finally, a sample was prepd. which, kept at a const. temp. of 69.5° in the dilatometer, first contracted and then expanded, indicating that more than 2 allotropic forms of the metal were present.

E. H.

The action of neutral salts on the constants of chemical equilibrium. G. POMA AND G. ALBONICO. Univ. Parma. *Atti accad. Lincei* 24, I, 747-54(1915).—The mechanism which det. the peculiar property shown by neutral salts of accelerating the course of some reactions is still quite obscure. P. has, however, (cf. *C. A.* 7, 2887) detd. experimentally: (1) that the intensity of the action developed by neutral salts is in strict relation with the chem. nature of their ions and diminishes in passing from chloride to bromides to nitrates to iodides in succession; (2) that it is independent of the chem. nature of their cations; (3) that it seems to be proportional not to the complex salt concn. of the soln. but only to its ionic concn. These results show that the action of neutral salts on the velocity of reaction is not due exclusively nor mostly to the formation of hydrates in soln. P. (*C. A.* 8, 2094; 9, 991) detd. the e. m. f. and calcd. the concn. of the Cu ion in a series of aq. solns. containing a constant concn. of $\text{Cu}(\text{NO}_3)_2$ and a variable amt. of alk. earth nitrate and found, apparently contrary to the law of mass action, an increase in the Cu ions with increase in the neutral salt. The same was true for the H ion. The characteristics of this action on Cu and H are the following: (1) The intensity of this action is a function of the chem. nature of the cation; it increases with increase of the affinity for H_2O of the salt added, i. e., Rb, K, Na, Li, Ca and Mg is the order of increasing activity; (2) it is not an exclusive property of the electrolytes, for substances little ionized but with a strong affinity for H_2O (MeOH , EtOH) have the same effect on the concn. of Cu and H as the deliquescent salts; (3) with increasing diln. of the Cu the effect diminishes rapidly. P. and A. have now made a complete and systematic study of the action of neutral salts on the reaction $\text{RCO}_2\text{H} + \text{R}'\text{OH} \rightleftharpoons \text{RCO}_2\text{R}' + \text{H}_2\text{O}$ (in the presence of a strong acid) in order to det. to what extent these ideas may be applied to the study of chem. equil. The equil. const. in this case is independent of the temp., as well as the initial concns. of individual compds., which is true in spite of the fact that H_2O and alcs. are strongly associated and that

probably only the mono-mol. portion takes immediate part in the equil. If the undissociated mol. of the mineral acid or the free H ion has a purely catalytic action and if the neutral salts affect only this activity, then the catalyzers and neutral salts ought not to displace this equil. and ought to make only the proportional velocity of the 2 reactions vary. But Knoblauch (*Z. phys. Chem.* 22, 269(1897)), W. J. Jones (*C. A.* 5, 3421; 8, 3141) and F. P. Worley (*C. A.* 5, 2354; 7, 3259) have found that this is not the case. P. and A. have studied the action of neutral salts on the equil. const. in relation with the concn. of the catalyst, with the chem. nature of the organic acid esterified, with that of the esterifying alc., with the concn. of the neutral salts used and finally as a function of the mol. ratio between the amt. of H_2O and of the alc. present in the system. In each expt. H_2O and the alc. were present and in each case also either the ester or the corresponding acid besides the mineral acid catalyzer; its neutral salt was present in part of the expts. The initial concns. in $AcOH + MeOH \rightarrow H_2O + AcOMe$ are represented by a , b , c and d and k_1 and k_2 are the consts. of esterification and hydrolysis, resp. P. and A. describe a method of calcg. the values of k_1 and k_2 . The detns. of the equil. and the velocity of reaction were all made at $25^\circ \pm 0.01^\circ$ in Jena flasks provided with the Price app. to diminish the loss by evapn. The results of each expt. are given in tables. The presence of LiCl in the mixt. has an accelerating action on the velocity of esterification as well as on that of hydrolysis. Thus k_1 increases from 0.00240 to 0.00594 in the presence of 3 mols. of LiCl, while k_2 increases from 0.00041 to 0.00064, which corresponds with the diminution of the equil. const. K , which decreases from 0.170 to 0.108. It is concluded that the influence of LiCl on these reactions does not have the fundamental characteristics of the catalytic actions, but that it acts as if the neutral salt removes from the equil. part of the H_2O present in the system. II. *Ibid* 917-85. The methods and reactions studied were the same; the mol. ratio of $H_2O : MeOH = 1 : 2$ was used again and as neutral salts the chlorides of Ca, Mg and Li which have a variable affinity for H_2O . The amt. of HCl used was 0.2 mol. per l. The results show that $CaCl_2$ and $MgCl_2$ exercise an accelerating action on the velocity of esterification and hydrolysis and thus the equil. constant $K = k_1/k_2$ diminishes. With solns. containing the same number of g. mols. the displacement of the equil. increases on passing from LiCl to $CaCl_2$ to $MgCl_2$. The equil. const. in the absence of neutral salt but in the presence of 0.2 mol. HCl per l. is 0.17 which is much less than that calcd. from the results of Berthelot and P. de Saint-Gilles (*Ann. chim. phys.* 65, 66, 68 (1862-3)) which furnished a basis for the hypothesis that the HCl does not only behave as a catalyzer. Expts. showed that increasing concns. of HCl affect the equil. const. in the same way that the neutral salts do. Thus k_1 increases from 0.00240 to 0.01537 in passing from 0.2 N to 1.0 N HCl, while k_2 increases from 0.00041 to 0.00247, which confirms the view of those who maintain that the catalytic activity of the undissociated acid mols. is greater than that due to the free H ions. In order to know the influence of the chem. nature of the alc. EtOH was substituted for MeOH. The HCl was 0.2 N and the mol. ratio of $H_2O : EtOH$ was varied. For the detns. in the absence of neutral salts the difference $k_1 - k_2$ was detd. by extrapolation since the observed values diminished rapidly but seemed to tend to a limit. The cause of this diminution is not understood. The presence of LiCl, $CaCl_2$ and $MgCl_2$ in 2 N concns. has the same effect in this case as when MeOH was used. III. *Ibid* II, 43-51.—The above expts. were continued with MeOH or EtOH in various ratios with H_2O , in the presence or absence of 2 N KCl, NaCl, LiCl, $CaCl_2$ and $MgCl_2$. Expts. were made with 0.2 N HBrO, HNO_3 , HCO_2H , AcOH and $EtCO_2H$ as catalyst. The results will be referred to in the following general summary: The first general conclusion is that in the conditions used the presence of a neutral salt changes the homogeneous equil. of esterification and hydrolysis as if part of the H_2O present in the system were removed from an active role in the immediate equil. The displacement depends on the concn.

of the neutral salt used and on the nature of its cations; it increases rapidly with the diminution of the electroaffinity of the latter and thus the series increases in the order K, Na, Li, Ca and Mg. The influence of the anion is much less but not negligible; thus 2 mols. LiCl cause a diminution of 35.7% in K , 2 mols. LiBr 40%, and 2 mols. LiNO₃ 37.5%. As a whole, the results may be completely explained by assuming that the neutral salts in soln. form hydrates, the complexity of which increases with the decrease in the electroaffinity of their ions. But P. and A. consider the fact that increasing the mol. ratio between EtOH and H₂O causes a diminution in the equil. const. as constituting a grave difficulty for this hypothesis. P. (*l. c.*) studied the action of neutral salts on the apparent concns. of Cu ions and found that for the concns. studied their effects may be explained by the formation of hydrates in soln. The provisional explanation was that the equil. $\text{Cu}(\text{H}_2\text{O})_n \rightleftharpoons \text{Cu}^{+} + n\text{H}_2\text{O}$ exists in soln. and that only the anhydrous ions are active in establishing the potential difference between the Cu electrode and the soln. containing the Cu ions. The addition of a compd. capable of combining in soln. with H₂O establishes a competition between the hydrate ion and the compd. and thus increases the number of anhydrous Cu ions. All the facts observed with Cu(NO₃)₂ could be explained by this hypothesis. The analogy with what was found in the case of esterification equil. is evident. The fact that the diminution of the equil. const. and the increase of the apparent concn. of the H ion, detd. with the same quantity of neutral salt, are independent of the abs. quantity of H₂O present in the resp. systems appears difficultly reconcilable with the hypothesis that such variations may be ascribed only to the formation of hydrates in soln. In order to clear up these points the work is being continued in other directions. It was also found that the action of neutral salts on the equil. const. is influenced by the chem. nature of organic acids of the alc. esterified; in fact this const. increases rapidly with the increase of the mol. wt. of both. The accelerating action exercised by neutral salts on the single velocities of esterification and of hydrolysis as was deduced from variations of the corresponding consts. k_1 and k_2 is generally greater the greater the affinity for H₂O of the neutral salt used. This influence on the velocity of esterification is roughly proportional to the total salt concn., while its effect on the velocity of hydrolysis causes smaller increases than would be required by the law of simple proportion. The velocity of hydrolysis and that of esterification oscillate between constant values although the mol. ratio of H₂O to EtOH varies widely.

E. J. WITZEMANN.

Absolute temperatures. K. SCHREBER. *Physik. Z.* 16, 327(1915).—Claim for priority over Weber (*C. A.* 9, 2181).

E. B. MILLARD.

Vapor pressure of liquids at low temperatures. C. DRUCKER, E. JIMÉNO AND W. KANGRO. Leipzig. *Z. physik. Chem.* 90, 513-52(1915).—Two methods of procedure for the measurement of small vapor pressures at low temps. are described, and it is shown that both the McLeod manometer and the horizontal manometer give, in accordance with the principle of Huygens, results which are exact to less than 0.001 mm. Hg. With these instruments the vapor pressure of hexane, EtOH, Et₂O, C₇H₈, CHCl₃, (CH₃)₂CO, CCl₄, C₆H₅I and H₂O has been measured between +15 and -100°. The results obtained agree well with previous values.

H. JERMAIN CREIGHTON.

Critical temperature of mercury. JULIE BENDER. *Physik. Z.* 16, 246-7(1915); cf. Koenigsberger, *C. A.* 7, 1655.—By means of a method to be published later, the crit. temp. of Hg was estd. to be near 1650°, and is certainly above 1500° (cf. Menzies, *C. A.* 7, 3558, who gives 1270°). Detns. of the d. of Hg vapor and liquid were made up to 1400°, and the critical d. calcd. as 4.5. Calcns. of the vapor pressure from the vapor d. from the Boyle-Mariotte law gave 1180 atm. at 1400°.

E. B. MILLARD.

Heat of equilibrium and the law of saturated solutions. A. COLSON. *Compt. rend.* 161, 586-9(1915); cf. *C. A.* 10, 304.—The heat of equil. is the heat of soln.

in a satd. soln. minus the heat of diln. to the required concn. Expts. have been made on the heat effect of adding 20 or 40 cc. of H_2O to 500 cc. of satd. soln. of $NaCl$, KNO_3 , KCl and NH_4Cl . The ordinary heat of soln. of $NaCl$ is zero near 75° , and it has been found that the heat of diln. is zero at about 31.5° . The heat of diln. decreases linearly as the temp. is decreased, reaching -388 cal. at 6.85° . From these figures it was shown that the heat of equil. became zero near 0° .
E. B. MILLARD.

Calculation of Brownian molecular motion for the Ehrenhaft-Millikan apparatus. M. v. SMOLUCHOWSKI. *Physik. Z.* 16, 318-21(1915); cf. *C. A.* 10, 145.—Mathematical.
E. B. MILLARD.

Isothermals of air, argon and helium between 0 and 200° . L. HOLBORN AND H. SCHULTZE. *Ann. Physik* 47, 1089-1111(1915).—Isothermals have been detd. at 0, 50, 100, 150 and 200° up to 75 m. Hg. The higher pressures were measured with the manometers used in former work (*C. A.* 5, 14). A flask of known vol. was filled with gas at the pressure desired for the temp. under investigation, and the gas was expanded to atm. pressure in a vessel of known vol. In this way larger and larger quantities of gas were used for the higher pressures, so that the sensitiveness of measurement remained const., in place of decreasing as is the case when a const. quantity of gas is used. Details should be obtained from the original. Discussion is reserved for a future paper.
E. B. MILLARD.

Thermodynamic laws of periodic motion derived from the principle of least work. F. FÖRSTERLING. *Ann. Physik* 47, 1127-38(1915).—Mathematics.
E. B. M.

Thermodynamics of condensed systems. ADOLF SMEKAL. *Ann. Physik* 47, 1139-44(1915); *Sitzb. Akad. Wiss., Wien., Abt. IIa* 124, 181-6(1915).—Theoretical.
E. B. MILLARD.

Maximum speed of vaporization of mercury. MARTIN KNUDSEN. *Ann. Physik* 47, 697-708(1915).—Assuming that none of the mols. which escape from a liquid returns to it, the speed which can be attained in evapn. is $G = \frac{1}{4} Nmc = 43.75 \times 10^{-4} p(M/T)$, where c is the mean velocity of a vapor mol., m the mass of a single mol., p the vapor pressure in dynes per sq. cm., M the mol. wt. of the vapor, and T the abs. temp. Whether this max. speed can be attained or not depends on the conditions of the evapn. The ratio between an actually observed speed of evapn. and the max. value calcd. has been detd. for Hg. It depends to a considerable extent on the condition of the surface from which the evapn. takes place, and can reach unity for an absolutely clean Hg surface. A drop of Hg was suspended in a vessel in front of an ocular microscope, the vessel was exhausted, and a side arm of it immersed in liquid air, and the rate of evapn. of the drop was detd. from measurements of the diam. made from time to time.
E. B. MILLARD.

Vapor pressure investigation of the fusion products of iodine with sulfur, selenium, and tellurium. ROBERT WRIGHT. *J. Chem. Soc.* 107, 1527-31(1915).—Weighed quantities of S and I were melted together in a tube at 180° , the mixt. cooled and broken up, and the v. p. detd. by passing a known vol. of air over it at 100° and detg. the I carried away. In other expts. the vapor pressures were detd. at 56 or 79.8° . No solid soln. was formed in any case, since there was no lowering of the vapor pressure, even when the concns. were excessive. No compds. are formed when S or Se are fused with I, but a compd. is formed with Te and I. The compn. of this compd. was detd. by fusing Te with an excess of I and removing the excess with a current of air at 100° . Its formula corresponds to TeI_4 .
E. B. MILLARD.

Interpretation of van der Waals' equation from the standpoint of volume determined by equilibrium of pressures. W. V. METCALF. *J. Phys. Chem.* 19, 705-19(1915).—In the form $p + a/v^2 = RT/(v - b)$ the equation states that external pressure (p) +

cohesive pressure (a/v^2) is equal to the elastic pressure, i. e., to $RT/(v - b)$. As necessary consequences of the kinetic interpretation of the equation, the 3 following propositions are stated: (1) vol. is detd. by an equil. of opposing pressures; (2) in the case of a stable liquid the elastic pressure, which tends to increase the vol., increases with d. more rapidly than does the cohesive pressure, which tends to decrease the vol.; (3) the difference between the d. coeffs. of these 2 pressures decreases as the d. of the liquid decreases. These 3 statements are then applied to the usual form of $V - T$ isobars, in which the first part of the curve represents the stable liquid, the part up to the max. a metastable region, from the max. to the minimum on the curve another metastable region, and from this point on the vapor condition. These points are then discussed.

E. B. MILLARD.

Ternary system: carbon tetrachloride, alcohol, water. H. A. CURTIS AND E. Y. TIRUS. *J. Phys. Chem.* 19, 738-52(1915).—Weighed amts. of H_2O and CCl_4 were stirred together in tubes in a thermostat, and alc. added from a wt. buret until the mixt. was homogeneous. From this data the equil. line between the 1-phase and 2-phase systems at 19.75° was located. The general type of the crit. soly. surface was detd. over a range of about 50° by raising and lowering the temp. of 3-component mixts. past the temp. at which turbidity occurred or disappeared. Temp. has but little effect on the mutual soly. of the 3 components. Values of n have been detd. for 8 series of mixts. As H_2O is added to mixts. of CCl_4 and alc. rich in alc., n at first increases and then decreases. With mixts. rich in CCl_4 the max. n is reached with less and less H_2O ; with mixts. containing more than 35% CCl_4 the addition of H_2O causes n to decrease continually. Expts. on the d. of mixts. showed that the vol. of the system is less than that of the components.

E. B. MILLARD.

Electrical conduction by the oxidation of benzaldehyde and pinene. W. P. JORISSEN AND J. A. VOLLGRAFF. Leiden. *Z. physik. Chem.* 90, 553-6(1915); *Chem. Weekblad* 12, 93-7(1915).—The elec. conduction was measured by means of an electroscope. Both pinene and BzH oxidized in a stream of O rendered the O conductive.

H. JERMAIN CREIGHTON.

Determination of the true temperature of solid substances from the point of intersection of their logarithmic isochromatics in the visible spectrum. ELISABETH BENEDICT. *Ann. Physik* 47, 641-78(1915).—Detg. the point of intersection of the gray or black logarithmic isochromatics is a sensitive method of detg. the constancy of absorption of temp. radiation. From the logarithmic isochromatics for C-filament lamps, and the existence of points of intersection, it is shown that this filament and the positive crater of a C arc have const. absorption in the visible region of the spectrum, over a temp. interval of 1500 to 4200° abs. The black body in radiation measurements in the visible range may be replaced by a C filament with known surface. The normal temp. of the C arc was estd. at 4200° abs., within 1%, from these measurements. Since the gray isochromatics did not intersect for Pt, Os, and Osram lamps and the Auer mantle, these sources of light show selective radiation.

E. B. MILLARD.

Thermal and electrical conductivities of some metals between twenty and three hundred and seventy-three degrees absolute. WALTHER MEISSNER. *Ann. Physik* 47, 1001-58(1915); cf. *C. A.* 8, 2102.—Values of thermal cond. (λ) and elec. cond. (κ) have been detd. for 2 specimens of Cu (one of which was especially pure), for Au, Pt and Pb, in order to test the Lorenz law of the constancy of $\lambda/\kappa T$, and to obtain the temp. coeff. of λ . The Dieselhorst form of the Kohlrausch method was used, in which the resistance and voltage between 2 points of the specimen were detd. for 2 different current strengths, as well as the temp. coeff. of the resistance at that temp. Formulas have been derived which allow the expts. to be carried out at very low temps. At low temps. both the ratio of the Lorenz law and the values of λ undergo some varia-

tion. The correctness of the Grüneisen resistance formula was proved. On lowering the temp. from 273 to 20° abs., the ratios $\lambda/\kappa T$ and $1/\lambda$ decrease as much as 85%. The temp. change of these 2 quantities is similar to that of atomic heat. E. B. M.

Theory of the urano-uranyl sulfate photochains. G. TRÜMLER. Zürich. *Z. physik. Chem.* 90, 385-457(1915).—When current is withdrawn urano-uranyl sulfate photochains behave like ordinary elements. It has been found that the cause of the Becquerel effect lies in the uranyl salt. This effect is the manifestation of an after volume effect of light in the soln. of the uranyl salt. The potential displacement in light depends upon the chem. condition of the electrode. Although the displacement of the equil., $U^{VI} + 2A^* = U^{IV} + 2A^* + 1$, is not reversible in light, certain substances (A) exert a strong influence on the potential displacements in light, so much so, that these displacements are pushed back to a marked extent by small quantities of such substances, and under certain conditions can change their signs. Therefore, according to the compn. of the system, a positive or negative effect may result. The negative effect is diminished by I, HI, $V_2(SO_4)_3$, $VOSO_4$, HCl, $Fe_2(SO_4)_3$ and $FeSO_4$. Change of sign, is brought about by I, HI, $VOSO_4$ and $FeSO_4$, that is, the negative effect appears to be positive. The positive effect is diminished by SO_2 , $U(SO_4)_2$ and oxalic acid. The foregoing substances, which exert either a positive or negative influence on the Becquerel effect, also decrease the fluorescence of uranyl sulfate solns. The fluorescence of these solns. is also decreased by rise in temp. In conclusion a theory is put forward to explain the Becquerel effect of U salts. H. JERMAIN CREIGHTON.

Absorption spectra of aqueous solutions of hydrated salts as measured by means of the radiomicrometer. E. J. SCHAEFFER, M. G. PAULUS AND H. C. JONES. Johns Hopkins Univ. *Z. physik. Chem.* 90, 561-92(1915).—The change of the absorption bands of water due to the presence of hydrated and water-free salts has been investigated. Solns. of H_2O -free salts, which do not in themselves cause absorption, show in the center of the absorption bands less transparence than pure H_2O . On the other hand, hydrated salts, the nitrates excepted, show in aq. soln., in the center of the absorption bands, greater transparence than H_2O . It has been found that all aq. solns. of such hydrated salts are more transparent than H_2O for all the wave lengths investigated. This holds especially for the 1.25μ bands of the aq. solns. of such salts. H. J. C.

Bohr's theory of the series spectra of hydrogen and helium. EDUARD RIECKE. *Physik. Z.* 16, 222-7(1915).—Mathematical. E. B. MILLARD.

Natural optical activity of liquids and gases. M. BORN. *Physik. Z.* 16, 251-8 (1915).—Mathematics. E. B. MILLARD.

Light sensibility of copper oxide. A. H. PFUND. *Science* 42, 805-6(1915).— Cu_2O has a much lower specific resistance than either Se or stibnite and is much more transparent to red light (layers having a thickness of more than 1 mm. are still slightly translucent). The facts established for this new light-sensitive substance are: (1) the conduction is electronic and not electrolytic; (2) the increase in cond., occasioned by light, is distinctly different from that produced by a heating effect; (3) the cond. increases with the applied voltage, i. e., Ohm's law is not obeyed (voltage effect); (4) the region of increased cond. spreads slightly to portions of the material not illuminated (transmitted effect); (5) the region of highest sensibility lies in the ultraviolet near $\lambda = 2800 \text{ \AA}$; (6) cooling in liquid air increases the % change in cond. and displaces the cond. max. in the red toward shorter wave lengths; (7) the relation between the radiant energy absorbed (E) and the resultant change in cond. (C) is very approx. of the form $C = KE^b$, where K is a const., and b lies near 0.5. While the % change in cond. is much less than for Se or stibnite, the comparatively high cond. of Cu_2O makes the abs. change quite large. The best cell constructed had a resistance of 15,200

ohms at 17° for 1 v. The change of cond. occasioned by the light from a 40-watt W lamp at 20 cm. is about 15% for an exposed area of about 12 sq. mm. Details are to appear later.

E. B. MILLARD.

Optical constants of transparent silver and copper films. H. FRITZE. *Ann. Physik* 47, 763-90(1915).—Systematic study of the optical properties of films prepd. by cathodic bombardment or by chem. processes, of their relation to the thickness of the film, and to the wave length. For Ag films n decreases steadily with increasing thickness of the film from 0.6 to $105\mu\mu$, while the absorption coeff. increases, though not in the same ratio. Both quantities approach the values for the massive metal, as was shown by the Drude reflection method. The term "massive metal" may be applied to films as thin as $105\mu\mu$. Films of any thickness may show either normal or anomalous dispersion. The properties of the Ag films were independent of the method of prepn., whether from chem. reactions or cathodic decompn. The Hagen-Rubens method did not give correct results for the absorption coeff.

E. B. MILLARD.

Absorption and dispersion of light in solutions of dyes. B. J. VAN DER PLAATS. *Ann. Physik* 47, 429-62(1915).—The results of the accepted dispersion theories have been confirmed from solns. of several dyes at various concns. by expts. after the Kettler method. Values of n detd. by this interferential refractometric method are correct to 3 places. Dispersion curves calcd. from the various theories did not differ much from each other, though they all showed a smaller anomaly than the exptl. curve. The law of Beer was valid so long as there was no fluorescence.

E. B. MILLARD.

Power of reflection of some aqueous solutions in the ultra-red spectrum. F. GEHRTS. *Ann. Physik* 47, 1059-88(1915).—The reflective power of H_2O has been detd. over the range 1.0 to 11.5μ ; the results are in harmony with those of Rubens and Ladenburg, and of Ångström. The max. reflective powers of the salts in the solid state, and in soln., were, resp., $AgNO_3$ 7.45, 7.65; $CdSO_4$ 9.1, 9.25; K_2CrO_4 11.05, 11.4. Measurements with $(NH_4)_2SO_4$ and NH_4NO_3 showed that the reflective power of a soln. was not a linear function of its concn., but increased sharply with increasing concn. With the increase in concn. the reflection max. is shifted toward the short-wave end of the spectrum. Both of these facts are in harmony with the Drude theory of dispersion. The displacement of the reflection max. is due to the increase in the extinction coeff. with increasing concn. The reflection maxima for several org. substances in soln. were detd., as follows: $KSCN$ 4.95, NH_4SCN 4.95, $KCOOH$ 6.30, NH_4COOH 6.35, $NaCOOH$ 6.3, $KOAc$ 6.45, $NaOAc$ 6.5. Even in org. salts the compds. of the same acid have approx. the same reflection maxima, as shown for inorg. compds. by Coblenz, Pfund and Clark. The characteristic frequency of an org. acid radical is also shown by the esters.

E. B. MILLARD.

Doppler effect for canal rays in argon. K. FRIEDERSDORFF. *Ann. Physik* 47, 737-62(1915); cf. Stark and Kirschbaum, *C. A.* 8, 1382.—This paper covers the range 4965.4 Å to 2884.1 Å and confirms for a larger number of lines the results of S. and K. between 4300 and 4000 Å. The lines of the red A spectrum have monovalent ions as carriers, those of the blue, di- and other polyvalent ions as carriers. The number of monovalent ion carriers decreases with increasing voltage, and becomes nearly equal to zero at 42,000 volts; at 30,000 v. all of the series C and D come into emission. In A canal rays at high voltages, beside di- and tri-valent ions, there appear to be tetra-valent ions.

E. B. MILLARD.

Number of emission centers in luminous metallic vapor in flames, and the relation of this number to the brightness of the radiated spectrum lines. HERMANN SENFTLEBEN. *Ann. Physik* 47, 949-1000(1915).—The magnetic rotation of the plane of polarized light by luminous Na vapor, for the D line, was detd. as exactly as possible.

The method of crossed Nicols is not suited to exact measurements, nor is the method of quartz double wedges, but the use of Savart plates gave exact results. Voigt's theory of magnetic rotation was given support from these expts., and the number of emission centers could be calcd. from this theory with the formula $\rho = 4\pi N(e^2/m)$, where ρ is a quantity proportional to the number of centers and detd. from a complex equation connecting the rotation with the wave length, and N is the number of emission centers per unit vol. The statement of Ladenburg and Reiche that the brightness is proportional to the cube of the number of emission centers for not too small vapor densities was very exactly confirmed. This relation was also detd. for very small vapor densities, at which a direct detn. would be impossible. From the relation between brightness and the number of centers for flames of different temps. it was shown that a variation of 1.5% in the temp. changes the number of emission centers 25%. The ratio of the number of centers in the 2 D lines was detd. as 2, within a few %, and showed no variation with the vapor density or the temp. of the flame in the range investigated.

E. B. MILLARD.

Addition to "correction of the Curie-Langevin magnetization law for molecular distances." E. A. HOLM. *Ann. Physik* 47, 694-6(1915); cf. C. A. 9, 2484. E. B. M.

Broadening of spectrum lines. A. LANDÉ. *Physik. Z.* 16, 313-6(1915).—Theoretical.

E. B. MILLARD.

Broadening of spectrum lines. A. J. DEMPSTER. *Ann. Physik* 47, 791-808 (1915).—A Hilger interferometer with Fabry-Perot plates was used to study the broadening of lines at pressures below an atm. When light is generated by electrons from a Wehnelt cathode the collisions are not elastic. The structure of a complex line is no simpler when this source is used. Over a large range of velocities the light vibrations of the electrons are equally homogeneous. In light from a quartz Hg lamp the main line is more broadened than the satellites. Broadening of the He lines is in general parallel to the Stark effect, though absorption may exert an influence. In a weak inductor-discharge the Hg green under He pressure is more broadened than would be expected from the Stark effect. The line H under He pressure is less broadened than found by Michelson under hydrogen pressure. By generating the line λ 4686 Å by rapid cathode rays it was possible to obtain a very sharp line by Rau's method, and to make an exact interferometric detn. of the wave length. The ratio of the lines to a definite at. wt. is uncertain until the cause of greater broadening of H_β and H_γ than H_α is discovered.

E. B. MILLARD.

Magnetic spectrum of oxygen canal rays. T. RETSCHINSKY. *Ann. Physik* 47, 525-62(1915).—The energy distribution of O canal rays in the magnetic field, and its relation to the discharge potential, current strength, pressure, and sign of the charge, have been detd. by the method of Wien (C. A. 4, 1934). Many maxima were found in the energy curve. It was shown by a photographic method that 3 kinds of particles were present in O canal rays under the conditions of these expts.: simple charged mols., simple charged atoms whose velocity was $\sqrt{2}$ times that of the mols., and simple charged atoms whose velocity was equal to that of the mols. Positively and negatively charged particles have corresponding velocities, but different distributions of energy among the 3 kinds of particles. The number of slow atoms is greater than that of rapidly moving atoms or mols. The velocity of the particles increases as the $1/2$ power of the discharge potential. By increasing the pressure in the discharge tube, or by decreasing the potential, the energy of the slow positive ions is decreased more than that of the rapidly moving ions.

E. B. MILLARD.

Radiation from an electric source, and line spectra. L. SILBERSTEIN. Univ. Rome. *Phil. Mag.* 30, 784-805(1915); cf. C. A. 9, 2484.—Mathematical theory.

G. L. WENDT.

Absorption spectra of metallic-amino complexes (SHIBATA) 6. Nature of vibrations causing the color of dyes (WATSON) 10. The electron theory in organic chemistry (McCLELLAND) 10. Nature of residual valence (EPHRAIM) 6.

3. RADIOACTIVITY.

WILLIAM H. ROSS.

The structure of the atom. K. FAJANS. *Umschau* 19, 661-6(1915); *Chem. Zentr.* 1915, II, 817.—A collective article on older and newer views concerning the structure of the atom with especial consideration of the radioelements. E. H.

X-rays and crystalline structure. LOUIS BRUNET. *Rev. gén. sci.* 26, 645-55, 678-88(1915).—A review. W. H. Ross.

Color effects of positive and of cathode rays in residual air, hydrogen, helium, etc. CHAS. T. KNIPP. Univ. Illinois. *Science* 42, 942-3(1915).—A description is given of an app. which is suitable for exhibiting the color effects produced by the positive and by the cathode rays in different gases. The discharge tube is dumb-bell shaped and is made of two 2-l. Florence flasks. The cathode is mounted in the neck joining the flasks and consists of a hollow Al cylinder closed at the ends with Al discs, through the center of each of which is a rectangular opening. The anode is placed in one of the bulbs. In a side tube placed at right angles to the neck of the bulbs are attached the cathode terminal, a nipple for exhausting, and a charcoal bulb for absorbing traces of air. When the proper amt. of a gas is placed in the app. according to the method described, the cathode beam will be found to give rise to one color in one of the bulbs, while in the other bulb the positive ray beam will be found to give rise to an entirely different color in the same gas. W. H. Ross.

Volatilization of extremely thin radioactive deposits. A. B. WOOD. Univ. Liverpool. *Proc. Roy. Soc. London (A)* 91, 543-60(1915).—An exptl. study was made of the more important factors which influence the volatilization of extremely thin films of the radioactive deposits. Each of the sources of influence was considered separately by eliminating as far as possible the disturbing effects of the others. Th B was chosen for the expt. as being typical of all similar constituents in the active deposits of Ra, Th or Act. Pt and quartz are recommended as the most suitable materials for forming a surface on which to collect the deposit in expts. of this kind. It was shown to be extremely difficult, however, to remove by heating alone the last traces of the active deposit from the surfaces of these as well as of other materials. This would indicate that a certain fraction of the mols. of the active deposit is held to the surface of the material on which it is deposited by forces of cohesion due to the mols. of the material in their immediate neighborhood, and it is considered possible that this small percentage of the active deposit has penetrated below the surface mols. of the material by the process of radioactive recoil. The most consistent results are obtained when the surface is exposed to the Em without elec. field, in which case the volatilization is independent of the time of exposure to the Em. The volatilization is shown to obey practically the same law as the rate of emission of positive ions from a hot body, this expression, $\text{rate} = AT^n e^{-B/T}$, being modified by the introduction of a factor $\phi(N)$ which depends on the amt. of active deposit which has been volatilized. A comparison of the volatilization curves at pressures of 760 mm. and 3 mm. showed a lowering by about 50° of the initial temp. of volatilization at low pressure. The volatilization curve at atm. pressure agrees extremely well with that given in a previous paper by Baratt and Wood (*C. A.* 8, 3530). W. H. Ross.

The variation of the potential in Röntgen tubes. A. WEHNELT. *Ann. Physik* 47, 1112-26(1915).—The deflections of the cathode ray spot of a Braun tube, connected as a condenser in parallel with a Röntgen ray tube, were photographed by means of a revolving mirror, and showed that the voltage on the tube increases to a max., when an abrupt partial discharge takes place, giving a heavy current through the tube. The voltage drops and builds up again more slowly to the discharging point, this occurring several times for each phase of the current from the induction coil. A hard tube shows only one or two such discharges per phase; a soft one has more, and when heavy currents are used there is a diminution in the abruptness of the discharge. The values of di/dt , and therefore of the voltage, are high. G. L. WENDT.

The velocity of electrons expelled by X-rays. C. G. BARKLA AND G. SHEARER. Univ. Edinburgh. *Phil. Mag.* 30, 745-53(1915).—The max. velocity of the electrons ejected from various substances on radiation with X-rays does not vary with the radiator, as is the case when ultraviolet light is used, but is within 2% the same for all substances studied. There is no notable difference in the velocities of the electrons arising from K and from L radiation. G. L. WENDT.

A method of finding the coefficients of absorption of the different constituents of a beam of heterogeneous Röntgen rays, or the periods and coefficients of damping of a vibrating dynamical system. SIR J. J. THOMSON. *Phil. Mag.* 30, 780-3(1915).—A mathematical paper. G. L. WENDT.

A comparison of the positive rays with the spectrum of the positive column in a mixture of helium and hydrogen. HAROLD SMITH. Cambridge. *Phil. Mag.* 30, 805-11(1915).—Photographs of the spectrum of the positive column, compared with the deflection curves of the positive rays in the same discharge tube, show no correspondence. A gas whose spectrum is completely masked by that of another gas present may yet take a large part in the carrying of the current in the dark space. It is suggested that, since it is the atoms of high at. wt. that effect the masking and these also tend to become multiply charged, the masking effect is due to the increased attraction and recombination of these multiply charged heavy atoms. G. L. WENDT.

The recoil of radium D from radium C. A. B. WOOD AND W. MAKOWER. Univ. Manchester. *Phil. Mag.* 30, 811-5(1915).—The α -rays from a strong deposit of Ra C on a Pt wire were passed through a narrow slit to impinge on a Schumann plate and were deflected by a magnetic field of 13,000 gauss. About half-way between the deflected and undeflected lines appeared a fainter somewhat diffuse line due to the recoiled atoms of Ra D which therefore carry a single positive charge. The diffuseness is attributed to the varying depths beneath the surface of the Pt at which the Ra C disintegrates after its formation from Ra B which enters the Pt by recoil from Ra A. G. L. WENDT.

The variation of the emanation content of certain springs. R. R. RAMSEY. Indiana Univ. *Phil. Mag.* 30, 815-8(1915).—Measurements of the Em content of the Hottle and of the Illinois Central springs at Bloomington, Ind., made weekly, from Sept. 1914 to June 1915, using the Schmidt shaking method and Em electroscope, show a variation between 445×10^{-12} and 1420×10^{-12} curies per l. in the case of the former, and between zero and 820×10^{-12} curies per l. for the latter. The Em content increased with the flow of the springs and the maxima came during the wet season. This indicates the soln. of the Em by the water percolating through the soil. G. L. WENDT.

Energy measurements of Röntgen rays. B. WINAVER AND ST. SACHS. Frankfurt a/M. *Physik. Z.* 16, 258-64(1915).—The present photographic and luminescent screen methods of detg. the radiation from an X-ray tube are far from

satisfactory. It appears desirable to devise a method utilizing the ionization produced, as in γ -ray measurements with Ra. In attempting a direct comparison of the energy from an X-ray tube with that from a known Ra prepn., in order to det. the Ra equiv. of the former, 2 factors must be dealt with particularly: the secondary radiation, and the difference in absorption of γ -rays and X-rays. The secondary radiation from γ -rays is much more penetrating than that from X-rays; hence it is proposed to reduce all secondary radiation to a minimum by employing a so-called "air electro-scope" with extremely thin walls, which Eve (C. A. 6, 26) first devised to minimize the vol. effect of the walls in producing secondary radiation. Such an electro-scope was made of thin paper walls rendered conducting by covering with lead pencil, with metallic bronze paint, or with very thin Al foil. By comparing the ionizations in this electro-scope and in an ordinary Pb electro-scope by means of a soft X-ray tube at 180 cm. distance, and 1.2 mg. of Ra at 40-50 cm., reduction factors were obtained for detg. the Ra equiv. of an X-ray tube with the Pb electro-scope. The equivs. thus detd. agree with those calcd. from the heat effects found bolometrically. A new unit of X-radiation is proposed according to which the ionization produced by the complete absorption in air of 1 unit shall be equal to the ionization produced by the complete absorption in air of the γ -rays from 1 g. of Ra in equil. with its products, Ra B and Ra C.

S. C. LIND.

A possible relation between the velocities of alpha rays and the quantum hypothesis. H. RAUSCH V. TRAUBENBERG. *Physik. Z.* 16, 264-5 (1915).—v. T. has shown (*Nachr. kgl. Ges. Göttingen* 1915) that by combining Bohr's two equations, $mv^2/r = eE/r^2$ and $mvr = h/2\pi$, the following expression is obtained for the initial velocity of β -particles: $v = (2\pi/h)eE$ in which h , the const. of the quantum hypothesis, $= 6.55 \times 10^{-27}$, e , the elemental charge, $= 4.76 \times 10^{-10}$ e. s., and E , the charge on the nucleus of the atom, $= 1/2$ at. wt.; it is assumed that the velocity of emission is the same as that of rotation about the nucleus as calcd. from the equation given above. The agreement of the calcd. with the measured velocities was satisfactory. On attempting to treat the velocities of α -particles similarly, assuming 3 electrons attached to the rotating atom, the calcd. velocities were about 10-fold too high. v. T. now makes a new assumption that the α -particle just before emission occupies a position on the equatorial belt of the parent atom which is revolving on its own axis with a velocity equal to the initial velocity of projection of the α -particle. The velocity of revolution is calcd. from the equation, $v = (9/4)(hc^2/\pi E^2)$, from which the initial velocity of α -particles from Ra C is calcd. to be 1.63×10^9 cm. sec.⁻¹, while the measured is 2.08×10^9 ; and from U₁, 1.31×10^9 cm. sec.⁻¹ as against 1.45×10^9 found by measurement, from which it is seen that the formula at least gives the order of magnitude of the velocity and also expresses the fact that the velocity increases for progressive disintegration members, without throwing any light however on the exceptions presented by Ra F and Th C₁.

S. C. LIND.

The beta rays from radium D and the absorption law for beta rays. L. MEITNER. Berlin-Dahlem. *Physik. Z.* 16, 272-6 (1915).—The existing value of 130 cm.⁻¹ for the absorption coeff. in Al of β -rays from Ra D was suspected of being greatly in error. The difficulty encountered in dealing with these rays is due to their extremely low penetrating power, which is even less than that of α -particles. This fact combined with the very high ionizing power of the latter necessitates a very complete sepn. of Ra D from Po. This was accomplished by dissolving the Pb containing Ra D in dil. HNO₃ to which a small quantity of tellurous acid was added. The Te was pptd. by SnCl₂. The Po was removed with the Te and the filtrate was repeatedly treated thus, until free from Po. A sulfide pptn. was then produced in this filtrate and a sepn. of Pb and Sn was accomplished by means of (NH₄)₂S_x. The small quantity of Pb con-

taining Ra D was dissolved in HNO_3 to which a little FeCl_3 was added and partially pptd. with NH_3 to remove Ra E. This operation was repeated until an inactive Fe ppt. was obtained. The Pb and Ra D pptd. from the last filtrate were used for the electroscopic measurements. The growth of activity due to β -rays of Ra E gave additional evidence of the purity of the Ra D initially. The 2 sets of β -rays have velocities of 0.33 and 0.39 of that of light, resp., and are the slowest β -rays which have yet been examd. electroscopically. The value of the absorption coeff. in Al is in round numbers 5500 cm^{-1} . Evidence was also obtained supporting the "complete arrest" theory of absorption of β -rays as opposed to the gradual loss of velocity from successive mol. encounters.

S. C. LIND.

The applicability of selenium to Röntgen ray energy measurements. R. FÜRSTENAU. *Physik. Z.* 16, 276-9(1915).—Remarks upon a paper of the same title by Voltz (*C. A.* 9, 3027). F. attributes the irregularities in the resistance curves of Se obtained by V. to the lag effect of the type of cell used, so that the after-effect of the previous measurement produced an error in the following one. The current loads used by V. were also excessive and were probably in part responsible for the irregular results. By suitable choice in the method of preparing the cell, F. claims that a type may be made which is distinguished by the absolute regularity of its action and which is particularly well suited to energy measurements of X-rays.

S. C. LIND.

The applicability of selenium to Röntgen ray energy measurements. F. VOLTZ. *Physik. Z.* 16, 308-11(1915).—Reply to Fürstenau (cf. preceding abstract). Even if the lag effect of a Se cell can be eliminated by suitable construction, V. remains of the opinion that selective absorption will still render the Se cell unsuitable for energy measurements of X-rays, if the primary cause of the resistance effect is attributable to the kinetic energy of the electrons produced in Se by the action of X-rays. Since this energy will vary with the conditions of operation of the X-ray tube it must still be reckoned as a disturbing source of error, a demonstration of which the author hopes to be able to furnish in the near future. The cell type constructed by Fürstenau may prove very valuable, however, for other measurements, particularly with ultraviolet light.

S. C. LIND.

The question of the measurement of the hardness of Röntgen rays photographically. F. VOLTZ. *Physik. Z.* 16, 306-8(1915).—V. finds that the results obtained in the detn. of the hardness of X-rays by photographic methods are influenced by the material of the plate as well as by the compn. of the developer. Previous results based on this method, therefore, which have been very common in medical work, are subject to criticism, and in the future the method should be abandoned except for purposes of preliminary orientation.

S. C. LIND.

Stereoscopic photography by Röntgen rays. P. KNIPPING. Charlottenburg. *Physik. Z.* 16, 280-2(1915).—Note upon the publication of Alexander (*C. A.* 9, 2485) under the same title. K. claims that X-rays played no role in the stereoscopic effects obtained by Alexander in making X-ray photographs of rolls of wire gauze. The same effects may be obtained by photographs with ordinary light under suitable conditions. Photographs are shown illustrating this contention.

S. C. LIND.

Extraction and recovery of radium, uranium and vanadium from carnotite. C. L. PARSONS, R. B. MOORE, S. C. LIND AND O. C. SCHAEFER. U. S. Bur. of Mines, *Bull.* 104, 124 pp.(1915).—A method of treatment of carnotite for the recovery of Ra, U and V has been devised in the Section of Mineral Technology in the U. S. Bur. of Mines, and in coöperation with the National Radium Inst. a plant has been constructed in Denver with a daily capacity of 3.5 tons of ore. Using this method, over 700 tons of ore had been treated up to Sept. 15, 1915, the results of which are reported

in this bulletin. The ore was mined under supervision of the Bureau in Long Park in the Paradox Valley region, Colo., and has averaged 2.66% U_3O_8 and 4.28% V_2O_5 . The Ra content has been shown to be in the theoretical equil. ratio with U and therefore averaged 7.5 parts of Ra per billion parts of ore by wt. The ore is ground for treatment to pass 20-mesh and is then extd. in earthenware pots with hot 38% HNO_3 . 500 lbs. of ore are introduced into the hot acid in each pot. 121 lbs. of 100% HNO_3 are diluted with distd. water to 38% and heated by means of live steam to about 85° before the introduction of the ore begins. Condensation of the steam lowers the concn. to 35% or less. The heat of reaction on adding the ore raises the temp. to about 92°. The heating is continued for about 15 min. after all the ore is added, and the acid soln. of Ra, V, U and other sol. bases is then dropped onto an earthenware suction filter and is filtered through asbestos cloth or filterose. The ore residue is washed once with hot HNO_3 diluted 3-fold from the original, and once with hot distd. water and is then discarded. The residue is mainly silica, should be quite light in color and does not retain more than 2-3% of Ra and about the same proportion of U. The total sol. portion of the ore is about 15%. The V extn. with HNO_3 is not very satisfactory owing to the tendency of V_2O_5 to be pptd. out by the oxidizing action. The filtrate from the extn. and the 2 washes are brought together from a number of pots into a wooden tank and are first diluted 2-3-fold with cold tap water. Since about $\frac{1}{2}$ of the original acid is still present, it is necessary to neutralize this as far as possible with NaOH until pptn. of Fe or V is just on the point of taking place. This partial neutralization still leaves about $\frac{1}{4}$ of the original acid unneutralized, but this point must not be exceeded or the Fe and V will contaminate the Ra- $BaSO_4$ ppt. Fifty lbs. of concd. H_2SO_4 and 5 lbs. of $BaCl_2$ are now added; these are sufficient together with the Ba in the ore to produce 15-20 lbs. of $BaSO_4$. The whole is pumped up, during continued agitation, through a "duriron" pump into a large wooden settling tank provided with a conical bottom into which the Ra- $BaSO_4$ ppt. is allowed to settle for 2-4 days. On the 2nd day 1 lb. of $BaCl_2$ is added in the settling tank to furnish new pptn. nuclei for the $RaSO_4$. After settling the supernatant liquid is syphoned off through a floating syphon which automatically interrupts the flow so as to leave enough liquid above the ppt. in the conical bottom to avoid disturbing the ppt. which is then brought down together with the rest of the liquid onto a large suction filter. After filtering, the Ra- $BaSO_4$ is washed once with dil. NaOH and once with H_2O , and is then collected by hand in Fe drying pans in which it is weighed after drying in steam closets. The recovery of Ra as sulfate is checked up by car-load lots of ore by making composites of ore and corresponding sulfates from each day's run; in these the Ra is detd. by the Em method. The recovery of Ra as sulfate was 88.3% for the 1st 21 cars of ore, representing a recovery of 4258 mg. of Ra element in the form of sulfate, averaging 1.08 mg. of Ra per kg. The $BaSO_4$ itself was a high grade sulfate containing little SiO_2 and running 90% pure, which constitutes a great advantage in that carbon reduction can be directly applied. For a time second sulfates were also recovered from the filtrate, this adding about 2-3% to the total Ra recovery, but since these sulfates contain only 0.07 mg. of Ra per kg., it appeared doubtful if their concn. would prove profitable and such collection was abandoned after the 14th car. The conversion of Ra- $BaSO_4$ into sol. form was accomplished by mixing with $\frac{1}{4}$ its wt. of charcoal in a ball mill and then heating for 7-10 hrs. in an oil furnace at 800°; this reduced 90% or more of Ra and Ba, in the same proportion, to the sulfide which was dissolved in excess of HCl and filtered. The undissolved residue is reserved for the same treatment, while the acid soln. is subjected to fractional crystn. in acid-proof enamel iron ware to concentrate the $RaCl_2$. After 3 crystns. at the plant, a crude chloride is delivered at the lab. containing 4-10 parts per million of Ra; this is redissolved in HCl

soln., filtered and recrystd. 3 times as chloride and is then rendered ammoniacal for the pptn. of Pb with H_2S ; the filtrate is treated with excess of $(NH_4)_2CO_3$, the ppt. of Ra- $BaCO_3$ is taken up in HBr and the recrystn. continued as bromide in acid soln., in fused quartz ware, to any desired degree of purity. The refining necessarily lags in point of time somewhat behind the production of Ra as sulfate. Up to Sept. 15, 1915, 1947.5 mg. of Ra element had been delivered to the National Radium Inst. as high grade bromide or chloride 10-90% pure, as desired. For the various methods of Ra measurement employed see Lind, *C. A.* 9, 1714; 10, 147. The filtrate from the original Ra- $BaSO_4$ pptn. which contains the V and U is run into a wooden tank containing a hot soln. of excess of Na_2CO_3 to ppt. the Fe and other bases; these are filtered off in presses and discarded. In the filtrate the U is pptd. as $Na_2U_2O_7$ by NaOH in boiling soln. The recovery of U in this form has been from 75 to 94%, averaging 84.4%. Several preliminary methods of freeing the uranate from V and of converting it into the oxide UO_2 are described but the method finally adopted is reserved for future publication. The alk. filtrate from the U is rendered neutral or very slightly acid and V is pptd. as ferrous vanadate of variable compn. containing 35-40% of V_2O_5 . The final recovery of V is very poor owing to the use of HNO_3 as original extg. acid, but since HNO_3 proved preferable for Ra, V had to be sacrificed to a final recovery of not more than 30%. The av. cost of producing 1 g. of Ra element is estd. at \$37,599; this will be further lowered on deducting the returns from the sale of the U and V by-products. The av. cost of producing 1 lb. of $Na_2U_2O_7$ has been 31.49 cents and of V_2O_5 59.1 cents in the form of ferrous vanadate. $NaNO_2$ was crystd. from the final liquors containing it and utilized to regenerate HNO_3 in a plant having a capacity of 3250 lbs. of acid daily which averaged 63%. Detailed costs of construction, equipment, operation including coöperation of the Bur. of Mines are presented and have been included in estg. final costs. A more detailed abstract of this bulletin is to be found in *J. Ind. Eng. Chem.* 8, 48-53(1916).

S. C. LIND.

Radium from carnotite. C. L. PARSONS. *Met. Chem. Eng.* 14, 51-3(1916); cf. preceding abstract.

W. H. ROSS.

Radium production from Colorado carnotite ores by the U. S. Bureau of Mines. ANON. *Chem. News* 112, 315-6(1915); *Chem. Eng.* 22, 129-30(1915); cf. preceding abstracts.

W. H. ROSS.

Radioactive liquids and gases. H. FARJAS. *Brit.*, 18,807, Aug. 18, 1914. Liquids are rendered radioactive by storing them in a vessel filled with radioactive balls prepd. according to 14,530, 1913 (*C. A.* 9, 22). Inlet and outlet cocks are fitted to the vessel. When a continuous supply of liquid is required, the app. comprizes a tube filled with the radioactive balls and provided with suitably placed end cocks. An app. for rendering air radioactive comprizes a cylinder through which a fan forces a current of air, and perforated plates placed across the cylinder and enclosing radioactive balls as before, one plate being removable.

Radioactive bodies. H. FARJAS. *Brit.*, 18,808, Aug. 18, 1914. Radioactive balls are made from mixts. of Ra ores or concentrates and cement according to 14,530, 1913 (*C. A.* 9, 22), and are formed with plain smooth surfaces without cavities, passages, or recesses.

Device for detecting loss of emanations. R. SOMMER. *Ger.*, 284,648, May 28, 1913. The device is used in connection with app. for satg. moisture with emanations.

Röntgen tubes. VEIPA-WERKE and F. DESAUER. *Ger.*, 283,858, Feb. 11, 1914.

Control of Röntgen apparatus. SIEMENS & HALSKER, ART.-GMS. *Ger.*, 285,405, Oct. 3, 1913.

Making Röntgen pictures. G. BUCKY. *Ger.*, 284,371, Feb. 6, 1913. The fogging action of secondary Röntgen rays is prevented.

4. ELECTROCHEMISTRY.

COLIN G. FINK.

Trygve D. Yensen. ANON. *Elec. World* 67, 165(1916), illus.—A biographical sketch. C. G. F.

Electrochemistry in 1914. K. ARNDT. *Chem. Ind.* 38, 242-51, 291-307(1915); cf. *C. A.* 9, 1718.—A review. F. W. SMITH.

Electric steel direct from ore fines. A. C. DALTON. *Iron Age* 96, 1184-5(1915).—Exptl. results of smelting finely pulverized (200-mesh) Moose Mt. magnetite show recovery as high as 97.1%. Anthracite screenings contain less S and cause better reduction than coke breeze. The fuel is coarse enough to allow some C to reach the bath in solid form. Excess C is largely consumed by use of natural draft through the tuyères. The lower the C content of the pig steel, the higher is the % of FeO in the slag. Control of slag must be balanced with phys. conditions, or erratic results will follow. A thin hot slag is best. Results already obtained tend to show that final costs will be within commercial limits and that the pig steel will be of high grade and uniform compn. W. H. B.

Progress in electroplating in 1914. K. NEUKAM. *Z. angew. Chem.* 28, 452-5, 463-7(1915). E. H.

Electrolytic precipitation of gold, silver and copper from cyanide solutions. G. H. CLEVINGER. *Met. Chem. Eng.* 13, 803-6, 852-60(1915).—A paper presented at the 28th general meeting of the Am. Electrochem. Soc. (San Francisco). Among the processes described are the Siemens & Halske process on the Rand, S. Africa; the practice at Minas Prietas, Mexico; San Sebastian, Salvador; Virginia City, Nevada; El Rayo, Mexico; and Nelson, Brit. Columbia. C. also discusses the relative merits of different kinds of anodes, cathodes, the treatment of by-products and the cost of installation of electrolytic pptn. plants. Full details of the various practices are given. C. A. N.

Copper cyanide solutions. W. H. WEBER. *Metal Ind.* 13, 493-4(1915); cf. *C. A.* 9, 1151.—W. compares results with CuCO_3 and CuCN dissolved in NaCN . There are secondary reactions when CuCO_3 is the Cu salt. The oxide formed at the electrode is probably Cu(OH) . $2\text{CuO} \cdot \text{Ba(CN)}_2$ is used to remove hydroxides and carbonates. From analysis the amt. of Ba(CN)_2 or other cyanide necessary to ppt. these is calcd. from the difference between total Na and Na required for NaCN and NaCu(CN)_2 in soln. W. H. BOYNTON.

A modern acid-dipping, electroplating and japanning plant. H. N. TURNBULL. *Gen. Elec. Rev.* 18, 1121-6(1915).—An illus. description of a part of the switchboard department of the General Elec. Co. The plant is divided into 3 rooms for the 3 operations. Splendid ventilation and working conditions are obtained. No hot plating solns. are used. H_2O for plating baths is distd. and that for cleaning is filtered. The cleaning soln. is agitated by admission of compressed air through a perforated pipe at the bottom of the tank. The bake oven is heated electrically and revolves. The turntable may be revolved so that one compartment is at the baking temp. (260°) while the other is in a position for loading and unloading or by turning 90° instead of 180° both will be in the baking zone. Heat is conserved by having 2 vertical doors or flaps along the edges of the oven opening; these press against the revolving cylinder and shut off from the outer air the zone between the oven and the cylinder. Advantages of the revolving oven are continuous baking, no fire risk, and economy of floor space. W. H. BOYNTON.

The installation and working of lead storage batteries. R. RANKIN. *Elec. Rev. West. Elec.* 67, 1107-8(1915); *Electrician* 76, 175(1915).—The charging plant should be large enough to charge the whole battery thoroughly. Also a means should be furnished for charging individually cells lower in condition than the rest of the battery;

this is done by a bridging-lead, or "milking booster." With the first, the "sick" cell is taken out of circuit during discharge and reinserted on charging while with the "milking booster" it may be connected during charge or discharge. The rate of charge is $\frac{1}{2}$ the usual charge rate and continuous, if possible. The temp. of the electrolyte should not be above 38°. For the first few hours the sp. gr. falls; then it gains till the whole of the sulfate is reduced. Constancy of voltage and sp. gr. indicate a full charge. If the level of the electrolyte is below the top of the plates, there is less active plate area available and corrosion results on the plate. Water is added through a tube reaching to the bottom of the cell to insure proper mixing. W. H. BOYNTON.

Effects of electrolysis on engineering structures. A. F. GANZ. San Francisco Eng. Congress. *Electrician* 76, 199-201(1915).—An explanation is given of the way in which electrolysis is caused by stray currents from electric railways with earthed return. Various means are discussed of averting electrolytic corrosion of railway tracks and their supports, sheathed cables, pipes, steel foundations, and reinforced concrete structures. F. W. SMITHER.

Tungsten arc lamps. E. A. GIMINGHAM AND S. R. MULLARD. *Elec. Rev.* 77, 743-5(1915); *Elec. World* 67, 52(1916); *Electrician* 76, 390-2(1915); *Elec. Rev. West. Elec.* 67, 1166(1915).—An arc lamp between W electrodes in an inert gas, such as N or A, is described. To start the lamps, an incandescent filament composed of W combined with ZrO_2 , ThO_2 , or the like is used. The refractory oxides are added to increase the ionizing properties. Cutout mechanism is provided to throw in the arc at the proper time. At the sputtering point 3.33 c. p. per watt is obtained. Lamps with a life of 500 hrs. have been made. The av. decrease in c. p. is 10% during life. The arc is shown to be very stable as a drop of 20 to 25% in voltage was necessary before the arc was extinguished. The range of intrinsic brilliancy between these points is 400 c. p. to 30,000 c. p. per sq. in. A stereoptican W arc lamp has recently been put on the market in London by the Edison and Swan Co. W. K. RUDER.

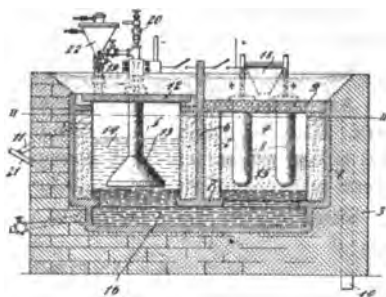
Solution of smoke, fume and dust problems by electrical precipitation. L. BRADLEY. *Met. Chem. Eng.* 13, 911-4(1915); cf. *C. A.* 9, 23, 1273.—With a proper arrangement of pipes or plates and wires acting as "collecting electrodes" and "discharge electrodes," resp., it is possible to produce a discharge from wires to the pipes or plates through the gases. These electrodes are insulated by high voltage insulators to insure passage of the current through the gas. Rapid polarity reversal keeps the particles in suspension, hence d. c. is necessary. The current is obtained by transforming a high voltage a. c. and converting into an intermittent high voltage d. c. The amount of power is relatively low and the smallest particles are collected. Fractional pptn. is possible. Several fields for research are suggested. W. H. B.

The construction of insulators out of "hard paper" or "pertinex." K. FISCHER. *Electrician* 76, 197-9(1915).—Pertinex consists of rolled layers of paper which have been impregnated with resin, heated and pressure applied. Its elec. properties are like those of paper; the other properties are like those of resin. Synthetic resins give best results. The mechanical strength is 120,000 kg. per sq. cm. Many shapes for indoor insulators are shown. The dielec. const. should have a mean value of 4.5. Pertinex insulator is designed to avoid a breakdown in the adjoining layer of air, or in the substance itself. W. H. BOYNTON.

Use of graphite in the lubrication of cylinders. F. W. CARTER. *Power* 43, 47-8 (1916).—C. describes tests showing that a decided saving is effected by the use of oil containing graphite over and against the use of straight oil. C. G. F.

Determining weight of deposit (WILSON) 7. An electrically conducting paint (JAMES) 26.

Electrolytic production of alkali metal cyanogen compounds. C. E. ACKER. U. S. 1,160,811, Nov. 16. A cast Fe or steel furnace, 1, with a refractory (Al_2O_3 or MgO) lining, 2, and heat-insulating brick casing, 3, has C anodes, 8, and Fe, Ni or C cathode, 13. BaCl_2 with a small amt. of NaCl is used in the chamber 14 in fused condition with an underlying layer of molten Pb, 16. The chamber 15 contains molten NaCN with or without admixture of Ba carbide, cyanide or other Ba salt from which the Ba may be subsequently displaced by Na. Metallic Na is liberated at the cathode but as soon as an appreciable proportion of Ba cyanide is present (this may be purposely introduced at the very start) the metallic Na displaces the Ba, which latter then immediately combines with C, free or combined, to form amorphous Ba carbide; and this substance remains suspended in the cyanide. N may then be introduced through pipe 20 and will pass down through the hollow shank of the cathode 13 to the lower surface thereof, and there spread out in the form of a thin layer between the face of the cathode, or "plunger," and the molten alloy, and thus come into effective reactive contact with the suspended Ba carbide with which it combines to produce Ba cyanide. The Ba in the Ba cyanide is then displaced by the metallic Na at the cathode, with the consequent production of Na cyanide and metallic Ba which latter again becomes available for the production of more carbide. If there is no free C present the Ba will seize upon one element of combined C in the Na cyanide to form Na cyanamide which is perfectly stable; but this latter substance is promptly reconverted into Na cyanide as soon as free C is added. C in the form of charcoal, from which the air and moisture have been removed by heat and vacuum, may be introduced through the hopper 22 into the reaction chamber. Fuel oil may be introduced through the oil feed device 21 under pressure, and will then come into contact with the red hot cyanide, which may also contain some cyanamide, below the surface of the plunger, at which temp. the oil will be broken up into finely divided C (lampblack) and H, the latter substance escaping through the overflow spout 11.



Drawn tungsten wire. GEN. ELÉC. CO. Brit., 13,076, May 27, 1914. The wire which readily takes a permanent set without heating is produced by heating in the presence of an oxidizing agent the wire, prepd. by one or more of the methods described in 21,513, 1906, 23,499, 1909 (C. A. 5, 2781), 8,031, 1910 (C. A. 5, 3543), and 9,877, 1912 (C. A. 7, 3472), and after the drawing operation has been completed. The wire may be treated after it has been mounted in a lamp, by passing current through it while the lamp is connected to the pump and before the usual degree of vacuum is reached, the small amt. of O present having the desired effect; or the wire may be treated before mounting it in lamps. The process may be applied to wire which has been treated for the prevention of off-setting. A modified process is described.

Rust-proofing. H. HANEMANN and F. HANAMAN. Ger., 284,803, Mar. 29, 1914. The article of Fe or steel is heated by means of an elec. current in an atm. of a gas, such as NH_3 , which forms a nitride. The metal can be heated to a white heat elec., and immersed in a nitride-forming liquid which yields a nitride-forming atm. by evapn. Or the articles to be treated may be immersed, as electrodes, in accordance with the Lagrange-Hoho process, in a liquid producing an elec. conducting and nitride forming

gas (such as NH_3). *E. g.*, the Fe article is connected, in a vessel, with a pole of a high tension d. c. The vessel contains an electrolyte composed of a conducting salt, preferably an NH_4 salt, and concd. NH_4OH . The other electrode, of large surface, is in combination with the other pole of the source of current. Upon completion of the circuit a mantle of gas is observed, and the Fe soon becomes incandescent. In consequence of electrolytic conduction and chem. action, the NH_4OH is volatilized with the formation of NH_3 and H_2O . By a thermic reaction between the NH_3 and the highly heated Fe surface, an exceptionally thick layer of Fe nitride is formed in a short time. After the incandescence, the article is allowed to cool in the electrolyte itself or in NH_3 gas which is contained in a bell over the electrolyte. The app. required is very simple.

Filament lamps. A. O. APPELBERG. Ger., 284,621, July 17, 1914. The filament consists of 2 or more V-shaped pieces.

Securing incandescent filaments. J. PLÉCHATI. Ger., 284,582, Feb. 18, 1913.

Arc lamp. SIEMENS-SCHUCKERT-WERKE, G. M. B. H. Ger., 285,250, July 24, 1913. The C electrodes are directed downward, and are regulated by longitudinal and lateral adjustments. A contact is actuated by the mechanism controlling the lateral adjustment which upon failure of the arc throws in a substitute resistance.

Incandescent vapor lamp. W. ROSENSTEIN. Ger., 284,437, Jan. 24, 1914.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

Sir Henry Roscoe. ANON. *Chem. Trade J.* 57, 583-4(1915); *Engineering* 100, 648(1915); *Chem. News* 112, 317-8(1915).—An obituary with a brief biography.

E. H.

Nature of residual valence. XII. Ammoniates of copper. F. EPHRAIM AND E. BOLLE. Bern. *Ber.* 48, 1770-7(1915); cf. *C. A.* 9, 2195.—The following compds. were studied by detg. the p - t curves over a short range: the "abs. temp. of dissociation" T , (*i. e.*, the temp. (abs.) at which the dissociation pressure reaches 1 atm.) was detd. by extrapolation, Q was calcd. from Nernst's formula. $\text{Cu}(\text{NO}_3)_2 \cdot 4\text{NH}_3$: t , 143° , p , 65 mm.; 153.5° , 85 mm.; 154.5° , 157 mm.; 175.5° , 255 mm.; T , 479° ; Q , 17.4 Cal. $\text{Cu}(\text{NO}_3)_2 \cdot 6\text{NH}_3$: -18° , 213 mm.; -12° , 264 mm.; -9° , 303 mm.; -3.5° , 390 mm.; 1° , 485 mm.; 6° , 600 mm.; 13° , 771 mm.; T , 284° , Q , 9.8 Cal.; some solid soln. is probably formed. $\text{Cu}(\text{ClO}_4)_2 \cdot 6\text{NH}_3$: 20° , 74 mm.; 28° , 119 mm.; 37° , 182 mm.; 47° , 247 mm.; 52° , 312 mm.; 60.5° , 409 mm.; 70° , 543 mm.; 75° , 617 mm.; 83° , 744 mm.; T , 284° ; Q , 9.8 Cal. $\text{CuS}_2\text{O}_6 \cdot 4\text{NH}_3$: 66° , 103 mm.; 77° , 108 mm.; begins to decomp. above 80° . $\text{CuS}_2\text{O}_6 \cdot 5\text{NH}_3$: -20° , 60 mm.; -13° , 113 mm.; -9° , 143 mm.; -4° , 183 mm.; 1° , 237 mm.; 9° , 351 mm.; 14° , 455 mm.; 19° , 585 mm.; 26° , 794 mm.; T , 298° ; Q , 10.4 Cal. $\text{CuS}_2\text{O}_6 \cdot 6\text{NH}_3$: 112° , 24 mm.; 149° , 34 mm.; 171° , 41 mm.; 184° , 77 mm.; T , 523.5° ; Q , 19.3 Cal. $\text{CuS}_4\text{O}_{14} \cdot 4\text{NH}_3$: 20.5° , 5 mm.; 50° , 87 mm.; 65° , 116 mm.; 82° , 240 mm.; 89° , 480 mm.; 93° , 753 mm.; T , 366° ; Q , 13.0 Cal. $\text{Cu}(\text{CNS})_2 \cdot 6\text{NH}_3$: -19° , 609 mm.; -15° , 680 mm.; -12° , 733 mm.; T , 258° ; Q , 8.9 Cal. $\text{Cu}(\text{CNS})_2 \cdot 4\text{NH}_3$: 17.5° , 3 mm.; 40.5° , 14 mm.; 55.5° , 39 mm.; 66.5° , 83 mm.; 72° , 123 mm.; 77° , 169 mm.; 84.5° , 249 mm.; 93° , 354 mm.; 104° , 574 mm.; 110° , 765 mm.; T , 383° ; Q , 13.7 Cal. $\text{Cu}(\text{CO}_3\text{H})_2 \cdot 4\text{NH}_3$: -13° , 9 mm.; -5° , 15 mm.; -2° , 19 mm.; 11° , 41 mm.; 20° , 66 mm.; 28° , 98 mm.; 36° , 184 mm.; 41° , 230 mm.; 47° , 269 mm.; 54° , 312 mm.; 62° , 367 mm.; T , 332° ; Q , 11.7 mm.; an inversion probably takes place at about 37° . $\text{CuC}_2\text{O}_4 \cdot 5\text{NH}_3$: -19° , 15 mm.; -2° , 15 mm.; 16° , 26 mm.; 16° , 48 mm.; 21° , 294 mm.; 27° , 438 mm.; 32° , 597 mm.; 38° , 788 mm.; T , 308.5° ; Q , 10.8 Cal.

GEORGE W. MORREY.

Absorption spectra of metallic-ammino complexes. I. Cobaltic amines and their chemical constitution. Y. SHIBATA. *J. Coll. Sci. Imp. Univ. Tokyo* 37, Art. 2, 1-28(1915); cf. *C. A.* 7, 1663; 8, 616.—The absorption spectra of 26 salts were examd. with a Hilger quartz spectrograph and iron arc as light source. The concns. were 0.01 *N*, 0.001 *N* and, in a few cases, 0.0001 *N*. Results are shown by curves, logs of layer thickness being plotted against wave lengths at limits of absorption. The curves all show minima (maximum absorption) near 2000 Å and 3000 Å; complexes containing two NO₂ groups in the 1-6 (trans) position show a 3rd band at about 4000 Å in 0.0001 *N* soln. The following conclusions are drawn: (1) The band at 2000 is little affected by substitutions within the complex and is probably due to a partially dissociated electron of the cobalt atom. The other bands are due to the metalloid atoms and are more or less displaced by substitutions. (2) Complexes of similar chem. constitution absorb alike and if the number of metalloid atoms in groups of similar character is the same, the complexity and molecular size have little effect. *E. g.*, the ammine and diethylenediamine complexes absorb alike but differently from the nitro or nitrito complexes. (3) The sign and valence of the complex ion does not affect absorption. (4) Optical isomers and the racemate absorb alike. (5) Stereoisomers in general absorb differently. (6) The anion is wholly without effect upon the absorption.

A. R. MIDDLETON.

Rare earths. Oxide and hydrates of neodymium. CH. GARNIER. *Arch. sci. phys. nat.* 40, 199-213(1915); cf. *C. A.* 9, 3162.—Very pure Nd(OH)₃, dried at 180° till the last trace of NH₃ was removed, was heated in a Heraeus furnace in a current of N. Two additional hydrates were found to exist: 2Nd₂O₃·3H₂O at 320°, clear brown with slight rose tint stable to nearly 525°; at this temp. Nd₂O₃·H₂O, paler brown, is formed and is stable to about 650°. The last in color and reflection spectrum is identical with the "Oxide A" described by Waegner (*Z. anorg. Chem.* 42, 118(1904)). Above 650° a slow transformation into the blue oxide takes place but this retains a gray tinge with a slight tint of brown; its spectrum shows some of the bands of the preceding hydrate. The clear blue oxide is obtained only by heating in a current of H and cooling in the same. A pastel of blue oxide heated in the oxy-hydrogen flame slakes in moist air to a rose powder, the reflection spectrum of which is entirely distinct from that of the blue oxide. The rose powder when heated to 1000° and cooled in H lost 12.7% wt. and its reflection spectrum then became identical with that of the blue oxide.

A. R. MIDDLETON.

Heteropoly acids which contain vanadium. V. Compounds which contain molybdic acid and selenic acid. W. PRANDTL AND W. VON BLOCHIN. *Z. anorg. Chem.* 93, 45-74(1915); cf. *C. A.* 9, 2744.—The following new compds. were prepd.: *Ammonium 2,5-selenitemolybdate*, 2(NH₄)₂O·2SeO₃·5MoO₃·3H₂O, from (NH₄)₆Mo₇O₂₄ and H₂SeO₃ or by weakly acidifying a strong NH₄OH soln. of MoO₃ and SeO₃, forms small rhombic prisms, easily sol. in H₂O. *Potassium and rubidium 2,5-selenitemolybdate* were similarly prepd. and are isomorphous with the above; the *barium* compd. was prepd. from a soln. on the NH₄ compd. and BaCl₂ soln. *Ammonium 2,8-selenitemolybdate*, 3(NH₄)₂O·2SeO₃·8MoO₃·5 and 8 H₂O, is best prepd. by acidifying with AcOH a soln. of 4 mol. MoO₃ and 1 mol. SeO₃ in NH₄OH; the corresponding K compd. could not be prepd. but the *barium compound* was obtained from BaCl₂ and the above NH₄ compd. Attempts to replace more than 2 mols. of MoO₃ in (NH₄)₆Mo₇O₂₄ with SeO₃ failed, indicating that 2 mols. of MoO₃ have a position in the mol. different from the others. When strong HNO₃ was added to an alkaline soln. containing MoO₃ and SeO₃, yellow ppts. of varying compn. were obtained, generally containing 2 SeO₃ to 12 MoO₃. When the soln. contained a large amt. of SeO₃ no ppt. was obtained, but the soln. yielded crystals of the compounds 2(NH₄)₂O·6SeO₃·6MoO₃·9H₂O and 2(NH₄)₂O·7SeO₃·6MoO₃·-

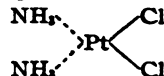
8H₂O. P. considers that the formulas assigned to complex heteropoly acids by Rosenheim are untenable, partly because they afford no explanation of the above fact that 2 of the MoO₃ groups in (NH₄)₂Mo₇O₂₄ have a unique position. G. W. M.

Ferroboron and manganoboron products. J. HOFFMANN. *Chem. Ind.* 38, 338-40 (1915).—A review of work on Goldschmidt's Feⁿ and Mn borides. It is concluded that the behavior of these borides with H₂O, H₂S, F, Cl, Br, I and N is of theoretical interest, but shows undesirable properties for the technologist. (Cf. C. A. 5, 639, 1732, 2226, 3017.) F. W. SMITHER.

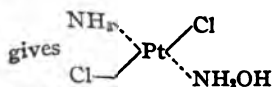
Chromyl chloride. II. E. MOLES AND L. GOMEZ. Madrid. *Z. physik. Chem.* 90, 593-602 (1915); see C. A. 9, 3184. H. JERMAIN CREIGHTON.

Two series of derivatives of bivalent platinum. L. CHUGAEV AND V. LEBEDINSKII. *Compt. rend.* 161, 563-4 (1915).—The compd. Pt(MeCN)₂Cl₂ when carefully heated yields an isomeric form, which is termed the β form. Both the α and the β forms, when treated with liquid NH₃, take up 4 mols. NH₃, forming the compound Pt(Me₃CN)₂(NH₃)₄Cl₂, colorless, very sol. in H₂O, both Cl atoms are completely ionized. This new type of compd. is being further investigated. GEORGE W. MOREY.

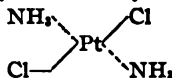
The complex hydroxylamine compounds of bivalent platinum. L. CHUGAEV AND I. CHERNYAEV. *Compt. rend.* 161, 637-9 (1915).—The authors have prepd. a number of the compds. of the type [Pt(NH₂OH)_n(NH₃)_{4-n}]X₂. In aq. soln.



reacts readily with NH₂OH to form the complex $\left[\begin{array}{c} \text{NH}_3 \cdots \text{Pt} \cdots \text{NH}_2\text{OH} \\ | \\ \text{NH}_3 \cdots \text{Pt} \cdots \text{NH}_2\text{OH} \end{array} \right] \text{Cl}_2$ which



gives [Pt(NH₂OH)₂NH₃] on treatment with HCl at 100°. From this, the compound [Pt(NH₂OH)₂NH₃] may be readily obtained by heating it with 2 mols. of NH₂OH and liquid NH₃ in sealed tubes.



in aq. soln. with NH₂OH gives $\left[\begin{array}{c} \text{NH}_3 \cdots \text{Pt} \cdots \text{NH}_2\text{OH} \\ | \\ \text{NH}_2\text{OH} \cdots \text{Pt} \cdots \text{NH}_3 \end{array} \right] \text{Cl}_2$. All the representatives of the series [Pt(NH₂OH)_n

(NH₃)_{4-n}]Cl₂ are perfectly colorless and are more or less sol. in H₂O. The mol. cond. (t = 25°, V = 1000) gives values varying between 240 and 260, which corresponds to that of electrolytes of the type [Pt(A)₄]X₂. The chloride [Pt(NH₃)₂NH₂OH]Cl₂ gives the salt [Pt(NH₃)₃Cl] on the addition of HCl, the NH₂OH being eliminated and substituted by an atom of Cl. An analogous reaction occurs if the compd. [Pt(NH₃)₂(NH₂OH)Cl₂] is heated with HCl, the principle product being the acid [Pt(NH₃)Cl₂]H.

L. T. FAIRHALL.

Dithio-trimercuric salts. G. DENIGÈS. *Bull. soc. chim.* 17, 353-9 (1915).—**Dithio-trimercuric sulfate**, HgSO₄·2HgS, small, white, microscopic prisms, was prepd. by heating a dil. soln. of HgSO₄ with a little CS₂ on the steam bath; the *nitrate*, *chloride*, *bromide*, *acetate*, and *propionate* are similar and were prepd. in a similar manner. The same compds. were obtained when COS or HCNS was substituted for CS₂.

GEORGE W. MOREY.

Phosphorus-molybdenum compounds. III. **Complex hypophosphosomolybdenosemipentoxide molybdic acids.** F. MAWROW AND M. NIKOLOW. *Sophia. Z. anorg. allgem. Chem.* 93, 170-6 (1915).—M. previously (*Z. anorg. Chem.* 28, 162; 29,

136(1901)) described 2 compds. obtained by adding H_3PO_4 to a soln. of $(NH_4)_3MoO_4$ acidified with HCl; one has a violet color, the other blue. These compds. have been prepd. again and analyzed, and it is concluded that the violet substance is *hypophosphorosodimolybdenosemipentoxide-monomolybdic acid*, $Mo_6O_{13} \cdot 6H_3PO_4 \cdot 3H_2O$; the blue compd., *hypophosphorosomonolybdenosemipentoxide-trimolybdic acid*, $Mo_6O_{14} \cdot 6H_3PO_4 \cdot 4H_2O$. Addition of NH_4Cl , $NaCl$ or $CoCl_2$ to the soln. of the above blue compd. gave blue amorphous ppts. of *ammonium*, *sodium* and *cobalt hypophosphorosomonolybdenosemipentoxide-pentamolybdate*, $M_2O \cdot Mo_7O_{10} \cdot 2H_3PO_4$. 4, 4 and 7 H_2O , resp.

GEORGE W. MOREY.

Uranyl formate. ARNO MÜLLER. Magdeburg. *Z. anorg. allgem. Chem.* 93, 267-70(1915).— $UO_2(HCO_2)_2 \cdot H_2O$ was prepd. by pptg. a warm acid soln. of $UO_2(NO_3)_2$ with H_2O_2 , dissolving the pptd. peruronic acid in HCO_2H with the aid of a catalyzer (platinized asbestos), and evapg. the soln. so obtained in a vacuum desiccator. The crystals were freed from excess acid and H_2O with KOH and H_2SO_4 , resp., in a vacuum desiccator kept in the dark. $UO_2(HCO_2)_2 \cdot H_2O$ was obtained in hard octahedral, greenish yellow crystals; d_{18} , 3.695; insol. in EtOH, Et_2O , $CHCl_3$ and Me_2CO ; sol. in concd. $HCOOH$, $MeOH$, H_2O . The aq. soln. hydrolyzes with sepn. of a light yellow basic salt. Heated in a test tube, it decrepitates, and leaves a residue of U_2O_5 . It is sensitive to light. Its H_2O is lost completely at 110° , leaving a grayish green residue which is decompd. by H_2O and $MeOH$.

GEORGE W. MOREY.

Thermal decomposition of hydrogen peroxide in aqueous solution. Preliminary note. W. CLAYTON. Univ. Liverpool. *Trans. Faraday Soc.* 1916 (advance copy), 8 pp.—Merck's perhydrol was dild. to the required amt. The decomposing solns. were placed in various flasks (Jena glass, wax-lined flasks, and quartz) in electrically controlled thermostats at 50° and 60° . The rate of decompn. is shown to be extremely sensitive to colloidal org. matter. Volatility and presence or absence of stirring do not exercise appreciable influence. The purity of the water is shown to be the chief factor; the rate in tap water is fully 50 times that in water of cond. 1.1×10^{-8} ohm. It is doubtful if the surface of the vessel exerts an appreciable effect; effects previously attributed to the surface may have been due to variations in the content of org. matter.

A. R. MIDDLETON.

7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Reagents for use in gas analysis. II. Chromous chloride. R. P. ANDERSON AND J. RIFFE. *J. Ind. Eng. Chem.* 8, 24-6(1916).—From their experiments A. and R. conclude that the prepn. of $CrCl_3$ by the method of von der Pfordten (*Ann.* 228, 112(1885)) and of Jannasch and Meyer (*Ann.* 223, 375(1886)) does not result in a stable soln., suitable for gas analysis; the prepn. of $CrCl_3$ by the reduction of violet $CrCl_4$ with H gives a soln. which, when properly filtered, is stable, but the absorption of O, though rapid, is not complete. It is improbable that $CrCl_3$ will ever be widely used in gas analysis, except in the presence of CO_2 and H_2S . E. W. BOUGHTON.

The absorption of oxygen in alkaline solutions. A new absorbent for oxygen. F. HENRICH. *Ber.* 48, 2006-9(1915).—By substituting KOH for NaOH in the alk. soln. of $Na_2S_2O_4$ used by Franzen (*Ber.* 39, 2069) for the absorption of O, H. finds that absorption occurs much more rapidly. A comparison of this soln. with one containing NaOH as the alk. agent was made by absorbing O from air in a Hempel pipet. The NaOH soln. required 9 min. to absorb the O from 50 cc. of air, whereas the KOH soln. required 3 min. only. The investigations of H. also show that solns. of pyrogallol in KOH absorb O more rapidly than those in NaOH. For special analyses, where the high

content of KOH in the absorption soln. is prohibitive, H. investigated the absorption capacity of solns. of 1,2,4-(HO)₃C₆H₃. 11.4 g. of 1,2,4-(AcO)₃C₆H₃ suspended in 20 cc. of H₂O were mixed with concd. KOH soln. (17.5 g. KOH). When soln. was complete, the mixt. was cooled and with 130 cc. H₂O was filled into a Hempel pipet. By this soln. the oxygen was completely removed from 100 cc. of air with vigorous shaking in 1/2 min. 100 cc. of oxygen were fully absorbed in 1/2 min. The soln. on standing for some months showed no trace of gas bubbles and the absorption capacity was unaltered.

L. T. FAIRHALL.

The action of metallic magnesium on the sulfides of tin, antimony and arsenic. C. PERTUSI. *Ann. chim. anal.* 20, 229-33(1915).—SnS₂ treated with powdered Mg in aq. suspension is reduced to Sn⁺⁺ and to Sn with the liberation of H₂S and the formation of Mg polysulfides. The sulfides of As in the presence of Mg and concd. HCl decompose readily with the evolution of H₂S and AsH₃, and are finally reduced to free As. The behavior of the sulfides of Sb is analogous to that of As. In systematic analyses divide the mixt. of the sulfides of the 3 elements into 3 parts. To the first add Mg powder until the yellow color turns brown; filter, treat the residue with HCl, heat the filtrate from this to boiling and identify Sn by adding HgCl₂. To the second portion add Mg and 4-5 cc. MeOH; warm gently and filter on a dry paper into a little concd. HCl. Sb remains in soln. but in the presence of As a yellow ppt. is obtained, easily recognized. Sb in the 3rd portion is identified by the method of Gas-taldi and Pertusi (cf. C. A. 9, 572).

H. L. OLIN.

A colorimetric method for the determination of copper and iron in pig lead, lead oxides, and lead carbonate. B. S. WHITTE. *J. Ind. Eng. Chem.* 7, 1035-6(1915).—*Pig Pb, PbO, and PbCO₃*: Weigh the finely divided sample (30 g. for refined products; 10 g. for crude) into a 400 cc. beaker and dissolve in hot HNO₃ (1:1) added portionwise (if basic nitrate forms, dil. with a little hot H₂O and boil). Add 32 cc. H₂SO₄ (1:1), let settle, filter, wash with small portions of warm H₂O, neutralize filtrate with NH₄OH, and add 4 cc. excess; boil, filter, wash ppt. well with hot H₂O and reserve for the detn. of Fe. Acidify filtrate with HCl (Fe- and Cu-free), adding not more than 2 drops excess; add 6 drops of K₃Fe(CN)₆ soln. (1:10) and filter through double papers, inspecting filtrate for Cu₃Fe(CN)₆. Dissolve the Cu₃Fe(CN)₆ ppt. from filter with alternate washings of NH₄OH and hot H₂O, keeping vol. within 40 cc.; acidify with HCl, transfer to a 100 cc. Nessler tube, dil. to mark with H₂O, and det. colorimetrically according to a modification of Carnelly's method (Sutton's "Volumetric Analysis," pp. 204-5), using a standard soln. of 0.393 g. CuSO₄·5H₂O per l. *Red lead*: Treat 30 g. with 40 cc. HNO₃ (1:1), slowly add 30-40 cc. of 3% H₂O₂, boil to effect soln., and proceed as above. *Na₂SO₄* may be used instead of the H₂O₂. *Fe in above compds.*: Dissolve the Fe(OH)₃ ppt. in HCl (1:1), make up to 300 cc. and mix, take 10 cc. and det. Fe colorimetrically with NH₄CNS as per Schaeffer (cf. C. A. 7, 1462). If the sample contains much Zn, acidify the filtrate from the Fe(OH)₃ with AcOH, add 5 cc. of 8% Na(NH₄)HPO₄ soln., boil, cool, filter, and det. Cu in filtrate. If a faint cloud of Pb₂Fe(CN)₆ develops, add a little Pb(NO₃)₂ soln. to the standard. *Indicator*: Litmus paper. Results are reported.

F. W. SMITHER.

Simple method of estimating antimony in stibnite. F. LEHMANN AND B. LOKAU. *Arch. Pharm.* 252, 408-12(1914).—Boil about 0.2 g. finely powered mineral 2 min. with 5 cc. officinal NaOH soln. and 10 cc. H₂O. Dilute with 10 cc. H₂O, filter into a 200 cc. glass-stoppered Erlenmeyer flask and wash the residue twice with 10 cc. hot H₂O. Boil the combined filtrate and washings 15 min. with 25 cc. officinal H₂O₂, add 25 cc. 25% HCl, cool and add 1-2 g. KI, dilute with 25 cc. H₂O, then titrate after a lapse of 5 min. with 0.1 N Na₂S₂O₄, being careful to shake the mixt. vigorously toward the end of the operation after each addition of thiosulfate.

W. O. E.

Determining weight of deposit. L. C. WILSON. *Metal Ind.* 13, 506-7(1915).—A continuation of a previous article (cf. *C. A.* 9, 756, 2492). This part deals particularly with the balance methods of detg. the wt. of Ag deposited and describes in detail the thiocyanate process for the detn. of Ag in the bath. The fire assay is also described.

W. E. RUDER.

Rapid volumetric procedures for determining combined alumina and basic alumina or free acid in aluminium salts. W. W. SCOTT. *J. Ind. Eng. Chem.* 7, 1059-61(1915).—"Rapid volumetric procedures are given for detg. combined and free Al_2O_3 in Al salts, followed by exptl. data showing reliability of the methods. Impurities such as commonly occur in these salts do not interfere, with exception of Fe, for which correction must be applied as stated. The methods are of special value for works control of liquors during the process of manuf. of Al salts, and the analysis of the finished product in daily routine analysis."

F. W. SMITHER.

Determination of sulfuric acid in the presence of phosphoric acid. T. v. FELLENERG. *Mitt. Lebensmit. Hyg.* 6, 191-5(1915).—An exptl. study reported in detail. The conclusion of Baragiola and Godet (cf. *C. A.* 9, 3321) that the presence of H_3PO_4 causes high results in the detn. of H_2SO_4 is confirmed. To reduce the error to a minimum in the detn. of H_2SO_4 in the ash of foods, etc., F. recommends adding the hot BaCl_2 soln. (in not too great excess) dropwise to the boiling slightly acid soln. (about 13-14 cc. *N* HCl per 100 cc.). Cf. Baragiola and Schuppli, *C. A.* 9, 1820

F. W. SMITHER.

A note upon the Kjeldahl method for nitrogen determination. P. L. BLUMENTHAL AND G. P. PLAISANCE. *J. Ind. Eng. Chem.* 7, 1044-5(1915).—A detailed report of a series of analyses under varying conditions by the methods in general use. The conditions followed were quite similar to those proposed by Pickel (cf. *C. A.* 9, 1286) except 50 cc. of concd. H_2SO_4 were used at the start. It is not satisfactory to rely upon a definite time of *total heating*, because of variations in gas pressure, and varying efficiency of burners. It is better to heat for a definite length *after clearing* (never less than 1 hr.).

F. W. SMITHER.

A rapid control method for the determination of sulfur in pyrites cinder. H. C. MOORE. *J. Ind. Eng. Chem.* 8, 26-8(1916).—Place 1.3738 g. of ground cinder in an Fe crucible containing 7 g. Na_2O_2 , and mix. Sprinkle a thin layer of peroxide over the surface and heat till completely melted, gradually increasing the flame. Cool, leach out the contents of the crucible with water, and add HCl to a slight excess. Transfer to a 500 cc. graduated flask, add 0.4-0.5 g. Al powder, shake and heat to boiling till nearly all Al is dissolved. Cool, dil. to mark, and filter. Dil. 200 cc. of filtrate to 450 cc., add 1 cc. concd. HCl, mix, and ppt. cold without stirring by adding slowly 25 cc. 5% BaCl_2 soln. from a buret. Mix and allow to stand 1 hr. Filter through a Gooch crucible and wash with cold water. Dry, ignite and weigh. $\frac{1}{4} \text{ wt. BaSO}_4 \times 100 = \% \text{ S}$. The method is rapid and accurate. If BaSO_4 is present it is decomposed by the fusion and the SO_4 pptd. later by BaCl_2 . The method would serve as a rapid approx. method for S in pyrites.

E. W. BOUGHTON.

Micro-reactions of carbon disulfide. G. DENIGÈS. *Bull. soc. chim.* 17, 359-60 (1915); cf. *C. A.* 10, 432.—The definite cryst. form of the dithiotrimercure salts and their extreme insolubility make them important in identifying their parent substance, CS_2 . Put the sample into soln. or suspension in a few cc. of water, add an equal vol. of (1) HgSO_4 soln. (HgO 5 g., H_2SO_4 20 cc., H_2O 100 cc.); or (2) a soln. of 0.30-0.40 g. HgCl_2 ; or (3) 2.5 cc. of an 80% soln. of $\text{Hg}(\text{NO}_3)_2$. Place the mixt. in a flask and immerse in a bath of boiling water for 15 min. in case the sulfate or nitrate is used, or 1 hr. with the chloride. Exam. the deposit under the microscope. The nitrate

forms hexagonal plates, the chloride cryst. groups resembling fish bones or fern leaves and the sulfate small prisms or lozenge-like plates. The presence of a few mg. of CS_2 may be detected by this method.

H. L. OLIN.

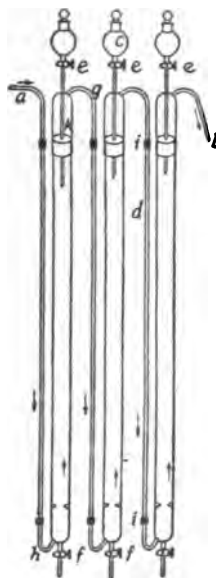
Methods for the determination of small amounts of sulfur dioxide in the atmosphere. A. E. WELLS, G. N. LIBBY AND R. J. MCKAY. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 188-206(1915); cf. C. A. 10, 446.—The primary novel features of the methods (due to J. R. Marston) comprise: (1) Running a "blank" simultaneously and in the same manner as the "sample" detn., this blank being run on an equal vol. of air which, previous to a test, had been treated with an oxidizing agent to oxidize any reducing constituents that might be present. (2) Titrating the SO_2 in the sample with I in a starch soln. and obtaining the end point of the reaction by comparing the colors of the "sample" and "blank" solns., the I required to give to the "sample" soln. the same color as the "blank" being the equiv. of the SO_2 in the sample. A modification of Marston's method, sufficiently accurate for all practical purposes for detg. the SO_2 in air containing less than 3 or 4 parts SO_2 per million parts of air, is described in detail. With higher concns. there are errors, mechanically introduced, in this method. In order to eliminate these sources of error, the following method was devised, carefully tested out, and adopted: As *sample bottles* were used two 24-l. aspirator bottles of the same kind of glass, so that the action of heat and light on the I would be the same in each. The top tubulure of each aspirator is closed by a rubber stopper through which a glass stopcock is inserted. In the lower tubulure is placed a 1-hole rubber stopper, in which is fitted a glass plug extending for about 1.5 in. outside the stopper. As *test bottles* were used 2 bottles, each a 500 cc. wide-mouth specimen jar of uniformly clear white glass, and equipped with a 3-hole rubber stopper. Through one opening of the stopper is inserted a glass tube (about 4 mm. diam.), bent at right angles; through the second opening is inserted a tube (about 2 mm. bore), extending nearly to the bottom of the bottle and closed on the outside by a cap. In the third hole is inserted a glass tube. On the outside of the bottles, covering the lower half, except over a vertical strip 5 to 7 cm. wide, is pasted a uniformly white paper to serve as a background for color comparison. *Mixing bottle*: A 1-l. wide-mouth specimen jar is fitted with a 3-hole rubber stopper. In one hole a 4 mm. bore tube is inserted till it reaches to the bottom. In the other 2 holes are inserted glass rods as stoppers. *Buret*: The buret is equipped with a long small-bore delivery tube. *Vacuum pump*: A cylindrical hand pump, or a large wheel-operated pump (a standard combination beer pump with valves changed to produce vacuum) was used. The vacuum gage is a calibrated Hg column. *Solutions*: 0.002*N* I (1 cc. = 0.0224 cc. SO_2 at 0° and 760 mm.). *Starch*: 1 g. per l. (either sol. or grain) prepd. by adding the starch paste to boiling H_2O , boiling for several min., cooling slowly, and adding 2 g. of KI per l. *Preliminary procedure*: Bring about 500 cc. of the starch soln. to a desired light blue color with I in the mixing bottle; then transfer one-half of the starch-iodide soln. to each test bottle. To make the transfer so that the soln. will not come in contact with the air, the right angle tube of the test bottle is inserted in one of the holes of the stopper of the mixing bottle. The glass tube (third hole, see above) of the test bottle is opened, the mixing bottle inverted, and the soln. run into the test bottle through the right angle tube. Having transferred the soln. to the test bottles, the colors of the solns. in the test bottles are compared carefully to make sure that they are coincident, and that no dirt or film on the glass obscures the colors. The solns. are then transferred to the aspirators (sample bottles) by inverting the test bottles (with the right angle tube extending through the 1-hole stopper in the lower tubulure of the aspirator, removing the cap of second tube of test bottle, and opening glass stopcock). The soln. having been transferred, the lower tubulure of the aspirator is closed with a glass stopper, and the stopcock

closed. The aspirators are then shaken vigorously for about 5 min. to wash them and to oxidize any reducing gases. The solns. are then transferred back to the test bottles (as above), and the colors compared. If the 2 solns. have the same color, the aspirators are considered ready for use. If the colors are not the same, the starch solns. are again mixed, transferred to the test bottles and to the aspirators as before. The aspirators are again shaken, the whole operation being repeated until after removal from aspirators, the solns. are of the same color, or can be brought to the same color by the addition of not more than 0.1 cc. of 0.002 $N I$ to the lighter one. *Sampling:* Having washed the aspirators sufficiently so that their I consumption factors are zero, or a const. for both, a fresh starch iodide soln. is divided between the 2 aspirators as before, 250 cc. to each. One aspirator is then evacuated by pump to a 380 mm. vacuum; both aspirators are then carried to the point where the sample is to be taken, care being taken that both aspirators have the same exposure to sunlight. The sample is taken by opening the stopcock at the top of the evacuated aspirator, the vol. taken in being that required to bring the pressure in the aspirator back to atm. conditions. *Determination:* The 2 aspirators are shaken vigorously 60 to 80 times in such a manner that the sample and soln. are brought into intimate contact, the "blank" being shaken in the same manner as the detn. The starch solns. are then transferred to the test bottles in the manner above described. The colors of the solns. are then compared, and by means of the buret sufficient 0.002 $N I$ soln. is added through the hole of the glass tube in the "detn." bottle to bring the color to that of the "blank." In cases where the color of the detn. soln. is very much lighter than the blank, or is completely discharged, this soln. is titrated to a color slightly deeper than that of the blank, the 2 solns. are returned to their respective aspirators, shaken, and the colors compared as before. Following this procedure, provided the detns. are made not more than 30 min. apart, each detn. prepares the aspirators for the following detn. With a little experience and using a well prepd. starch soln. an analyst can detect, by comparison, a change produced by the addition of 0.1 cc. of 0.002 $N I$ to 250 cc. of the starch soln. It is more satisfactory to introduce the starch soln. into the aspirators before evacuating than to introduce it later after the sample is contained in the aspirator. With the starch soln. present in the aspirators when the sample is being taken the aspirator can be shaken immediately, to eliminate any possibility of the disappearance of SO_2 by oxidation or adsorption. There is no appreciable loss of I during evacuation. The starch soln. should be kept in tightly stoppered bottles protected from sunlight; soln. 1 day old is the most sensitive to color changes. When using this method for analyses of the air in the "smoke zone" of a smelter, the following notes should be recorded: time, temp. of air, barometric pressure, direction and approx. velocity of wind, capacity of aspirator used, initial vacuum in aspirator, cc. of 0.002 $N I$ soln. From the above is calcd.: vol. of sample at 0° and 760 mm., vol. of SO_2 equiv. to I , ratio of SO_2 to air, parts per million. A sample may be taken in less than 15 secs., and the detn. made in 5 min. Results are given in detail.

F. W. SMITHER.

Method for the determination of the total sulfur in the atmosphere present as dioxide or trioxide. A. E. WELLS. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 206-10(1915); cf. C. A. 10, 446.—The absorption app. (see fig.) consisted of a train of 3 glass tubes, 4.5 cm. inside diam., and 110 cm. long, about $\frac{1}{8}$ of each tube being filled with glass beads. Over the top of each tube was fitted a glass cap, *k*, the joint being made tight by a thin rubber gasket. Through the top of each cap was inserted and sealed a 100 cc. sepg. funnel, *c*, and an outlet tube, *g*, 0.6 cm. inside diam., bent as shown. To the bottom of each tube was welded a glass stopcock, *f*, and an inlet tube, *h*, 0.6 cm. diam. The outlet tube, *g*, of one tube was connected to the inlet, *h*, of the next following by a glass tube, *d*, of the same diam., the joints, *i*, being

made tight, glass to glass, so that the rubber tubing was not exposed to the action of the gases or fumes from the inside. At a point 5 cm. from the bottom of each tube, the glass was so indented as to provide a seat for a glass wool pad (2 cm. thick), which held the beads in place. In order to maintain a steady flow of air through the absorption train entering at *a* and leaving at *b*, and at the same time to measure the vol. accurately, a steel tank of known capacity (116 l.) was evacuated to a known degree,



then connected to the absorption train and the air drawn through the train until the pressure in the tank was brought back to a known point. For evacuating the tank there was used a hand-wheel-driven double-cylinder pump superimposed on the tank itself. The pump and tank arrangement was a standard combination beer pump with valves changed to produce vacuum. The first tower of the absorption train contained Br or I soln.; the 2 following, either a dil. ammoniacal, or a 0.2% NaHCO_3 soln. App. (tubes, beads, etc.) were previously cleaned by treating with warm acid and washing with H_2O . *Procedure:* The solns. were introduced to fill the towers to above the top of the glass beads, the tank evacuated to the desired vacuum (e. g., 560 mm.), and then caused to draw the sample through the towers (about 1300 cc. per min.) until the vacuum was reduced to 180 mm. The tank was then evacuated again (requiring from 2 to 5 min.), and the aspiration repeated. At the beginning and end of each tank filling time, temp. of air in tank, vacuum in tank compared with outside atm. and barometric pressure of outside air (aneroid barometer) were noted. The total vol. of each sample averaged about 570 l. At the end of each sampling the solns. were drained through cock *f* into 500 cc. bottles. The first 2 tubes were washed with about 100 cc. of the stock soln., and the washings added

to the sample for analysis. The analyses were made by the usual gravimetric method (weighing as BaSO_4). Ammoniacal solns. were acidified with HCl , a slight excess of NaHCO_3 added, evapd. to about 80 cc., filtered, and washed. The soln. was acidified with HCl (litmus paper), 2 to 3 cc. of 10% BaCl_2 soln. added to the boiling soln., boiled 10 min., let stand 20 hrs., filtered, and weighed as BaSO_4 . In 177 tests, the first tube was found to contain over 71% of the total S. The S found in the solns. represented, within at least 5%, the total S in the air aspirated. With reasonable care in handling the solns., there is but small possibility of contamination with S from an outside source. Many detns. on "blanks" indicated that the analytical work was accurate to about 0.3 mg. of BaSO_4 . With a 570 l. sample 0.3 mg. $\text{BaSO}_4 = 0.05$ part SO_2 per million parts of air by vol.

F. W. SMITHER.

Apparatus for transferring gases in the Hesse method for the determination of atmospheric carbon dioxide. E. GROZA. *Bull. soc. Stiinta Bucuresti* 16, 156-9 (1914); *Chem. Zentr.* 1915, II, 297-8.—The vessel containing the air to be analyzed (provided above and below with cocks) is fastened on a stand and connects directly above to the neck of the Hesse flask mounted on same stand. The Hesse flask is filled with H_2O and is closed with a 2-hole rubber stopper; through 1 hole a glass tube passes to the bottom of the flask, with other end extending into the sampling vessel; a second glass tube extends through the other hole just below the stopper; to this tube is attached a rubber tube through which the H_2O in the flask can flow into a lower overflow vessel. The lower end of the sampling vessel is connected with a vessel filled with F to isolate F of rubber tubing evolved from the

outer air and at the same time to establish in the sampling vessel pressure equil. with the outside air. On opening the 2 cocks of the sampling vessel, the H_2O in the Hesse flask flows out and the air to be analyzed is drawn into the flask; the lower H_2O vessel is raised till the H_2O columns are of same height in each vessel (producing same pressure of the outer and inner air), the 2 cocks closed, the Hesse flask disconnected, and the CO_2 titrated in usual manner with $Ba(OH)_2$. App. is illustrated in the original.

F. W. SMITHER.

Methods for the determination of carbon dioxide and a new form of absorption tower adapted to the titrimetric method. E. TRUOG. *J. Ind. Eng. Chem.* 7, 1045-9 (1915).—Summary: (1) The grav. detn. of CO_2 by weighing of absorption app. gives accurate results with small amts. of CO_2 , slow aspiration, and due precautions in weighing and drying. (2) The detn. of CO_2 by absorption in alkali hydroxide and double titration has many disadvantages. The amt. of indicator used needs to be carefully regulated and standard end-points should be used. Under the best conditions, the end-points are not sharp. Good results can be obtained by observing the necessary precautions. (3) A new form of tower, described in the text, makes possible the use of $Ba(OH)_2$ as an absorbing medium for CO_2 under nearly all conditions. It also eliminates practically all contamination of CO_2 from the air, and greatly facilitates the washing. The titration has a very good end-point. The standard $Ba(OH)_2$ soln. is easily prepd. free of carbonates.

F. W. SMITHER.

A rapid method for the determination of carbon dioxide. W. H. WAGGAMAN. *J. Ind. Eng. Chem.* 8, 41 (1916).—The app. consists of flask for decompn. of carbonate, a condenser and an absorption train. By means of an Ostwald regulator the flame under the flask is regulated automatically. The flask is cooled by being surrounded by a coil of lead tubing, through which passes cold water. A cut of app. is given.

E. W. BOUGHTON.

The estimation of carbon dioxide in the ash of plant and animal substances. S. B. KUZIRIAN. *J. Ind. Eng. Chem.* 8, 89 (1916).—K. claims that the method of Gooch and K. (*C. A.* 5, 2475) using $5Na_2O \cdot 12WO_3$ is much simpler than the method of Boltz (*cf. C. A.* 10, 321) and gives excellent results.

E. W. BOUGHTON.

Determination of potassium hydrogen tartrate by the reduction of potassium iodate and iodide. KANTOR. *Mon. sci.* [5], 5, 273 (1915).—An application of Sander's picric acid method (*cf. C. A.* 8, 2132) based on the reaction $6RH + 5KI + KIO_3 = 6RK + 3I_2 + 3H_2O$. K. did not obtain concordant results by titrating the I directly in the reaction vessel, owing to poor end-point and slowness of reaction towards the end. However, by distg. in a Bunsen app., absorbing the I in KI soln., and titrating with $Na_2S_2O_3$ soln., excellent results were obtained. The method is applicable to pure $KHC_4H_4O_6$ or technical products. Results are reported.

F. W. SMITHER.

The hydrochloride method for the determination of alkaloids. G. D. BEAL AND ST. E. BRADY. *J. Ind. Eng. Chem.* 8, 48 (1916).—The method consists in extn. of the alkaloid with Et_2O , pptn. from this soln. as the hydrochloride by passing in dry HCl gas, evapg. and weighing the salt, then dissolving the hydrochloride in H_2O and titrating with standard alkali, using phenolphthalein as indicator. Results agree with those of U. S. P. method for conium seeds, tobacco and colchicum root.

E. W. B.

Determination of water in mineral greases. A. DEL CAMPO AND J. DE LA PUENTE. *Ann. Soc. espagnole de Phys. et de Chim.* June, 1914; *J. pharm. chim.* 12, 265 (1915).—Grignard's reagent $MeMgI$ in H_2O -free Et_2O is employed, and the vol. of CH_4 produced is detd.

S. WALDBOTT.

Apparatus for the culture of yeast used for the determination of various sugars by fermentation (TRAMBICKS) 1. Graphite (LANG) 18. Determination of the deposition of lead and arsenic on the soil in the Selby smelter zone (WELLS) 9.

8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

Pressure as a factor in the formation of rocks and minerals. JOHN JOHNSTON. *J. Geology* 23, 730-48(1915); see C. A. 10, 29. W. F. HUNT.

Decomposition of mineral sulfides and sulfo-salts by thionyl chloride. H. B. NORTH AND C. B. CONOVER. Rutgers Coll. *Am. J. Sci.* 40, 640-2(1915).—The authors' work on the application of this reaction to compds. produced in the lab. (C. A. 9, 3185) is here extended to include naturally occurring substances. The mineral tested was, in each case, powdered in an agate mortar, dried at 110°, and kept in a tightly stoppered bottle. The reactions for galena and cinnabar are similar: $\text{PbS} + 2\text{SOCl}_2 = \text{PbCl}_2 + \text{SO}_2 + \text{S}_2\text{Cl}_2$; pyrite gives FeCl_2 , thus: $6\text{FeS}_2 + 20\text{SOCl}_2 = 6\text{FeCl}_2 + 10\text{SO}_2 + 11\text{S}_2\text{Cl}_2$. Qual. expts. showed that pyrargyrite, covellite, boulangerite, enargite, marcasite, orpiment, realgar, stibnite, sphalerite, tetrahedrite, and arsenopyrite were decompd. quite readily by SOCl_2 , proustite with great difficulty, while molybdenite, cobaltite, and argentite were unaffected by the reagent after heating for several days. In the case of argentite this result appears remarkable since artificially prep'd. Ag_2S is readily decompd. by this treatment. L. W. RIGGS.

Mineralogy of Borneo. G. P. CHERNIK. *Trav. mus. acad. sci. Petrograd* 6, 49-95(1912); *Z. Kryst. Min.* 55, 184-91(1915).—I. *Platinum*. Analyses of 10 specimens of Pt according to the Deville-Stas method are given, the properties of each sample being stated. One strongly magnetic sample with sp. gr. = 14.15 contained 20.90% Fe, and is called "ferroplatinum." [Since $\text{Fe}:\text{Pt} > 1:1$ it should be named *platiniferous iron*.—ABSTR.] In another lot 28.87% Ir was found. Formulas are calcd. for 4 of the samples, and variety names given. II. *Minerals of the osmium-ruthenium group*. Of these, 15 samples are described, 5 of which were completely, the others only partially analyzed. In 9, $\text{Ir} > \text{Os}$, in 6 Os was in excess. Rh is always present, in one case to the amt. of 11.25%, and Ru is usually found, although perhaps present as inclusions of laurite in some specimens. Formulas are calcd. for the completely analyzed specimens, and variety names assigned; Vernadskii has recognized 6-8 varieties of "osmium-iridium," but C. thinks there are twice as many. III. *Gold*. Analyses of 12 samples are given, in one of which Pt amounts to 10.45% and in another Ir 30.36%. Formulas are derived for both of these. [The former is a new variety, which may be named *platiniferous gold*.—ABSTR.] A brittle Au-amalgam was also found, containing Au 34.23, Hg 60.57, Ag 4.78, Pt 0.12, insol. 0.09, sum 99.79%. IV. *Heavy minerals*. Analyses are given of rutile, topaz, ilmenite, chromite, ruby and zircon. E. T. W.

Some new mineral occurrences from the Tintic District, Utah. A. H. MEANS. Mass. Inst. Tech. *Am. J. Sci.* 41, 125-30(1916).—M. describes geocronite (?) ($5\text{PbS} \cdot \text{Sb}_2\text{S}_3$) from the 300 ft. level of the Colorado mine; adamite from the No. 3 shaft, Iron Blossom mine; daubréeite (?) ($2\text{Bi}_2\text{O}_3 \cdot \text{BiCl}_3 \cdot 3\text{H}_2\text{O}$), bismite (?) and jarosite from the 1200 ft. level of the Eagle and Blue Bell mine; and bismutite from the 1050 ft. level of the Victoria mine. The chem. and physical characters which led to the identification of these minerals are given. From the 600 ft. level of the Mammoth mine an apparently new mineral was found, occurring in large amts. and consisting of a heavy yellow friable material associated with limonite, barite, and a little erinite and mixite. About 0.5 kg. of this material was crushed to 80-mesh, vanned on a vanning shovel and about 30 g. of concentrate analysis by R. C. Wells gave the fol-

lowing results: Treatment of the concentrate with hot HCl gave a residue consisting of SO_3 16.60, BaO 31.90 (calcd.), and SiO_2 1.42 (by difference) showing 49.92% of the original concentrate to be barite. That portion of the concentrate sol. in hot HCl gave Bi_2O_3 28.17, As_2O_3 10.59, Fe_2O_3 3.88, Al_2O_3 0.44, CuO 0.12, CaO 0.62, MgO tr., SO_3 0.46, H_2O — 1.09, $\text{H}_2\text{O} +$ 1.43, P_2O_5 0.04, Sb_2O_3 1.26, PbO 1.12, sum, including insol. material, 99.14%. From the mineral association as observed in the district, anglesite, mixite, limonite and jarosite are assumed to be present. Deducting their mol. ratios from those furnished by the above analysis, and assuming that the remaining Fe_2O_3 , CaO , Sb_2O_3 , and Al_2O_3 are isomorphous with Bi_2O_3 , the formula $2\text{Bi}_2\text{O}_3 \cdot \text{As}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$ is deduced. If 0.38% of H_2O , given off to anhydrous H_2SO_4 , be included as water of crystn., the formula is changed to $4\text{Bi}_2\text{O}_3 \cdot 3\text{As}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$. Both formulas appear to fit the data equally well. The mineral consists of cryptocrystalline aggregates, yellowish green with a tinge of brown, hardness approx. 3, sp. gr. 5.70, n about 1.60. The material described is homogeneous and of uniform chem. compn., and, unlike the other Bi arsenates, atelestite and rhagite, which are rare, it occurs in considerable amts. The name *arseno-bismite* is suggested as best conveying an idea of its chem. compn.

L. W. RIGGS.

The minerals of the St. Kreuz ore veins. R. KRAEMER. Strassburg. *Mitt. geol. Landesanst. Elsass-Lothringen* 8, 449-509(1914); *Neues Jahrb. Min. Geol.* 1915, I, Ref. 331-3.—Paragenetic tables, based on age relations of the crystals, are given, and the following minerals described, with analyses: siderite, ankerite, a variety of ankerite called "perlspar," Ag-bearing galena, and pitticite. The deposit is compared with those of other regions, and it is concluded that it is later than the pre-carboniferous granite.

E. T. W.

Mineralogy of the Kyshtym Mountains. I. Minerals of Datschen Kyshtym and Kassli. A. V. NIKOLAEV. Petrograd. *Trav. mus. geol. acad. sci. Petrograd* 6, 171-231(1912); *Z. Kryst. Min.* 55, 182-4(1915).—Descriptions are given of Au, Os-Ir, pyrite, quartz, amethyst, sapphire, magnetite (with analysis), Ti-bearing magnetite altering to hematite (analysis), chromite, oncosine, hydrobiotite, cerolite (analysis) and titanite, modes of occurrence and genetic relations being discussed.

E. T. W.

A regular intergrowth of rutile with calcite from Val Devero (Ossola). ANGELO BIANCHI. Univ. Pavia. *Rend. ist. Lombardo sci. lettere* [2], 48, 773-8(1915).—Regular intergrowth of rutile with calcite has not been reported. The specimen observed by B. showed a long slender rutile crystal traversing and supporting a limpid crystal of calcite; this was in a geode, among other variously interwoven crystals of calcite and rutile. The zone (111) of rutile was parallel to the zone (3140) of calcite, and accordingly the face (101) of the rutile and the face (1321) of the calcite were parallel.

E. J. W.

The artificial preparation and fusibility of iron calcium silicates. N. KONSTANTINOV AND B. SELIVANOV. *Ann. inst. polytechn. Pierre le Grand* 17, 427-45 (1912); *Z. Kryst. Min.* 55, 198(1915).—The system $\text{FeSiO}_3\text{-CaSiO}_3$ was investigated by thermal and optical methods. FeSiO_3 crystallizes well only when slowly cooled, and solidifies at 1145-1160°. Melts containing up to 65 mol. % CaSiO_3 solidify to material with fine cryst. structure, lower double refraction than pseudowollastonite, and $2V = 71^\circ$. With more CaSiO_3 pseudowollastonite separates from the system, its m. p. being 1510° , and complete crystn. being observed with 80% or more. The double refraction is high, and $2V = 4-5^\circ$. The curves showed no break at the ratio $\text{FeSiO}_3\text{:CaSiO}_3 = 1:1$, corresponding to the mineral hedenbergite, so this may be a secondary product, or a compd. of variable compn.

E. T. W.

Cancrinite from Ditró. B. MAURITZ. Budapest. *Math. term. Értesítő* 30, 673-87(1912); *Z. Kryst. Min.* 55, 206-8(1915).—Rose-red cancrinite occurring

associated with sodalite, nephelite and feldspar in a pegmatite vein was carefully selected and analyzed, yielding SiO_2 34.34, Al_2O_3 29.62, CaO 5.23, MnO 0.29, Na_2O 19.83, K_2O 0.35, CO_2 5.59, H_2O 5.16, sum 100.41%. This agrees very closely with the formula $\text{H}_4(\text{Na}_2, \text{K}_2, \text{Ca}, \text{Mn})_2\text{Al}_2\text{Si}_4\text{CO}_{11}$, with $\text{Na} + \text{K} : \text{Ca} + \text{Mn} =$ between 4:1 and 3:1. Previous work, which is reviewed, has yielded a different formula, but M. regards his material as purer than that heretofore analyzed, especially in respect to SiO_2 , which is set free in the course of the secondary formation of cancrinite from nephelite, and may not have been entirely removed. Thugutt's view that Fe is a characteristic constituent of cancrinites formed in this way is opposed. E. T. W.

Chemical disintegration of talc, chlorite, and biotite. F. MALT. *Dissertation*, Leipzig, 1913; *Neues Jahrb. Min. Geol.* 1915, II, Ref. 357-9.—The minerals studied were pale, greenish white talc from Greiner, Tyrol, pale green chlorite from Zlatoust, Urals, and biotite (anomite) from Miask, Urals. Their compns. are given. Talc loses most of its H_2O at red heat, with a break in the dehydration curve at $850-960^\circ$, leaving enstatite and SiO_2 . HCl , HNO_3 , or H_2SO_4 act very slightly on talc, while fusion with $\text{MgNH}_4\text{HPO}_4$ leaves 95.45% SiO_2 (tridymite?). Chlorite loses H_2O gradually up to 460° , then with break in curve up to 560° , above which the loss is gradual, the bulk having gone at red heat. Hydrated silica is left by digestion with dil. H_2SO_4 or concd. HCl . Biotite is bleached, and leaves scales of SiO_2 , optically negative and nearly uniaxial, by digestion with HCl , while HF expels the silica, leaving white scales of fluorides of Fe, Al, and Mg. W. B. JOHNSON.

The occurrence of ratovkite near Moscow. A. S. SERGEV. *Bull. acad. sci. Petrograd* 1912, 141-62; *Z. Kryst. Min.* 55, 170-1 (1915).—Ratovkite forms a layer 10-15 mm. thick between silicious marl and dolomitic limestone. It may be covered by a palygorskite-bearing substance, or lie directly upon silicious concretions. At times a second bed is also observable. The mineral is violet-blue, paler where mixed with CaCO_3 ; it has not yet been analyzed. E. T. W.

Mineralogy of (Russian) phosphorite deposits. J. V. SAMOILOV. *Verh. Komm. Moscow landw. Inst. Geol. Unters.* 4, 651-71 (1912); *Z. Kryst. Min.* 55, 192-3 (1915); continuation of C. A. 8, 889.—Fertilizing expts. showed that the phosphorite from the Gault rocks behaved differently from others; this proved to be due to the presence of H_2O -sol. P_2O_5 in the former. Two very complete analyses of phosphorites by Chervyakov are given, and the mineralogical compn. calcd. The results of microscopic and microchem. studies of various phosphorites are also described, and 2 generations of phosphate materials recognized, the H_2O -sol. compd. being in the 1st. A method of examg. phosphorites proposed by A. M. Nastjukov, consisting in comparison of the colors of ignited powders, proved valueless; the odor obtained on rubbing pieces together is of some practical use, yet not always dependable. E. T. W.

Chemical composition of the potash salt deposits in the Tertiary of upper Alsace. M. RÓZSA. Budapest. *Z. anorg. allgem. Chem.* 93, 137-50 (1915); cf. C. A. 9, 1449.—A discussion of the salt deposits in certain Alsace mines, from which it is concluded that the differentiation is largely to be ascribed to periodic temp. variations.

GEORGE W. MORREY.

The oil and gas fields of Ontario and Quebec. W. MALCOLM. Canada Dept. Mines, Geol. Survey, *Mem.* 81, 237 pp. (1915).—It was detd. that the oil and gas have accumulated in anticlines. Much of the oil is dark brown in color and has a sp. gr. of 31° to 35° Beaumé. It differs from the oils of the U. S. in that its S content is much higher, at times running as high as 2.5%; this makes it difficult to refine. Most of the wells produce less than 1 bbl. per day but use of economical pumping methods and also of a government buy at 10¢ per gallon. Some

bituminous shales are described containing 12.4% volatile and inflammable matter and leaving a black residue. A small deposit of "anthraxolite" containing 74% fixed C and 1.3% vol. matter was discovered. This is supposed to have formed from near-by beds of slate containing bituminous matter which has lost most of the volatile matter from the once plastic substance and retains the solid C. Various statistics, including the logs of the different wells, are given.

R. L. SIBLEY.

Devonian of southwestern Ontario. C. R. STAUFFER. Canada Dept. Mines, Geol. Survey, *Mem.* 34, 286 pp.(1915).—Chiefly a stratigraphical and paleontological study of the Devonian deposits of this region. A black shale is mentioned of which the carbonaceous matter is undoubtedly of vegetable origin, as it contains numerous plant fragments and large amts. of sporangia. Analysis showed 11.6% fixed C and 11.3% volatile combustible matter. A discussion of the economic products of the Devonian is included, and an extensive bibliography given.

R. L. SIBLEY.

Upper White River District, Yukon. D. D. CAIRNS. Canada Dept. Mines, Geol. Survey, *Mem.* 50, 143 pp.(1915).—Among the limestone deposits were noticed occasional reddish weathering beds which ranged in compn. from a siliceous limestone to a calcareous sandstone and which constituted a transition between the limestones and sandstones. In the vicinity of intrusive igneous rocks, the shales and argillites have become bleached and indurated and thus transformed into hard, cherty rocks with alternating white or grayish and dark gray to black bands. Some of the volcanic rocks are amygdaloidal and the cavities are largely filled with secondary minerals, mainly zeolites and calcite. It is in certain of these reddish amygdaloidal flows that native Cu has been found in this region. The color of the granitic intrusives depends on their constitution; the more acid varieties are almost white or light gray while the increasing basicity causes the color to become darker so that hornblendites are almost black. A statement of the mineral deposits of the locality is given. Cu ores are found associated with basaltic amygdaloids or in limestone at or near the contact with dioritic intrusives.

R. L. SIBLEY.

Arisaig-Antigonish District, Nova Scotia. M. Y. WILLIAMS. Canada Dept. Mines, Geol. Survey, *Mem.* 60, 153 pp.(1914).—A graywacke or impure quartzite and flinty slate are described. The slate is very siliceous. Such regional silicification is probably to be ascribed to the readjustment of the SiO_2 of quartz and the silicates which is favored by conditions of great pressure and high temp. This results in a slate in many cases harder than steel. The graywacke when studied microscopically showed quartz fragments, plagioclase and finer quartz, mica and other materials. A rhyolite corresponding in general characters to modern acid lava flows but differing from them in its complete felsitic texture is described as aporhyolite. Cu stains scattered about this region are explained by assuming that the CuSO_4 generally present in sea and river water was reduced to sulfide, during the deposition of sediments, by the action of decaying vegetable matter. Later these small sulfide deposits were converted to the carbonates by the weathering action of surface water. The economic features of various deposits are considered. An extensive bibliography is included.

R. L. SIBLEY.

Topical parameters of rocks. A. OSANN. *Sitzb. Heidelberg Akad. Wiss. Abh.* 26 (1914); *Neues Jahrb. Min. Geol.* 1915, I, Ref. 338-42.—If the values A , C , and F , obtained in the recalcn. of rock analyses according to O.'s well-known method, are plotted in the + octants of a triaxial, right-angled system of coördinates, and a plane is passed through the intercept-points, a "rock-surface" is obtained, which, together with the values s , n and m , represents the chem. compn. of the rock. The usual triangular diagram is really a gnomonic projection of this rock-surface on the plane xyz . The conditions obtaining in the isometric system are here applied, but if instead the orthorhombic system is followed, and different units used on the different axes, natural

differentiation phenomena can be brought out. The units to be used may be derived from the compn. of a fundamental magma of a petrographic province, the magma of a single differentiated mass of rock, the compn. of a sphere of rock to which that of a single layer is to be compared, etc. Further, if a picture of the chem. relations of igneous rocks is desired, the values derived from the av. analysis of the earth's crust may be used. The method of calcn. advized is illustrated by the latter example, the units on the 3 axes being detd. as 6.03, 3.95 and 14.26; for a given rock the values A , C and F are to be divided by these numbers, respectively, and the resulting parameters indicated by A_i , C_i and F_i , and called "topic." The value of this procedure is illustrated by 2 triangular diagrams; in the first the usual parameters are employed, and the points representing analyses of different rocks are crowded toward one side, while the mean compn. of the earth's crust is irregularly situated; and in the second topic parameters are used, whereupon the mean compn. of the earth falls in the center, and the analyses are grouped around it in a fairly uniform way. The translation undergone by the points on passing from one plan to the other is discussed, and the extreme value of the new plan in demonstrating differentiation relations between rocks pointed out. E. T. W.

The later stages of the evolution of the igneous rocks N. L. BOWEN. *J. Geology* 23 (Supplement), 1-91 (1915).—Stoping with abyssal assimilation and the formation of immiscible portions are unimportant factors in the production of the diversity of igneous rocks. Likewise the direct refusion of sedimentary terranes would often give rocks of mineral compn. never found in an igneous series. On the contrary, it is believed that the rocks of an area vary among themselves in a systematic manner which indicates derivation from a common stock through a systematic process of differentiation. This differentiation is controlled entirely by crystallization. The sinking of crystals and the squeezing out of the residual liquid are considered the important instruments of differentiation, and exptl. evidence is cited to show that typical igneous rock series would be formed from a basaltic magma if it cooled slowly enough.

W. F. HUNT.

Petrography of central Caucasus. Andesite-dacite from Keli Plateau and Liachva River. K. J. TIMOFEEV. *Kiev. Ann. Geol. Min. Russie* 14, 170-3 (1912); *Z. Kryst. Min.* 55, 203 (1915).—Analysis is given of a mineral occurring as phenocrysts in rock, from the Keli Plateau, and its compn. shown to be $3\text{MgSiO}_3 \cdot \text{FeSiO}_3$. It is thus an Fe-rich bronzite.

E. T. W.

An osannite-hornblende, a feldspar-free end-member of the alkali series from Old Pedroso. A. OSANN AND O. UMHAUER. *Sitzb. Heidelberg Akad. Wiss. Abh.* 16 (1914); *Neues Jahrb. Min. Geol.* 1915, I, Ref. 342-3.—Small veins of a black rock, consisting of amphibole with a little magnetite, occur in an alkali syenite at this locality in Portugal. The amphibole agrees optically with osannite, and analysis confirms its identity with that mineral. The parameters of the rock show clearly that it belongs to the alkali series. The rock melts to a glass even in the Bunsen-burner flame.

E. T. W.

Mottled limestones and their bearing on the origin of dolomite. FRANCIS M. VAN TUYL. *Univ. Illinois. Science* 43, 24-5 (1916).—Limestones mottled with dolomite are regarded as "an incipient stage in the process of dolomitization, and it is believed that many dolomites have passed through such a stage in the progress of their formation.....there is convincing evidence that it took place in the majority of cases prior to or contemporaneously with the recrystn. of the limestone.....It seems probable, therefore, that the mottling was produced while the limestones were still beneath the sea, and that the sea water contributed the Mg."

E. T. W.

9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Testing ores for the flotation process. O. C. RALSTON AND G. L. ALLEN. *Mining Sci. Press* 112, 8-13, 44-9 (1916), illus.—Detailed descriptions are given of the different machines in use and their operation: film-flotation and the Wood machine, the Potter or Delprat process, mechanical frothing by the Janney machine, the Hoover, the Slide, the Elmore, and the Callow machines. The most important points to be tested on a given ore with any given flotation machine are: method and fineness of grinding, kind and amt. of frothing agent, acidity or alkalinity, temp., necessity of preliminary agitation, effect of addition-agents in flocculating gang-slime. There may be a certain best combination of the above variables that will be entirely missed if a great many tests are not carried out; hence it is desirable to do the testing in a small lab. machine, where many trials can be made in a short time. Lab. manipulations are described.

F. W. SMITHER.

Thermal principles of the blast furnace. II. J. E. JOHNSON, JR. *Met. Chem. Eng.* 13, 905-10, 954-62 (1915); cf. *C. A.* 10, 36.—Directions are given in detail for calcg. the distribution of heat in the blast furnace in the 2 stages of ore treatment, (1) that of the prepn. of the ore for its descent into the hearth and (2) that of complete reduction and melting, on the basis of operating data furnished largely by Cornell (*C. A.* 9, 777) and Mathesius (*C. A.* 9, 1164). J. deduces from a consideration of the reactions involved that of a total heat consumption of 6400 B. t. u. per lb. of Fe produced, 5200 are expended in stage (1) in the partial reduction of the ore, the decompn. of CaCO_3 and H_2O and in raising the temp. of the materials to the critical point, i. e., the temp. of free running slag, and 1100 B. t. u. in stage (2) for the reduction of SiO_2 , the heating of slag and Fe above the critical temp., for making up radiation losses and for a 10% Fe oxide reduction which he thinks takes place in the bosh. The discrepancy of 100 B. t. u. is not excessive. The theorem that "for ideal working the C burned by the blast at the tuyères should be a max. and that dissolved by the O_2 of the charge a min. is explained by the fact that the dissociation of Fe_2O_3 is highly endothermic and the demand for C for heat production is much greater than for the reduction of the oxide. He sums up as follows: For max. economy the fuel must develop its max. heat and a certain portion of it must be developed above the critical temp. To accomplish this provide for max. oxidation at the tuyères, dry and heat the blast so far as possible, lower the critical temp. by governing slag viscosity, and then keep down hearth requirements by reducing slag vol. and protective cooling.

H. L. OLIN.

Metallurgy of gold and silver. HERBERT A. MEGRAW. *Eng. Mining J.* 101, 94-7 (1916).—A review for the year 1915.

E. H.

Metallurgy of copper in 1915. LAWRENCE ADDICKS. *Eng. Mining J.* 101, 90-2 (1916).

E. H.

Recent progress in the metallurgy of copper. H. O. HOFMAN. *J. Franklin Inst.* 181, 83-97 (1916).—An address.

E. J. C.

Metallurgy of zinc in 1915. W. R. INGALLS. *Eng. Mining J.* 101, 92-4 (1916); cf. *C. A.* 9, 890, 2755.

E. H.

Advancement in the metallurgy of zinc. M. F. CHASE. *Mining Eng. World* 44, 15-6 (1916).—A review of progress in 1915.

E. H.

Hydrometallurgy of zinc and lead in 1915. D. A. LYON, O. C. RALSTON AND J. F. CULLEN. *Met. Chem. Eng.* 14, 30-2 (1916).

E. H.

Metallurgy of lead in 1915. H. O. HOFMAN. *Eng. Mining J.* 101, 89-90 (1916).

E. H.

The physical condition of cassiterite in Cornish mill products. J. J. BERINGER. *Inst. of Mining and Metallurgy, Bull.* 134, 13-8(1915).—A discussion by Hutchin (cf. *C. A.* 8, 2661; *Trans. Inst. Min. and Metallurgy* 18, 82). F. W. SMITHER.

Electrostatic separation of pyritic zinc ores. J. H. LEWIS. *Mining Sci. Press* 111, 927-9(1915).—A review. F. W. SMITHER.

Ashio's copper-smelting works at Honzan, Japan. ANON. *Eng. Mining J.* 100, 998-1001(1915).—A detailed description with illustrations and drawings. The coarse first-grade ores are charged directly to the blast furnaces; the concentrates and fines are first briquetted or sintered in pots. Acid-lined, barrel-type converters are used. A new dust-settling system was recently installed. The ore deposits consist mainly of veins transversing Tertiary liparite (rhyolite) and, to some extent, the Paleozoic sediments of the district. The principal paleozoic rocks are slate, quartzite, and limestone. The chief vein constituents are chalcopyrite and pyrite, with frequently arsenopyrite, blende, galena, and pyrrhotite; occasionally bornite, chalcocite, cuprite, malachite, pisanite, azurite, and native Cu are all found in the oxidized zone. Rarely native Bi, bismuthinite, wolframite, fluorite, vivianite, ludlamite, and apatite are found. As gang, chlorite, quartz, and clay are common, with calcite occurring occasionally. The output from the concg. plants is about 300 tons daily (about 11% Cu). Cement Cu (about 2.3 tons per day, 66% Cu) is pptd. on scrap Fe from the mine water and drainings from the old dumps. The smelting plant treats annually about 100,000 tons. The converters produce about 65,000 lbs. of blister Cu per day, which is cast into 70 lb. bars or anode plates. Analysis of blister Cu: Cu 99.077, As 0.029, Bi 0.006, Fe 0.052, S 0.028, Se and Fe 0.038%, Au 0.0003 oz., Ag 0.1065 oz. F. W. SMITHER.

Minnesota Steel Company's new plant. ANON. *Iron Age* 96, 1507-19(1915).—A detailed description, with illustrations, of construction, layout and operation of this large new plant. E. J. C.

Report of the Selby Smelter Commission. J. A. HOLMES, E. C. FRANKLIN, R. A. GOULD, et al. *Bur. Mines, Bull.* 98, 528 pp.(1915).—A comprehensive publication giving in detail with tables, curves, analytical and other data, and numerous illustrations, the report of the commission organized for the detn. of questions of fact and other matters concerned with certain injunction proceedings at issue between the people of Solano Co., Calif., and the Selby Smelting and Lead Co. The report contains papers by the different investigators (cf. following abstracts and *C. A.* 10, 403, 404, 436, 437, 489, 504, on which the following conclusions are based. *Conclusions:* (1) With respect to the visible element of the smoke from the Selby smelter: (a) Prior to April 1, 1914, a nuisance was maintained in the smoke zone. (b) The installation of the bag house in connection with the sintering machines (Dwight and Lloyd type) has abated this nuisance. (c) Pb and As from the smoke of the smelter were deposited on the soil of the smoke zone during the period of time included between the beginning of operations and April, 1914, but the quantity of these metals so deposited was of no economic importance and did not poison the soil nor in any way produce a loss or reduction of crops. (d) The blackened appearance of many trees and plants in the smoke zone, which appearance is believed by many of the residents to be due to a deposit of Pb from the smelter smoke, is in fact due to the growth of a mold within the honeydew secreted by certain insects which infest the trees and plants. It contains no Pb whatever. (2) With respect to the SO₂ contained in the smelter smoke: (a) The Selby smelter has not maintained a nuisance with respect to producing within the smoke zone a disagreeable or objectionable odor, or with respect to affecting disagreeably or injuriously the throat and lungs of human beings or domestic animals living in the smoke zone. (b) The rare instances during the investigations when SO₂ from the smelter was present in the smoke zone in sufficient concns. to be observed by the residents by the

sense of smell do not constitute a nuisance; nor do these rare visitations prevent the residents of the smoke zone from the peaceful enjoyment of life and property. (c) The smelter has not maintained a nuisance with respect to economic damage to trees, vines, shrubs, or growing crops of any kind within the smoke zone. (d) The smelter has not maintained a nuisance with respect to the corrosion of wire screens or barbed wire in use within the smoke zone. (3) With respect to the future operation of the Selby smelter: (a) So long as the mechanical devices now used for clearing the smoke of the plant of its visible element are kept in operation the smelter will not maintain a nuisance with reference to injury to horses or other domestic animals, or with reference to injury to the soil of the smoke zone; nor will a nuisance be maintained by the smelter in these respects so long as the visible element is removed from the smoke by any means, mechanical or otherwise. (b) The app. now installed at the smelter which are used to eliminate the visible element of the smoke are subject to accident and are so constructed as to require occasional cleaning and repairing; and, for the purpose of cleaning and repairing the app. so used, the smelter will not maintain a nuisance in the smoke zone if it discharges visible smoke from the blast-furnace stack for a total period of no more than 48 hrs. in any one month of each calendar year; or if it discharges visible smoke from the roaster stack for a total period of 48 hrs. in any one month of each calendar year. (c) During the "closed season" (Mar. 15 to Nov. 15) the emission of smoke into the atm. from the Ropp roaster will be productive of a nuisance in the smoke zone unless the visible element is removed from the smoke before it is discharged into the atm. (d) So long as the total output of SO_2 discharged through all of the stacks of the smelter into the atm. is less than 80 tons per day of 24 hrs. during each hour of which day less than $3\frac{1}{4}$ tons of SO_2 are discharged the smelter will not maintain a nuisance with respect to a disagreeable or objectional odor or with respect to affecting disagreeably or injuriously the throat and lungs of human beings or domestic animals living within the smoke zone; or with reference to economic damage to vegetation or to the corrosion of wire screens or barbed wire in use within the smoke zone. An excellent bibliography on the effect of SO_2 on vegetation and animal life is appended. F. W. SMITHER.

Conditions in and around the Selby smelter and the Selby "smoke zone." A. E. WELLS. Report Selby Smelter Commission, Bur. Mines, *Bull.* 98, 63-81(1915).—A detailed description, with illustrations, tables and curves of the Selby smelter, its operations, and "smoke zone." The products of the smelter are refined Au, refined Ag, Pb bars, white lead, Pb shot, and bluestone. *Summary*: "On account of the geographical position of the Selby smelter and the 'smoke zone,' the topography of the surrounding and intervening country, and the general wind conditions existing during the greater part of the year, the Selby smelter is situated very unfortunately in so far as 'smoke troubles' are concerned. To a degree not usual around most smelters, all of the natural conditions tend to retard the dispersion and diffusion of the dust, fume, and gases that might emanate from the smelter, and make them more concd. over the 'smoke zone' than would be expected. We must expect, therefore, that the elimination of a comparatively small amt. of SO_2 gas, dust, and fume from the Selby smelter would be more serious during 8 months of the year than a larger amt. emanating from smelters situated in more favorable locations." F. W. SMITHER.

Investigations to determine the extent of the contamination of the atmosphere in the Selby "smoke zone" by the smelter emanations. A. E. WELLS. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 82-212(1915).—A detailed account of conditions, methods, etc., with several pages of analytical data, illustrations, and a description of a portable lab., a set of app. arranged on an automobile body. Six or 7 min. after arriving at a place the total S app. could be started drawing in a sample, and the analyst could be taking an "instantaneous" sample for SO_2 detn. The results

obtained by this portable lab. were as accurate as those obtained at the fixed stations.

Summary. General conditions: (1) When the wind was from the west and blew the smoke from the smelter over the "smoke zone," there was present in the air of this area a higher concn. of SO_2 than was found when the wind was blowing from other directions. This concn. is higher than is normally present in the atm. outside of large cities. (2) The SO_2 contamination was due mainly to the emanations from the Selby smelter. Only when the wind was blowing the smoke directly from the smelter over the area were the higher concns. found. (3) The concn. of SO_2 in the air was not entirely proportional to the SO_2 output from the Selby smelter, for the concn. at any point was influenced to a great extent by the atm. conditions. (4) No indications were found of the presence of very high concns. during the early morning hours. The highest concns. were found in the samples taken about noon or in the early afternoon. (5) Under moderate or brisk wind conditions, the increase in SO_2 concn. was not very great in any part of the "zone," a max. of 1.25 parts of SO_2 per million parts of air being found when the smelter was sending out SO_2 at the rate of 70 tons per day. (6) Under a very slight west or southwest wind or a drift of air from the smelter across the "smoke zone" the concn. at certain places became relatively rather high for short periods of time. These high concns. were found only when there were puffs of smoke relatively undispersed or poorly dissipated drifting past the point of sampling. (7) These puffs of Selby smoke were not of long duration at any time and came only at infrequent intervals. They were present more often and with higher SO_2 content over the land lying nearest the straits and west of Dillon Point than in the city limits of Benicia or over the agricultural area bordering along the Vallejo-Benicia highway. At no time during the period of field investigations has the smoke from the Selby smelter been present in the city of Benicia to such an extent as to constitute a nuisance. This is fully established by extensive tests made. The tests to det. the sensibility of human beings to SO_2 showed that the av. person required to be surrounded by an atm. containing at least 3 parts of SO_2 per million parts of air before he could detect the presence of the gas either by smell or taste. The av. person did not consider concns. of 5 to 6 parts of SO_2 per million of air, lasting for several min., a nuisance. With concns. up to 20 parts of SO_2 per million, none of the subjects experimented upon experienced a feeling of nausea or any symptom other than an irritation of the throat and a tendency to cough. The data obtained in these tests check very closely the data obtained by Lehmann (*Arch. Hyg.* 18, 180-91(1893)). With an output from the Selby smelter of less than 100 tons SO_2 per day, and considering the fact that it is not during the wet season that the smoke is present to any extent over the area, and that during the dry season it is present only on infrequent occasions in sufficient strength to do damage, the smoke does not constitute a menace to the successful growing of crops in the smoke zone. From the fumigation expts. no indication of "invisible injury" to grain to decrease the yield of the crop was found. Detns. of the rate of deposition of Pb and As on the soil in the Selby smoke zone showed that when the roaster smoke was allowed to go out into the atm. unfiltered from the Selby plant there was undoubtedly a very slight deposition of Pb on the soil of the "smoke zone." However, the amt. so deposited was very small and would have required many years deposition to bring about an appreciable increase in the Pb content of the soil. With the successful operation of both the bag houses there is no possibility of further deposition.

F. W. SMITHER.

Determination of the deposition of lead and arsenic on the soil in the Selby smoke zone (Solano County, Cal.). A. E. WELLS AND C. E. BRANDT. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 181-6(1915).—Pairs of glass plates (4×6 ft.) were set up at 3 points in the district; 1 plate of each set was covered with a thin coating of vaseline, the other left clean. The plates were slightly elevated from the ground and

set to face the direction of the smelter, at an angle of about 45° from the horizontal. The samples were removed from the plates by rubbing off the vaseline with clean cloths, the cloth being included with the sample in the subsequent analysis. The samples were treated with petroleum ether to dissolve the vaseline, and the residual solids weighed. The solids were then divided, one part being used for the detn. of As by treating directly in a Marsh app. and comparing with standard mirrors. The other part was treated with HNO_3 , then heated to fumes with H_2SO_4 , dild., and filtered. The PbSO_4 was dissolved in AcONH_4 , the Pb pptd. as PbS , dissolved in HNO_3 , then fumed with H_2SO_4 , dild., filtered, and weighed as PbSO_4 . Blanks made on the vaseline showed no Pb and a slight trace of As, amounting to a correction of less than 1 part in 1 million. Some of the samples were treated directly with HNO_3 and H_2SO_4 to destroy org. matter. The calcd. deposition per acre per yr. on the soil at the test stations showed from 13 to 113 g. of Pb and 0.2 to 1.2 g. of As. Determination of lead and arsenic present in the grasses and straw. *Ibid* 187-8.—A sample (254 g.) was digested with HNO_3 and H_2SO_4 until all org. matter was oxidized and then heated to SO_2 fumes, and Pb detd. as above. For As 5 g. were treated directly in a flask with H_2SO_4 and Zn, connected with the regular Marsh app. and the As mirror compared with standard mirrors. The amts. found, representing the max. deposit for a season, were: Pb 21 parts per million by wt., As 5 parts per million by wt.

F. W. SMITHER.

Determination of sulfur in plant foliage. G. C. BARTELLS, JR., AND C. E. BRANDT. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 297-300(1915).—In connection with investigations of injury to growing barley by SO_2 , it was considered important to det. whether the plants subject to the action of SO_2 showed an increase in the amt. of S present in the foliage and grain kernels above that found in plants not subjected to the gas. The method used in the analyses is essentially the fusion method described in *Bull.* 107, Bur. of Chemistry. The tests showed that all the S was present (in fumigated vegetation and in checks) in fixed combinations. It is concluded that the detn. of the S content of vegetation is not sufficient alone to det. the extent of the damage that the vegetation may have endured by SO_2 , for great differences are found in the S content of normal uninjured vegetation.

F. W. SMITHER.

Disappearance of sulfur dioxide from dilute mixtures of sulfur dioxide with air. G. C. BARTELLS, JR. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 308-23(1915).—Expts. reported in detail with illustrations and tabulated data lead B. to the following conclusions: (a) When a mixt. of SO_2 and air was introduced into a closed glass carboy and brought into contact with green vegetation, the SO_2 disappeared very rapidly and almost completely, due in great part to the simple absorption of the SO_2 by the live plant, to a small degree to the oxidation of SO_2 in an excess of moist air, and also to adsorption of the H_2O of the air with fixation of the SO_2 . (b) When a mixt. of SO_2 and air was left standing in a glass container for a considerable period in a dry atm. in diffused light, there was a disappearance of SO_2 (about 10% in about 30 hrs.), due partly to oxidation, partly to loss by diffusion, and partly to the adsorptive property of the glass in the presence of probable traces of H_2O (although mixt. was considered dry). (c) When SO_2 was mixed with air containing H_2O to the point of 50% satn., the rate of disappearance was much greater than in the dry air alone, due mostly to adsorption on the glass. (d) When SO_2 was mixed with air containing H_2O to the point of 100% satn., the rate of disappearance of the SO_2 was much greater and the disappearance more nearly complete than under any other conditions. (e) When a mixt. of SO_2 and air was exposed to the action of direct sunlight, a gradual disappearance of the SO_2 took place, the rate of its disappearance being greatest at those times when the temp. in the vessel was highest. This fact would preclude to a large extent the simple soln. of SO_2 by any H_2O present, for as the temp. of H_2O increases,

the solubility of SO_2 decreases to a marked degree. A part of the SO_2 was adsorbed, varying with the amt. of H_2O present. (f) In all of these tests both oxidation and absorption took place. In a moist atm. both of these took place to a greater degree than in a dry atm.

F. W. SMITHER.

Investigations of the gases from the Dwight & Lloyd sintering machines at the Selby smelter. A. E. WELLS. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 324-37(1915).—The only emanation from the Selby smelter (Solano Co., Cal.) that now contaminates the atm. is the SO_2 from the sintering machines. Investigations, discussed in some detail, were made for the purpose of detg. the possibility of reducing the amt. of this SO_2 output. *Summary:* Under the charge and operating conditions consistent with good roasting and sintering results, at least 75% of the total SO_2 from the machines was obtained in a gas vol. that had an av. concn. of 7.3% SO_2 . The roasting area of a machine has been divided into 4 sections, beginning at the ignition part. Section 1 has a length of 3 ft.; section 2, 7 ft.; section 3, 5 ft.; section 4, 5 ft. From section 2 alone has been drawn out a vol. of gas containing 5.5%, or 55% of the total SO_2 produced in the machine, from section 3 a gas containing 2.8% SO_2 . By conducting the gas from section 3 into a hood placed over section 2, the concn. of the gases in the exit pipe from section 2 was raised to an av. content of 7.3% SO_2 . This gas then contained 78% of the total SO_2 eliminated by the machine. In order to gain these results, certain conditions must be maintained, the most essential of which are: (1) The variations in the physical condition of the charges should be kept within limits that will exclude very coarse Pb concentrates, coarse raw mat, lumpy materials, and the presence of an excessive proportion of Pb slimes. (2) The constituents of the charges should be intimately mixed. (3) The charges should contain the correct H_2O content, which should also be intimately mixed with the other materials. (4) The ignition of the charges should be carefully watched. All of these conditions are equally as essential for the best roasting and sintering results as for the production of a gas of high concn., and the attainment of these conditions is well within the range of smelter operating practices. The chem. compn. of the charges may vary within the wide limits that will still allow of a successful roast and sinter, and, if the conditions mentioned above exist, the high gas concn. can be realized. Should it be desirable, 85% of the total SO_2 can be concd. in a vol. that will contain a concn. of at least 8% of SO_2 . This would call for a rather more complicated arrangement of fans and air-pipe lines, but would still be practical. With a concn. of 7 to 8% it is possible to apply a com. scheme for the recovery of SO_2 , either as liquid SO_2 , H_2SO_4 , or S.

F. W. SMITHER.

Conditions of plant life in the Selby smoke zone, Jan. 1 to July 1, 1914. J. W. BLANKINSHIP. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 381-97 (1915); illustrations.—“ SO_2 to do material damage in dry weather to vegetation within 0.5 hr. must be so strong as to be almost unbearable, or if dil. must be very frequently repeated or almost const. over the area injured in order to affect vegetation at all.”

F. W. SMITHER.

The occurrence of sulfur dioxide injury to plants in the Selby smoke zone. W. W. JONES. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 398-427 (1915); illustrations.—A report on SO_2 injury, the common fungous diseases, the presence of insect pests, the nature of the soil, the cultural methods and practices, etc.

F. W. SMITHER.

Agronomic and soil conditions in the Selby smoke zone. C. F. SHAW AND E. E. FREE. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 451-67(1915).—The soils of the region (Solano Co., Cal.) are loams or silts derived from the weathering of sandstones and shales which are extensively exposed. There is little or no

river silt or other soil material transported from a distance. The topography is between rolling and mountainous. The conclusions in the matter of soil pollution are as follows: (1) Arsenic is certainly a normal, though extremely minute, constituent of the soils of the region, and Pb is probably so. (2) The past contamination of the soils by Pb and As from the smelter is possible but unproven and appears not to be susceptible of proof. (3) The quantities of Pb and As added, if any, have been small and of the same order as the quantities of these elements normally present in the soils. The max. amts. of Pb and As found are far too small to have any injurious effect on plants grown in the soils. Analytical results are reported. A letter from C. B. Lipman confirming the above opinion is given.

F. W. SMITHER.

Investigation of live-stock conditions and losses in the Selby smoke zone (Solano County, Cal.). C. M. HARING, K. F. MEYER, *et al.* Report Selby Smelter Commission. *Bur. Mines, Bull.* 98, 474-502 (1915); illustrations.—*Conclusions:* It appears probable that in the past considerable damage to horses has occurred in the smoke zone from Pb emanating from the Selby smelter. To date (July 19, 1914) no evidence has been found of injury since March, 1914. There is no evidence or suspicion that the smelter smoke has ever injured cattle or hogs. It has been claimed that sheep have been injured, but no clinical evidence could be procured to substantiate such assertions. Until additional evidence can be found, there is no reason to believe that the Selby smelter smoke is now doing any damage to live stock.

F. W. SMITHER.

Aluminium alloys and their use for canteens and cooking utensils (BOGS) 12. Determination of sulfur dioxide in the atmosphere (WELLS) 7. Determination of total sulfur in the atmosphere (WELLS) 7. Effect of dilute sulfur dioxide on a growing grain crop (WELLS) 11D. Extraction and recovery of radium, uranium and vanadium from carnotite (PARSONS) 3.

Hardening steel rails. C. P. SANDBERG. *Brit.*, 18,972, Aug. 22, 1914. The head only of a rail, which retains the heat existing therein after the completion of the rolling operation, is cooled to a point below the critical temp. by directing thereon from a pipe a jet of fluid, such as air or steam, or H_2O , the rail being subsequently allowed to cool naturally. A rail made of steel containing 0.5% of C, 0.9% of Mn and 0.08% of Si is referred to.

Coating iron and steel. *Brit.*, 18,932, Aug. 21, 1914. W. E. WATKINS. A coating of Cu, or other metal having less affinity for O than has Fe, is formed on Fe and steel sheets, etc., by deposition from an oxide compd. The compd. is applied to the surface in admixt. with a neutral vehicle, such as oil, and the coated sheet is passed through a furnace chamber heated to the welding temp. of Fe. The coating itself becomes covered with a protective layer consisting substantially of Fe_2O_3 , which may be removed after cooling.

Coating surfaces with metals. H. SCHLÖTTER. *Brit.*, 18,970, Aug. 22, 1914. The coating metal is vaporized in a chamber having a throttled outlet, so that the issuing jet impinges against the surface with sufficient violence to secure adhesion.

Treating zinciferous ores with sulfurous acid. ERZ-VERWERTUNGS-GES. M. B. H. *Ger.*, 284,982, Apr. 25, 1913. In view of the observation that $ZnSO_3$ dissolves much more readily than the oxide, ores or other materials containing ZnO are treated first with combined SO_2 , whereby the ZnO is converted into $ZnSO_3$, which is then treated with gaseous SO_2 and converted thereby into $ZnH_2(SO_3)_2$. The conversion into the monosulfite can be effected readily by adding to the roast a bisulfite soln., as follows: $ZnO + ZnH_2(SO_3)_2 = 2ZnSO_3 + H_2O$. This treatment of the ore can be

carried out in special app. outside of the gas-absorption app. The resulting monosulfite is then stirred up with H_2O and treated with SO_2 gas. This SO_2 gas is quickly and completely absorbed with the instant formation of bisulfite. The conversion can be effected well and completely in the tower despite the short period of passage. *E. g.*, if a 5% Zn soln. be made from 16 tons ore with 25% Zn content, the 4000 kg. Zn would require 80 tons H_2O and 8000 kg. SO_2 . At first, 80 tons H_2O are mixed with 1 ton ore, and treated with SO_2 gas until the 250 kg. of Zn in the ore mixt. are completely dissolved. The resulting 0.3% Zn soln. is allowed now to run off from the extd. material, and is then brought to act with 1 ton of fresh roast. The soln. and the material are first intimately mixed, whereby the ZnO of the ore is converted by the bisulfite of the soln. into monosulfite. SO_2 gas is then introduced until all monosulfite is dissolved. After removal of the extd. material the soln. is mixed with 2 tons of fresh roast. The soln. obtained by repeated introduction of SO_2 gas is mixed with 4 tons of roast, and the soln. finally obtained from this is mixed with 8 tons of roast. In this manner the SO_2 gas comes only in contact with monosulfite. Only on a very small portion of the ore does the gas act directly. This even can be prevented by reserving a small portion of the concd. soln. and bringing it into contact with the first ton of ore. The process may be made continuous by conducting the SO_2 gas through a reaction tower, and introducing a mixt. of the previously formed monosulfite, with H_2O , counter to the gas. The monosulfite is produced continuously, the lye drawn from the tower for admixt. with the fresh roast being returned after the extd. material has been withdrawn from below.

Recovering values from the residues obtained by dressing gold and silver ores by the oil flotation process. S. MICHAELIS. *Ger.*, 285,229, Apr. 18, 1913. The oil adheres only to the metallic particles or compds. of the ore and carries them upon the surface of the liquid, while the incompletely disintegrated, and, therefore, but partially oil-covered portions do not rise to the surface, but are suspended over the dead gang and are removed therewith without being exhausted of their values. This objection is overcome, and a yield of 80-90% is obtained (as against the heretofore obtained yield of 30-40%) by taking advantage of the lower sp. gr. of the intermediate product, due to its oily character, and sepg. it by centrifugation from the dead gang. The ore is first stamped, and mixed dry with oil, in a suitable app. The resulting oily ore slurry is conducted into an acidified liquid wherein the completely comminuted metallic constituents sep. first by rising to the surface. After these are removed, the dead gang, with the layer of oily, imperfectly disintegrated ore above it, is drawn from the container and centrifuged.

Briquetting flue dust containing iron. R. HÜBNER. *Ger.*, 285,464, July 19, 1912. In order to render the briquets so firm that they will bear the charge in the blast furnace and at the same time retain their form until all the contained Fe is reduced, the flue dust is stirred up with coal, kaolin, quartz, lime, magnesia, HF and H_2O , to a stiff plastic mass which is briquetted in the usual manner. *E. g.*, a mixt. is prepd., consisting of ferruginous flue dust 54, coal 16, kaolin 7.5, quartz 8.4, CaO 10, MgO 3.5 and HF 0.6 parts. The constituents are mixed first without the HF, then to the HF is added sufficient H_2O to form a stiff plastic mass, and the briquets are made from this product. The amt. of HF is in inverse proportion to the amt. of Fe in the flue dust, and falls to between 0.6 and 5%. The HF is said to induce the formation of a basic, readily fusible slag in the blast furnace.

Briquetting soot with flue dust or fine ore. F. SCHUSTER and C. LICHTENSTERN. *Ger.*, 285,078, Dec. 5, 1913. Heretofore the use of soot has been impractical because of the action of the blast in blowing it away. This difficulty has been overcome by mixing the soot first with a liquid binder. The soot, preferably moistened first with H_2O , is mixed with the liquid binder, as salt solns. or salt mixt. solns. and acids, before

it is mixed with the ore dust material, whereby it is rendered so consistent that it can be mixed with the fine dust or ore dust in mixing app. Briquetting is effected by compressing the material and allowing it to harden. The resulting briquets require but a small amt. of fuel, in the blast furnace, for the reduction.

Decarbonizing iron, steel, chromium, manganese, nickel, cobalt and other metals containing carbon. NITROGEN PRODUCTS CO. Ger., 285,465, Mar. 7, 1913. The metal, solid or fused, is brought into contact simultaneously with N and an alkali or alk.-earth metal, such as Ba. The C is removed by distg. off the resulting cyanide from the metal. A suitable app. is specified.

Case-hardening iron. K. STRATMANN. Ger., 284,859, Mar. 21, 1914. The tools are packed, together with pulverulent hardening agent, in vertical retorts adapted to be discharged from below, in containers of combustible or carbonized material, such as paper, wood, and the like, which fall to pieces upon incandescence.

Hardening and tempering steel pegs, tuning pins, etc. J. W. DUNKER. Ger., 285,503, July 14, 1914. An app. is employed in which the articles are conducted intermittently, in progressive order, through the heating canal.

Casting wheels from two kinds of steel. H. R. KEITHLEY. Ger., 283,287, Sept. 16, 1913. The casting is effected in such manner that after pouring and compressing into the mold, the hard metal forms the rim and flange.

Coating metal with aluminium. ALLGEMEINE ELEKTIZITÄTS-GE. Ger., 285,245, Sept. 28, 1912. Al powder is mixed intimately with NH_4Cl and Zn powder. The articles to be treated are introduced into a furnace and covered with the mixt. The furnace is then closed and revolved slowly. The articles are maintained for about 7 hrs. at a temp. of about 450° , whereupon they are removed and heated for 15 to 20 min. at $700-800^\circ$. Good results were obtained with a mixt. of 70% Al, 23% NH_4Cl and 7% Zn. The Zn may be substituted by graphite, in which case Al 60%, graphite 30% and NH_4Cl 10% are employed. By employing this mixt. the temp. can be raised to 700° . The product has the appearance of Al bronze and takes a high polish. It is covered with a layer, 0.2-0.5 mm. thick according to the period of the treatment, of an alloy which is exceptionally hard and tough and which is so firmly united that it cannot be removed from the base metal. It is not attacked by acids. In an atm. which prevents oxidation, heating of the article with pure Al powder will suffice in many cases.

Electric resistance welding of aluminium. ALLGEMEINE DEUTSCHE ALUMINIUM-KOCHGESCHNEIDFABRIK G. G. GER. Ger., 285,490, Dec. 8, 1912. Due to oxidation in the elec. welding of Al the electrodes are quickly rendered impure, lose their smooth surface, and permit access of air to the point of welding. To obviate this difficulty a movable piece of metal or other material of sufficient cond. is interposed between the point of welding and the electrode. It may be removed and replaced as often as necessary, and must be less fusible than Al.

10. ORGANIC CHEMISTRY.

CHAS. A. BOUILLER.

Formation and preparation of glucosemoneacetone. JAMES C. IRVINE AND JAMES I. A. MACDONALD. Univ. St. Andrews. *J. Chem. Soc.* 107, 1701-101515. d. M., C. A. 8, 907.—It is shown that, contrary to the opinion of Fischer (*Ber.* 28, 2496 (1895)), glucosemoneacetone (A) is not an intermediate product in the formation of glucoediacetone (B), but is formed from this as a result of the great instability of 1 of the Me_2C -groups in the mol. While 0.1% HCl hydrolyzes both groups at 50° ,

only 1 group is removed at 30°, this being the non-glucosidic group. Although 2 glucosidic forms of (A) are possible, only the variety described by Fischer was isolated. 65 g. finely powdered glucose were shaken 8.5 hrs. with 1200 cc. MeOH containing 1.5% HCl and let stand for 60 hrs. After shaking 2 hrs. with BaCO₃, filtering, and evapg. *in vacuo*, 700 cc. acetone containing 0.5% HCl were added and shaken at 35° for 20 hrs. Acid was removed with Ag₂CO₃ and the acetone distd. off on the H₂O bath. Several extns. of the residue (50 g.) with petr. ether removed (B), leaving a residue sometimes consisting of (A) and sometimes of a solid soln. of (A) and (B). The (B) obtained was recrystd. from petr. ether and half-hydrolyzed as follows: 40 g. were dissolved in 850 cc. H₂O containing 0.1% HCl and kept in a thermostat at 30°. [α]_D decreased gradually, and usually reached a const. value in ca. 3.5 hrs. After neutralization with Ag₂CO₃ and treatment with blood charcoal, the soln. was evapd. to 200 cc., filtered from sepd. Ag, and concd. to a syrup *in vacuo*. The residue, extd. with boiling, neutral EtOAc, gave 28 g. (88% of the theory) of (A) on cooling. It seps. (best from not too concd. solns.) in bulky, gelatinous form, and is best freed from adhering solvent by drying at 40° in a current of dry air. A further recrystn. from H₂O is necessary. C and H detns. were unreliable for some reason, and the best criterion of purity was found to be hydrolysis at 75° with 0.1% HCl, when [α]_D should become about 52.5°. The EtOAc mother-liquors, when concd., deposited warty aggregates which m. constantly at 150–1° when crystd. from EtOAc, but were ultimately fractionated from H₂O into (A), (B), and glucose, indicating that the crystals were a solid soln. of (A) and (B), which suffered slight hydrolysis during the fractionation. However, the polarimetric results obtained on hydrolysis of the crystals indicated the presence of a strongly *d*-rotatory substance, possibly an isopropylidenediglucose. Methylation of the mixed crystals according to I. and Scott (C. A. 7, 2383) gave results which were of value only in confirming the presence of (B) and showing that some compd. was originally present which contained fewer than 3 OH groups. Trimethyl-glucosemonoacetone was prepd. from (A) according to I. and S. On hydrolysis, isolation of the product in the usual manner, and distn. in high vacuum, there was obtained, instead of the expected sugar, which was to be used in the synthesis of glucosamine, trimethylglucosone, syrup, b_p 153°, reacts energetically with Fehling soln. in the cold, [α]_D –15.7° in H₂O. The rotation in H₂O is unaffected by the addition of H₃BO₃, indicating that the Me groups are in the γ, ϵ, ζ -positions.

M. HEIDELBERGER.

Nature of the vibrations causing the color of dyes. EDWIN R. WATSON AND DAVID B. MERR. Dacca, India. *J. Chem. Soc.* 107, 1567–78(1915).—It was previously pointed out (C. A. 8, 2368 *et seq.*) that those dyes which are quinonoid in all possible forms show deep color, provided different PhH nuclei become alternately quinonoid. It is now proposed that the process taking place during these changes in a long series of conjugated double and single bonds may be visualized by the analogy of the pulsation running along a freight train when the engine is started or stopped. The breadth, indefiniteness, and frequent asymmetry of the absorption bands of dyes suggest forced vibration. If the analogy holds good, in very similar mols. the period of the principal vibration causing color would be proportional to the length of the conjugate chain. Measurements showed this actually to be the case. The following pairs of substances were investigated: Michler's hydrol and ketone, the corresponding unmethylated derivs., quercetin reduction product and quercetin, morin reduction product and morin, apigenin reduction product and apigenin, pyronine-G and 3,6-tetramethyldiaminoxanthone, 3-hydroxyfluorone and 3,6-dihydroxyxanthone. The arrangement of the chains of double bonds in these compds. is shown in a series of diagrams. In the first 2 pairs, the ratio of the wave lengths of the max. of the principal

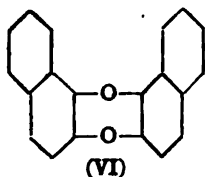
bands should be 5:3, while for the flavone dyes an arrangement of the bonds is assumed which also gives the ratio 5:3. It is shown that the ratio 4:3 is possible for the xanthone and fluorone dyes. These ratios were experimentally verified in every case, the figures being given. A criticism is also made of the theories attempting to refer the absorption of a dye to that of its "mother substance." The applicability of Baly's new theory (permitting the calcn. of absorption bands in the visible and ultra-violet from the infra-red absorption (*C. A.* 9, 1001, 3163)) to the anthraquinone dyes is indicated, and its limitations with reference to the explanation or prediction of colors discussed. In making the measurements, the basic dyes were dissolved in dil. acid, and the acid or phenolic dyes in dil. alk. in order to develop the colors fully. The reduction products of the flavones were prepd. (in soln.) according to *C. A.* 8, 1748.

M. HEIDELBERGER.

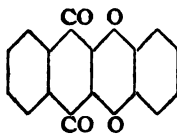
Effect of additional auxochromes on the color of dyes. I. Phthalein and benzein dyes. VISHNU R. MISHRI AND EDWIN R. WATSON. Dacca. *J. Chem. Soc.* 107, 1579-82 (1915).—Fluorescein (A), gallein (B), the dihydroxyfluorescein (C) from $C_6H_4(CO)_2O$ and 1,3,4- $C_6H_3(OH)_3$ (D), resorcinolbenzein (E), pyrogallolbenzein (F), and hydroxyquinolbenzein (G) (prepd. according to Ghosh and W., *C. A.* 8, 3367) were examd. spectroscopically in alc. soln. before and after the addition of KOH. The results are given in a series of curves. In both groups of dyes the effect of increasing the number of auxochrome groups was to widen the absorption band in the visible part of the spectrum and to shift the max. a little towards the red, the effect being more marked in (B) and (F) than in the dyes derived from (D). Addition of alkali enhances the effect and makes the band shallower. The results are interpreted as being due to 2 bands at about $\lambda 5000$ and 5800 , resp., their relative strengths being different in the different cases. The bands and the max. are not seen separately because the width of the bands is greater than the difference between their centers. In (A) and (E) with and without alkali and in (C) and (G) in neutral soln. only the band at $\lambda 5000$ is developed, but in alk. solns. of the latter 2 the 2nd band appears. This band is relatively most strongly developed in the pyrogallol derivs., and is favored by the occurrence of 2 OH groups *o*- to one another.

M. HEIDELBERGER.

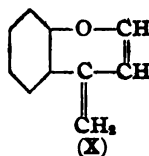
Influence of constitution on the basic property of oxygen. I. BROJENDRA N. GHOSH. Univ. Coll., London. *J. Chem. Soc.* 107, 1588-1605 (1915).—A systematic investigation to throw light on the manner in which the basic property of O is controlled by the constitution of the mol. in which the O occurs. The present paper deals particularly with the influence of certain unsatd. groups on the additive capacity of O in a cyclic chain. The following types of 6-membered ring systems were examd.: $(CH_2)_6O$ (I), $O:(CH_2)_4:O$ (II), $C_6H_4.(CH_2)_2O$ (III), $C_6H_4O.(CH_2)_2O$ (IV), $O.(CH_2)_2O.(CO)_2$ (V), (VI), (VII), $O.C_6H_4O.CO.CH_3$ (VIII), $O.C_6H_4O.(CO)_2$ (IX),



(VI)



(VII)



(X)

(X), and $O.C_6H_4.CH:CH.CO$ (XI). Since Hofmann (*C. A.* 4, 1043, 2464) has shown

that $HClO_4$ is probably the most useful acid for the formation of stable salts with weak bases, this was used in every case and supplemented, when salt formation was observed, with the use of other acids. (I), (II) and (III) yielded no salts. (IV): 22 g.

α -C₆H₄(OH)₂ (A), 40 g. BrC₆H₄Br, 28 g. powdered, fused K₂CO₃, and 0.5 g. Cu bronze with a little glycerol were heated under a reflux 7-8 hrs. at 190-200°, made alk. with NaOH and distd. with steam. The distillate, containing oil, was extd. with CHCl₃ and this was washed with dil. alkali, dried, and concd. The portion of the residue b₇₁₇ 212-4° was used. Yield, 16 g., 66% of the theory, and double that obtained by Vorländer's original method (Ann. 280, 203(1894)). It is insol. in acids or alkalis and has d₄²⁰ 1.180; the mono-NO₂ deriv. was converted into *dinitrobenzodihydrodioxin* in HOAc with 1 mol. HNO₃ and excess H₂SO₄ on the H₂O bath for 2 hrs., needles, m. 133-4°. (IV) and an excess of HNO₃ and H₂SO₄ at room temp. for 1 hr. gave *trinitrobenzodihydrodioxin*, needles, m. 155°. (IV) in boiling HOAc with 1 mol. Br gave a *mono-bromo derivative*, b₇₁₄ 275-6°, the Br being stable to boiling with alc. KOH; with an excess of Br there is formed the *dibromo derivative*, needles, m. 138°. (V): Prepd. from (COCl)₂ and HOC₆H₄OH in C₆H₅N; *dihydrochloride*, using the concd. acid and evapg. *in vacuo* over KOH, m. 152°; *dihydrobromide*, not very stable, m. 132° (decompn.); *dipicrate*, needles, m. 115°; *perchlorate*. (VI): 1 mol. each of HOC₁₀H₇Br and K₂CO₃ were heated in PhNO₂ with a little Cu bronze 10-12 hrs. at 190-200°, distd. with steam, and the residue washed with dil. NaOH and H₂O. Solvents extd. from this the difficultly sol. *di- α,β -naphthodioxin* (VI), pale yellow needles, m. 184-5°; yield, small; *ferrichloride*, from dry Et₂O solns., green, decomp. on heating; *dipicrate*, in PhH soln., chocolate needles, m. 156°; *diperchlorate*, from (VI) in HOAc and HClO₄ (d. 1.7), purple needles. (VII): 1 mol. each of 1,2,3-C₆H₃(OH)₃ and 2,3-dichloro- α -naphthoquinone in pure, dry C₆H₅N were heated on the H₂O bath until a sample, on mixing with dil. H₂SO₄, gave a product free from Cl (about 5 hrs.). The soln. was poured into dil. H₂SO₄ and the ppt., *4-hydroxy-6,11-diketobenz- β,β -naphthodioxin*, recrystd. from HOAc, purple needles, m. 288°; *sodium salt*, insol.; *ferrichloride*, green; *diperchlorate*, in HOAc, dark, cryst. powder, decomp. explosively on heating; *dihydrochloride*, brown, cryst. powder, m. 122°; *acetyl derivative*, pale pink needles, m. 154°. (VIII): 22 g. (A) and 4.6 g. Na in alc. and 25 g. ClCH₂CO₂Et were boiled 3 hrs. on the H₂O bath, with occasional shaking, and poured into H₂O; the resulting *ethyl o-hydroxyphenoxyacetate* forms needles, m. 48°, and when boiled under a reflux 1 hr. with concd. HCl, neutralized with Na₂CO₃, and extd. with Et₂O, yields *ketodihydrobenzodioxin* (VIII), prisms, m. 135°; *dipicrate*, needles, m. 125°; *dihydrochloride*, needles, m. 131°; *dinitrate*, from an HOAc soln. and HNO₃ (d. 1.2), needles, m. 113° (decompn.); *diperchlorate*, crystals with 0.5 H₂O, begins to decomp. at 100°. (IX): Prepd. like (V), since (A) and (CO₂H)₂ did not condense under the influence of dehydrating agents; *dipicrate*, needles, m. 112°; *disulfate*, needles, m. 271° (decompn.); *dihydrochloride*, needles, m. 175°; *diperchlorate*, crystals. (X): 7-Hydroxy-2-methyl-4-methylenebenzo- γ -pyrane was prepd. according to Bülow and Wagner (Ber. 34, 1198(1901)); *hydrobromide*, using the d. 1.49 acid, contains 0.5 H₂O, m. 217° (decompn.); *perchlorate*, yellow crystals with 2 H₂O, decomp. above 90°; *chloroplatinate*, plates with 2 H₂O; concd. HNO₃ causes decompn. (XI): Coumarin forms a *picrate*, needles, m. 112°; *sulfate*, needles, m. 155-6°; *perchlorate*, deliquescent, cryst. powder. 2-Thio-1,2-benzopyrane yields a *picrate*, needles, m. 118°; *hydrochloride*, in MeOH soln. at 0° with dry HCl, pale yellow needles, m. 62°; *perchlorate*, by evapn. *in vacuo* over KOH of a soln. in the acid. 4-Methylcoumarin (Peters and Simonis, C. A. 8, 1703) gives a *picrate*, needles, m. 65°; *perchlorate*. 4,6-Dimethylcoumarin; *picrate*, needles, m. 124°; *sulfate*, needles, m. 168-9°; *nitrate*, cryst. powder, m. 175°; *perchlorate*; *hydrobromide*, unstable at room temp. 6,7-Dimethylcoumarin (B); *picrate*, needles, m. 124°; *sulfate*, crystals, m. 135°; *nitrate*, needles, m. 140-1°; *perchlorate*. Equal wts. (B) and P₂S₅ fused a short time at the m. p., extd. with hot PhH and the soln. boiled 3 hrs. with a little Cu powder, gave 2-thio-6,7-dimethyl-1,2-benzopyrane, yellow needles, m. 159-60°; *oxime*, needles, m.

121.5°; *phenylhydrazone*, yellow needles, m. 168°; both of these are, of course, the same as the compds. derived from (B). 4,6,7-Trimethylcoumarin; *picrate*, needles, m. 105°; *nitrate*, m. 118° (decompn.); *sulfate*, m. 92°; *perchlorate*; *chloroplatinate*, seps. with 4 H₂O. 2-Thio-4,6,7-trimethyl-1,2-benzopyrane, yellow needles, m. 158-9°; *oxime*, faintly yellow needles, m. 179-80°; *phenylhydrazone*, yellow needles, m. 147°. 7-Hydroxycoumarin; *mercurichloride*, crystals, decomp. at a high temp.; *picrate*, needles, m. 108°; *hydrochloride*, may be obtained by passing dry HCl into a soln. of (A) and AcCH₂CO₂Et in HOAc, needles, unstable at room temp.; *sulfate*, needles, m. 175° (decompn.); *perchlorate*. 3-Acetylcoumarin; *semicarbazone*, needles, m. 231°; *picrate*, needles, m. 75°; *hydrochloride*, needles, m. 108° (decompn.); *perchlorate*. 4-Methyl-1,2- α -naphthopyrone (XII); *mercurichloride*; *picrate*, needles, m. 89°; *hydrochloride*, needles, m. 178° (decompn.); *sulfate*, deliquescent crystals, m. 62°; *nitrate*, m. 78°; *perchlorate*, deliquescent crystals. 2-Thio-4-methyl-1,2- α -naphthopyrone, yellow needles, m. 186°; *mercurichloride*; *picrate*, m. 167°; *perchlorate*. For comparison, benzodioxole (catechol methylene ether) was prepd. (preferably using CH₂Cl₂ instead of the iodide as given by Moureu (*Bull. soc. chim.* [3] 15, 654(1897)); d_{4}^{20} 1.0640, is not sol. in acids. O.(CH₂)₂.O.CH₂ also failed to give salts with acids. Conclusions: The possibility of

salt formation with special reagents has been disregarded, hence the results are to be taken only as relative. In the compds. containing only 1 cyclic O, only the unsatd. substances yielded salts, and to these may also be added fluorane and the flavones. In the series containing 2 cyclic O, only (II) and (IV) failed to give salts. It is therefore seen that the additive power of O in these compds. is increased by the entrance of acidic or negative groups, such as the C:C, C:O, C:S groups and the PhH and C₆H₅ nuclei, although a single PhH ring is not sufficient to confer basicity (cf. III and IV). Previous work on the hydroxyflavones and the unsatd. ketones ArCH:CHCOCH:-CHAr, which form salts, furnishes additional support to the relation herein advanced.

M. HEIDELBERGER.

Action of alkalis on the nitrosoamines of 4-piperidone derivatives. ERIC D. EVENS, EDGAR C. GIFFORD AND WALTER E. L. GRIFFITHS. Univ. Bristol. *J. Chem. Soc.* 107, 1673-7(1915).—Francis (C. A. 7, 1351) found that the nitrosoamine of 2,6-tetramethyl-4-piperidone (triacetonamine) is quant. converted into phorone, H₂C=, and N by the catalytic action of OH ions. This work was undertaken with the idea of prepg. further nitrosoamines for the examn. of this reaction and of studying the resulting products. Diacetonamine oxalate and aldehydes were condensed in boiling alc. until no more ppt. formed. The percentages below refer to the yields obtained; the nitrosoamines were prepd. from the oxalates in H₂O or dil. acids with NaNO₂ in almost quant. yields. Only the descriptions given below are recorded of the substances which were obtained: Isobutyldiacetonamine oxalate, 80%; nitrosoamine (A), m. 56°, not 51-2° (Kohn and Wenzel, *Monatsh.* 27, 981 (1906)); phenyldiacetonamine oxalate, 62%; nitrosoamine (B), m. 75°, not 66-8° (K. and W.); cinnamyldiacetonamine oxalate, 60%; nitrosoamine (C), m. 126°; isovaleryldiacetonamine oxalate, 60%; nitrosoamine, m. 59°; vinylldiacetonamine oxalate, 60%; nitrosoamine, m. 59° (not analyzed); anisyldiacetonamine oxalate, 50%; nitrosoamine (D), m. 74°; *p*-tolylldiacetonamine oxalate, 50%; nitrosoamine, oil; butyldiacetonamine oxalate, 42%; nitrosoamine, m. 44°; heptyldiacetonamine oxalate, 40%; nitrosoamine, oil; propyldiacetonamine oxalate, 26%; nitrosoamine, m. 28°. The nitrosoamines were expected to behave as that of triacetonamine when treated with alkalis in the absence of air, but only those compds. given below gave products which could be handled. (B), treated with a small amt. of NaOEt, gave an oil which partly crystd. The solid portion, recrystd. from alc., gave the compound (PhCH:CHCOCH:CM₂)₂, m. 88°. The oil, which slowly continued to deposit

small amts. of the solid, was probably a mixt. of monomer and dimer. (D) gave quant. a yellow oil which solidified, giving α -*p*-methoxyphenyl- ϵ -methyl- Δ^{ab} -hexadien- γ -one, $\text{MeOC}_6\text{H}_4\text{CH:CHCOCH:CMc}_3$, yellow plates, m. 56° . (C) yielded 85% of the theory of α -phenyl- η -methyl- Δ^{ar} -octatrien- ϵ -one, $\text{PhCH:CHCH:CHCOCH:CMc}_3$, yellow needles or plates, m. 87.5° ; with Br in CS_2 it gives a hexabromide, m. 160° . (A) gave in small yield, and not absolutely pure, β - η -dimethyl- Δ^{ar} -octadien- ϵ -one, $\text{Me}_2\text{C:CHCOCH:CHCHMc}_3$, oil, b₁₁ $93-8^\circ$; tetrabromide, m. $76-7^\circ$. M. HEIDELBERGER.

Simple hydroaromatic hydrocarbons, alcohols and ketones. K. v. AUWERS, R. HINTERSEBER AND W. TREPPMANN. Univ. Greifswald and Marburg. *Ann.* 410, 257-87(1915).—The following new detns. of physical constns. are reported: *Cyclohexane*, b₇₁₀ $80.0-80.2^\circ$, $d_4^{11.2}$ 0.7869, n_D 1.42910, n_D 1.43119, n_D 1.43668, n_D 1.44116 at 10.85° , EE -0.05 , -0.06 , 0%, -3% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *Cyclohexene*, b₇₁₀ $83-83.5^\circ$, $d_4^{15.6}$ 0.8143, n_D 1.44653, n_D 1.44921, n_D 1.45620, n_D 1.46194 at 15.1° , EE -0.24 , -0.26 , -4% , -4% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *Methenecyclohexane* (twice distd. over Na), b₇₁₀ $100.5-1.3^\circ$, $d_4^{15.6}$ 0.8035, n_D 1.44934, n_D 1.45222, n_D 1.45958, n_D 1.46568 at 15.5° . EE 0.34, 0.34, 7%, 6%, for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *3,5-Dimethylcyclohexyl bromide*, b₇₁₀ $92-4^\circ$, d_4^{18} 1.2076, n_D 1.48020, n_D 1.48321, n_D 1.49033, n_D 1.49626 at 18.2° , EE 0.31, 0.32, 9%, 6%, for α , D, $\beta - \alpha$, and $\gamma - \alpha$. The bromide is best converted into the cyclohexane by heating a mixt. of 16 g. bromide, 70 cc. 96% alc., 32 g. Zn dust and the same amt. of sand 10 hrs. at 100° . The product is purified by shaking 2 days with ice-cold KMnO_4 , distg., adding Br to a permanent color and again distg. *1,3-Dimethylcyclohexane*, b. $118-20^\circ$, $d_4^{20.76}$ 0.7707, n_D 1.42276, n_D 1.42499, n_D 1.43947, n_D 1.43500 at 20.75° , EE 0.18, 0.20, 7%, and 3% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *1,2-Dimethylcyclohexene*, $d_4^{13.7}$ 0.8315, n_D 1.45906, n_D 1.46178, n_D 1.46908, n_D 1.47517 at 13.5° , EE -0.07 , -0.09 , 3%, 3% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *1,3-Dimethyl-3-cyclohexene*, prepd. from the alc. and P_2O_5 and twice distd. over Na, b₇₁₀ $124-6^\circ$, $d_4^{22.6}$ 0.7998, n_D 1.44263, n_D 1.44533, n_D 1.45215, n_D 1.45795 at 22.4° , EE 0.16, 0.16, 3%, 3% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *1,3-Dimethyl-5-cyclohexene*, b₇₁₀ $126-7^\circ$ (yield, 80%), $d_4^{21.1}$ 0.797, n_D 1.44086, n_D 1.44361, n_D 1.45020, n_D 1.45587, EE 0.16, 0.16, 2%, 2% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. The constitution follows from the facts that it forms a nitrosochloride with difficulty and that upon oxidation with KMnO_4 it yields, not a keto acid, but an oil (dibasic acid), b₁₁ $210-220^\circ$, probably α, γ -dimethyladipic acid. *1,4-Dimethylcyclohexene*, b₇₁₀ $124-6^\circ$, d_4^{22} 0.7989, n_D 1.44112, n_D 1.44372, n_D 1.45056, n_D 1.45626 at 22° , EE 0.12, 0.10, 2%, 2% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *Ethenecyclohexane*, b₇₁₀ $136-6.4^\circ$, $d_4^{17.6}$ 0.8237, n_D 1.46094, n_D 1.46389, n_D 1.47139, n_D 1.47773 at 17.6° , EE 0.35, 0.36, 9%, 10% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *1,3,5-Trimethylcyclohexene*, b. $140.5-42^\circ$, $d_4^{13.6}$ 0.8031, n_D 1.44604, n_D 1.44909, n_D 1.45591, n_D 1.46155 at 13.5° , EE 0.27, 0.29, 7%, 5% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *1,3,5-Trimethylcyclohexyl chloride*, prepd. by satg. trimethylcyclohexene in AcOH with HCl with cooling, oil, b₇₁₀ $68-9^\circ$, $d_4^{16.2}$ 0.9219, n_D 1.45182, n_D 1.45455, n_D 1.46035, n_D 1.46555 at 15.2° , EE 0.47, 0.49, 6%, 5% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *Bromide*, b₇₁₀ $95-8^\circ$, $d_4^{11.1}$ 1.1749, n_D 1.47951, n_D 1.48280, n_D 1.48971, n_D 1.49532 at 11.1° , EE 0.28, 0.31, 10% (?), 5% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. Attempts to reduce these compds. to the hexane were unsuccessful. *1,3-Dimethyl-5-methenecyclohexane*, prepd. by heating 1,3-dimethylcyclohexylidene-5-acetic acid in a stream of CO_2 for 2 hrs., mobile oil, b₇₁₀ $135-6^\circ$. It does not form a nitrosochloride. Upon oxidation with KMnO_4 it yields 1,3-dimethyl-5-cyclohexanone (identified as the semicarbazone); $d_4^{14.6}$ 0.7918, n_D 1.44334, n_D 1.44628, n_D 1.45313, n_D 1.45917 at 14.6° , EE 0.57, 0.60, 8%, 9% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *Cyclohexanol*, m. 23° , d_4^{27} 0.9373, n_D 1.45902, n_D 1.46035, n_D 1.46685, n_D 1.47146 at 37° , EE 0.07, 0.05, 0%, -1% for α , D, $\beta - \alpha$, and $\gamma - \alpha$. *1-Methylcyclohexanol*, m. $24-5^\circ$, b₇₁₀ 56.5° , $d_4^{24.66}$ 0.9251, n_D 1.4531, n_D

1.45874, n_D 1.46428, n_T 1.46908 at 24.65°, EZ —0.14, —0.13, 0%, 0% for α , D, β — α , and γ — α . *1-Methyl-2-cyclohexanol*, b_{16} 167.4–7.6°, $d_4^{13.4}$ 0.9333, n_D 1.46352, n_D 1.46585, n_T 1.47180, n_T 1.47665 at 13.4°, EZ 0.00, 0.00, 2%, 1% for α , D, β — α , and γ — α . *1-Methyl-3-cyclohexanol*, b_{14} 76–8°, $d_4^{24.3}$ 0.9182, n_D 1.45217, n_D 1.45444, n_T 1.46031, n_T 1.46502 at 25.5°, EZ —0.02, —0.02, 4%, 2% for α , D, β — α , and γ — α . *1-Methyl-4-cyclohexanol*, b_{12} 74.7–75.2°, $d_4^{22.5}$ 0.9183, n_D 1.45366, n_D 1.45594, n_T 1.46160, n_T 1.46651 at 22.5°, EZ 0.01, 0.02, 4%, 2% for α , D, β — α , and γ — α . *1,3-Dimethyl-3-cyclohexanol*, b_{11} 79–81°, $d_4^{22.9}$ 0.9028, n_D 1.45177, n_D 1.4514, n_T 1.45984, n_T 1.46463 at 22.9°, EZ —0.02, —0.02, 4%, 1% for α , D, β — α , and γ — α . *1,4-Dimethyl-4-cyclohexanol*, b_{11} 70–2°, $d_4^{23.9}$ 0.9060, n_D 1.45317, n_D 1.45534, n_T 1.46141, n_T 1.46622 at 23.9°, EZ —0.05, —0.05, 5%, 2% for α , D, β — α , and γ — α . *1,3-Dimethyl-5-cyclohexanol*, 2 samples were examd.; the 1st b , 81.5–2°, b_{18} 89°, b_{17} 181°, $d_4^{18.65}$ 0.8996, n_D 1.45354, n_D 1.45601, n_T 1.46181, n_T 1.46651 at 18.55°; the 2nd, m , 36–8°, long glistening needles, $d_4^{18.9}$ 0.8806, n_D 1.44440, n_D 1.44700, n_T 1.45238, n_T 1.45727 at 38.4°, EZ 0.21, 0.23, 5%, 2% for α , D, β — α , and γ — α . *Acetate*, b_{11} 84–5°, $d_4^{20.2}$ 0.9277, n_D 1.43526, n_D 1.43758, n_T 1.44312, n_T 1.44771 at 20.2°, EZ 0.15, 0.15, 3%, 1% for α , D, β — α , and γ — α . *1,3,5-Trimethyl-5-cyclohexanol*: 2 samples were used, 1 prepd. from the liquid, the other from the solid dimethylcyclohexanol. (1) b_{18} 83–5°, $d_4^{24.7}$ 0.8861, n_D 1.44865, n_D 1.45115, n_T 1.45674, n_T 1.46160 at 24.7°; (2) b_{18} 82–3°, $d_4^{18.8}$ 0.8876, n_D 1.45108, n_D 1.45371, n_T 1.45921, n_T 1.46422 at 16.3°, EZ 0.13, 0.13, 5%, 2% for α , D, β — α , and γ — α . *Cyclopentanone*, b_{18} 23.2–3.6°, d_4^{17} 0.9516, n_D 1.43587, n_D 1.43817, n_T 1.44390, n_T 1.44867 at 17.3°, EZ 0.11, 0.11, 3%, 0% for α , D, β — α , and γ — α . *Cyclohexanone*, b , 156.6–6.8°, $d_4^{15.3}$ 0.9503, n_D 1.45024, n_D 1.45261, n_T 1.45859, n_T 1.46370 at 15.3°, EZ 0.18, 0.18, 2%, 1% for α , D, β — α , and γ — α . *Cycloheptanone*, $d_4^{21.5}$ 0.9498, n_D 1.45801, n_D 1.46027, n_T 1.46646, n_T 1.47149 at 21.9°, EZ 0.03, 0.01, 0%, —1% for α , D, β — α , and γ — α . *1-Methyl-2-cyclohexanone*, b_{110} 167°, $d_4^{14.6}$ 0.9300, n_D 1.44827, n_D 1.45049, n_T 1.45653, n_T 1.46135 at 14.6°, EZ 0.09, 0.07, 0%, —1% for α , D, β — α , and γ — α . *1-Methyl-3-cyclohexanone*, b_{18} 60–60.2°, $d_4^{26.15}$ 0.9139, n_D 1.44092, n_D 1.44313, n_T 1.44914, n_T 1.45394 at 25.15°, EZ 0.18, 0.17, 2%, 0% for α , D, β — α , and γ — α . *1-Methyl-4-cyclohexanone*, $b_{10.8}$ 55.8–6.4°, $d_4^{24.4}$ 0.9119, n_D 1.44092, n_D 1.44322, n_T 1.44918, n_T 1.45413 at 24.4°, EZ 0.24, 0.23, 2%, 2% for α , D, β — α , and γ — α . *1,3-Dimethyl-5-cyclohexanone*, b 180°, $d_4^{13.2}$ 0.8967, n_D 1.44272, n_D 1.44542, n_T 1.45118, n_T 1.45590 at 13.2° (1 of the 5 sets given), EZ 0.33, 0.35, 5%, 4% for α , D, β — α , and γ — α .

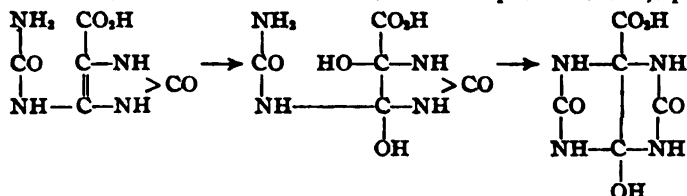
C. J. WERT.

Relation between the constitution and physical properties of isomeric and homologous hydroaromatic compounds. K. v. AUWERS. *Ann.* 410, 287–336(1915).—A general discussion of the question, in which all the values for the hydroaromatic compds., with a 6-membered ring (cyclohexanes, cyclohexenes, cyclohexanols, cyclohexanones and their Me derivs.), are collected together and the most probable values indicated. Certain general conclusions are also drawn. The b. p. of the satd. alcs. and ketones decreases with the approach of the Me group to the OH or keto group, while in the simple unsatd. hydrocarbons it is raised with the approach of the Me group to the double bond. The relative positions of the Me groups play a minor role. In the satd. hydrocarbons no definite regularity in the b. p. has been observed, though this may be due in part to faulty observations. The density increases, in general, with the introduction of the Me group into the mol. and with its approach to the double bond or to the OH or CO group. Where both influences are present the highest densities are found. The same general relations hold for the index of refraction, though they are not as pronounced. The mol. refraction of isomeric compds. of all 4 classes is the larger the farther sepd. the side chains are from one another and from the double bond.

or the OH or CO groups. The sym. compd. usually has a marked exaltation, while the unsym. has a normal index or a depression. The mol. dispersion is normal for all satd. and endocyclic unsatd. compds. Methene derivs. have lower b. p. and smaller densities than the isomeric compds. with endocyclic double bonds, but have about the same index of refraction. With cyclohexanes and cyclohexenes the introduction of a Me group regularly produces an increase of the b. p., though the possibility that higher homologs boil lower is not excluded. This is seen in some of the alcs. and ketones. The density of O-containing compds. decreases with the number of Me groups introduced, though there are exceptions. In the satd. hydrocarbons the differences in the densities are very slight. No rule can be given concerning the index of refraction of homologous compds. The b. p. of satd. hydroaromatic hydrocarbons are lower than those of the analogous cyclohexenes; on the other hand the H-rich alcs. boil higher than the H-poorer ketones. This is also true of the density, the cyclohexenes being heavier than the cyclohexanes, while the ketones are lighter than the alcs. The index of refraction increases from satd. to unsatd. hydrocarbons and decreases by the change of the alc. into the corresponding ketone.

C. J. WEST.

Oxidation of uric acid in alkaline solution. III. ROBERT BEHREND AND RUDOLF ZIEGER. Hannover. *Ann.* 410, 337-73 (1915).—Behrend supposed a compd. of the type of uric acid glycol as an intermediate oxidation product of uric acid in order to explain the production of β -methylallantoin from 1- and 7-methyluric acid (*Ann.* 333, 141; 343, 151). This compd. has been prepd. by Biltz (*C. A.* 4, 2644; 6, 2620; 8, 1430) and, since it does not yield allantoin nor uroxic acid when treated with alkali, it is not the desired intermediate product. A second possible explanation of the oxidation is that the uric acid mol. is split at the 1,6-position:



Best yields of uric acid glycol are obtained by neutralizing the acid formed in the reaction with 10% Na_2CO_3 . An isomeric glycol was not obtained. 8.56 g. alloxan tetrahydrate, 24 cc. H_2O , 6.4 g. $\text{CO}(\text{HNH}_2)_2$ and 10 cc. 36% HCl were heated 4 min. until boiling ensued, filtered from alloxantin the next day and then allowed to evaporate at room temp., giving 4.12 g. pure *alloxanic acid urea*, 4-sided prisms, decomp. $155-6^\circ$. 17.5 cc. 50% hot EtOH dissolves 10 g. substance. Heated at 102° for some time the compd. gradually decomps., more rapidly if $\text{CO}(\text{NH}_2)_2$ is added. *Acid calcium salt*, $\text{Ca}(\text{C}_4\text{H}_3\text{O}_4\text{N}_3)_2 \cdot 6\text{H}_2\text{O}$, prepd. by dissolving the substance in a little more than 1 equiv. of warm 10% CaCl_2 and adding an equiv. of 20% AcONa , lancet-like needles or prisms. *Neutral calcium salt*, short rhombic prisms, obtained by treating the CaCl_2 soln. with NH_4OH , contains 5 mols. H_2O . Uric acid glycol gives the same product when warmed to 50° with 35% HCl . *Urea alloxan*, from the components in H_2O , decomp. 117° or 134° , easily sol. in H_2O , and probably is a salt-like compd. It gives uric acid glycol when heated with H_2O , AcOH or when heated to $95-100^\circ$. Ac_2O gives an *anhydride of urea alloxan*, microscopical needles, decomp. $185-6^\circ$. *Potassium alloxan*, from 2.14 g. alloxan tetrahydrate in 5 cc. H_2O and 0.74 cc. 50% KOH , light red, decomp. 235° . It is sol. in about 20 parts H_2O , giving a soln. alk. to litmus. Upon standing it gives K alloxanate. *Alloxanic acid urea* is most easily obtained by the action of 21.4 g. alloxan

tetrahydrate in 50 cc. H_2O and 6.2 g. KOH, allowing the mixt. to stand overnight, filtering, adding 7 g. $CO(NH_2)_2$ and 10 cc. 36% HCl and allowing to evap. at room temp. Alloxanic acid is easily obtained from the K salt (above), by decomp. with 10–20% HCl, evapg. and extg. with Et_2O or EtOH. With $SOCl_2$ at 40–50° for 2 hrs., the *chloride* is formed which, with MeOH, gives *methyl alloxanate*, pointed prisms from AcOEt, decomp. 175–6°. The aq. soln. reacts strongly acid to litmus and decomps. bicarbonates. The ester does not condense with $CO(NH_2)_2$. Alloxanic acid urea and Ac_2O give allantoin. Various expts. on the oxidation of uric acid are reported with the yields of allantoin.

C. J. WEST.

Sulfonation of benzene. II. GERHERD MOHRMANN. *Ann.* 410, 373–85 (1915). —100 g. H_2SO_4 , d. 1.84, were heated to 235–45°, and the vapors of 25 g. C_6H_6 passed through until completely absorbed. The sulfonic acids were changed into the Na salts, which were obtained in 3–4 fractions by concn. These were dried at 150° and changed into the chlorides. The 2 chlorides were sepd. by crystn. from ligroin. The effect of various catalyzers was detd. The figures given represent the yield of *p*- $C_6H_4(SO_2Cl)_2$, which with the yield of the *m*-compd., make 100%. No catalyzer, 1.4; 1 g. Hg, 32.6, 30.4; 1.8 g. dry $CdSO_4$, 4.2, 5.2; 1 g. Al, 14.6, 13.9; 1.5 g. Pb, 9.7 (9.5% monochloride was also obtained); 1.3 g. As_2O_3 , 9.3; 1.1 g. Bi_2O_3 , 8.7, 9.4; 1.4 g. Se, only monochloride obtained; 2.7 g. $MnSO_4$, 2.7%.

C. J. WEST.

Hydrazides and azides of organic acids. XXXII. The hydrazides and azides of succinic acid. THEODOR CURTIUS. *J. prakt. Chem.* 92, 74–107 (1915); cf. C. A. 9, 2765.—I. (With ERNST MUCKERMANN.) Succinyl dihydrazide (a), $(CH_2CONHNH_2)_2$ (Schöfer and Schwan, *J. prakt. Chem.* 51, 190 (1895)) and succinyl diazide (b), $(CH_2CON_3)_2$ (Curtius, *J. prakt. Chem.* 52, 221 (1895)) are the only members of this series which have been previously prepd. *Hydrazinosuccinic acid* (c), $NH_2NHCOCH_2CH_2CO_2H$, is obtained in the form of its *hydrazine salt* (d), needles from abs. alc., stout prisms from 90% alc., m. 104°, when 8 g. $(CH_3)_2(CO_2Et)CO_2H$ (e) is allowed to stand several days with 6 g. $N_2H_4 \cdot H_2O$ (f) *in vacuo* over H_2SO_4 ; the aq. soln. reacts weakly acid. Contrary to the statements of Heintz, *Pogg. Ann.* 108, 86 (1859), (e) cannot

be distd. under ordinary pressure without partial decompn. into $CH_3CO.O.CO.CH_3$. On attempting to prep. (c) from the Ba salt of (e) and $(N_2H_5)_2SO_4$, (a) is formed; *di-benzal derivative*, a voluminous ppt. m. 223–4° on crystg. from alc. *Hydrazine succinamate* (g), from $NH_2COCH_2CH_2CO_2H$ (h) and 1 mol. (f), small crystals from abs. alc., m. 113°; the aq. soln. is neutral and gives with BzH ($PhCH:N$)₂ (i) in theoretical amt. When (h) is treated with 2 mols. (f) at ordinary temp., a *hydrazine salt* (j) of (c), is formed, large well-formed crystals, m. 122–3°, which crumble in the air; the aq. soln. is neutral and reduces NH_4AgNO_3 on warming, but not in the cold. When (d) in 15–20 parts H_2O is shaken well with 2 parts BzH, then heated to boiling and filtered hot from (i), *benzalhydrazinosuccinic acid* (k), $PhCH:NHNHCOCH_2CH_2CO_2H$, seps., leaves from H_2O or alc., m. 164°; it may also be obtained from equal parts of (i) and BzH in 20 parts H_2O and is sepd. from traces of (i) by washing with alc. and Et_2O ; long heating with dild. alc. gives (i) and $(CH_3CO_2H)_2$ while hot dil. acids decomp. it with the formation of BzH, N_2H_4 and $(CH_3CO_2H)_2$. When *o*- HOC_6H_4CHO is condensed with (d), heated to boiling, filtered from *o*-($HOC_6H_4CH:N$)₂ and then cooled, *o*-hydroxybenzalhydrazinosuccinic acid seps. as a flocculent ppt. m. 193°. *m*-Nitrobenzalhydrazinosuccinic acid, from *m*- $NO_2C_6H_4CHO$ and (d), bright yellow crystals, m. 207°; *m*-($NO_2C_6H_4CH:N$)₂, which is also formed, is sepd. as in the previous cases. *Acetonehydrazinosuccinic acid*, formed when (d) is heated in Me_2CO , cryst. powder, m. 161°; it was not obtained pure. *Benzoylhydrazinosuccinic acid*, $BzNHNHCOCH_2CH_2CO_2H$, is formed when (f) is subjected to the Baumann and Schotten reaction; columnar prisms, m.

175°. *Asidosuccinic acid* (j), $\text{N}_2\text{COCH}_2\text{CH}_2\text{CO}_2\text{H}$, is formed when 10 g. (j) in H_2O is treated below 0° with 5 g. NaNO_2 in concd. aq. soln., covered with Et_2O , acidified with the calcd. amt. of H_2SO_4 , the Et_2O layer sepd. and evapd. *in vacuo* at room temp.; cryst. residue, which explodes weakly on heating; it is also obtained, but in very small quantity, when (d) is similarly treated with NaNO_2 . In both cases, *hydrasidisuccinic acid* (m), $(\text{HO}_2\text{C}.\text{CH}_2\text{CH}_2\text{CONH})_2$, seps. from the aq. solns. remaining after removal of the Et_2O layer; leaves from H_2O , m. 212° with the effervescence; liberates CO_2 from Na_2CO_3 ; (m) may also be prepd. by the action of I on (j) in alc.; *ammonium salt*, radiating needles; *silver salt*, amorphous powder; *diethyl ester* (n), from the Ag salt + EtI , needles from Et_2O , m. $127-8^\circ$. (n) in alc. with 2 mols. (f) is converted into (a). When the dry Et_2O soln. of (b) is boiled with abs. alc. the *urethan* (o), $\text{EtO}_2\text{C}.\text{NHCH}_2\text{CH}_2\text{CO}_2\text{H}$ (?) is obtained as an oil; the yield is small and the product impure. With the object of converting (o) into the β -amino acid, $\text{HCl}.\text{NH}_2\text{CH}_2\text{CH}_2\text{CO}_2\text{Et}$, (o) was treated with alc. HCl in the cold and also at 100° . In neither case could the ester hydrochloride be isolated; NH_3 was split off and the residue gave a product with PhSO_2Cl which m.

175°. When $\text{CH}_2.\text{CO}.\text{NH}.\text{CO}.\text{CH}_2$ (p) in alc. is boiled with 2 mols. (f), (a) is formed, but when only 1 mol. (f) is used and the mixt. not warmed, *succinamyl hydrazide* (q), $\text{NH}_2\text{COCH}_2\text{CH}_2\text{CONHNH}_2$, seps. on standing; fine needles from abs. alc. which shrivel at 138° and m. 145° with effervescence; *dihydrochloride*, unstable ppt. when concd. alc. HCl is added to an aq. soln., m. $115-6^\circ$ with lively effervescence; *benzyl derivative*, crystals from alc. m. 194° ; *benzoyl derivative*, leaves from abs. alc., m. 192° (decompr.). *Hydrazine ethyl sulfate* is produced when 50 g. EtOH is heated $1/4$ hr. with 326 g. H_2SO_4 , then dild. with H_2O , satd. with BaCO_3 , filtered from BaSO_4 , treated with $(\text{N}_2\text{H}_5)_2\text{SO}_4$ until pptn. is complete, filtered and evapd. to dryness; on standing, the resulting sirup solidifies in long hygroscopic needles, m. 51° . II. (With KARL HOCHSCHWENDER and HERMANN THIERMANN.) When 60 g. $(\text{CH}_3\text{CO}_2\text{Et})_2$ in 90 cc. abs. alc. are heated 4 hrs. at $120-30^\circ$ with 9 g. (f), then filtered from 8-9 g. (a) and evapd. *in vacuo* at 40° ,

N-aminosuccinimide (r), $\text{CH}_2.\text{CO}.\text{N}(\text{NH}_2).\text{CO}.\text{CH}_2$, is formed as a very hygroscopic solid which deliquesces in the air and is best identified by its *benzyl derivative* (s), long needles from abs. alc. m. $172-3^\circ$; *hydrochloride*, pptd. from alc. soln. by HCl in Et_2O , cryst. ppt. decomps. 150° but does not m. to a clear oil below 280° ; *diacetyl derivative*, fine needles from ligroin, m. $69-70^\circ$. When a soln. of (r) in NaOH (1:4) is acidified with dil. acids, an insol. amorphous substance, m. 255° , seps., from which N_2H_4 is split off on warming with H_2SO_4 ; this same product is likewise formed when (r) is heated alone and will be further investigated. With HgO (r) gives a red color, with the evolution of a gas; rubbed with (f) at 0° , it is converted into (a). The hydrochloride (t), with

NaNO_2 , gives $\text{CH}_2.\text{CO}.\text{NH}.\text{CO}.\text{CH}_2$. When $\text{EtO}_2\text{C}(\text{CH}_3)_2\text{CO}_2\text{Et}$ is treated with (f) no compd. similar to (r) is produced, only the known dihydrazide. (a) warmed in aq. soln. partially decomps. into N_2H_4 , (r) and (c); attempts to convert (a) into (r) by means of Br or I were unsuccessful.

NORMAN A. SHEPARD.

Simple and mixed alkyl phosphates. W. A. DRUSHEL. Yale Univ. *Am. J. Sci.* 30, 643-8(1915).— Me_3PO_4 , Et_3PO_4 , Pr_3PO_4 , $(\text{iso-Bu})_3\text{PO}_4$, Me_2EtPO_4 , Me_2PrPO_4 , MePr_2PO_4 , Et_2PrPO_4 , EtPr_2PO_4 , were prepd. by treating the Na alcoholates with POCl_3 in abs. Et_2O . All the alkyl groups are hydrolyzed by $\text{Ba}(\text{OH})_2$ at room temp., although the 1st is much more easily attacked than the 2nd and 3d. In mixed alkyl phosphates the hydrolysis product contains both types of dialkyl phosphoric acids, $\text{HRR}'\text{PO}_4$ and HR_2PO_4 with the first type largely in excess. The b. p. (at reduced pressures), densities and solubilities in H_2O of the esters are given.

R. L. SIBLEY.

Some new organic compounds of vanadium. A. T. MERTES AND HERMAN FLECK. *J. Ind. Eng. Chem.* 7, 1037-8 (1915).— VCl_4 in C_6H_6 soln. reacts with NH_3 and its derivs., apparently forming mol. compds. containing 3-6 mols. of the NH_3 deriv. combined with 1 mol. VCl_4 . The methods of detg. V and Cl are described. Compds. (not named and properties not given) corresponding approx. to the following formulas were prepd.: $4\text{PhNH}_2 \cdot \text{VCl}_4$, $4\text{PhNMe}_2 \cdot \text{VCl}_4$, $4\text{PhNHNH}_2 \cdot \text{VCl}_4$, $4\text{MeC}_6\text{H}_4\text{NH}_2 \cdot \text{VCl}_4$, $3\text{MeC}_6\text{H}_4\text{NH}_2 \cdot \text{VCl}_4$, $4\text{NH}_3 \cdot \text{VCl}_4 \cdot 4\text{H}_2\text{O}$, $5\text{NH}_3 \cdot \text{VCl}_4 \cdot 3\text{H}_2\text{O}$, $6\text{MeNH}_2 \cdot \text{VCl}_4 \cdot \text{H}_2\text{O}$, $3\text{Ph}_2\text{NH} \cdot 2\text{VCl}_4$. C_6H_6 after 6 weeks gave a product which M. and F. represent by the formula $\text{C}_6\text{H}_5 \cdot 2\text{VCl}_3$; shorter time gave $\text{C}_6\text{H}_5\text{V}_2\text{Cl}_5$. With anthracene was obtained $\text{C}_{14}\text{H}_{10} \cdot 2(\text{C}_6\text{H}_5 \cdot \text{V}_2\text{Cl}_5)$.

R. L. SIBLEY.

The crystal form of phenylglyceric acid $\text{C}_6\text{H}_5\text{C}(\text{OH})\text{HC}(\text{OH})\text{HCOOH}$ and its active components. V. M. GOLDSCHMIDT. Kristiania. *Z. Krist. Min.* 55, 123-31 (1915).—The active forms of phenylglyceric acid cryst. in the sphenoidal class of the monoclinic system; they have equal angles (tabulated) but are enantiomorphic. The so-called racemic acid is a microscopic intergrowth of both active compds. but belongs to the prismatic class of monoclinic system. The m. p. of the active components is $164-165^\circ$, while that of the racemic form is 141° . Solns. of the inactive antipodes gave mechanically separable conglomerates of right and left crystals, pseudo-racemic crystals consisting of sub-microscopic portions of right and left substances, and real racemic crystals, i. e., crystals formed by the chem. union of both antipodes. The pseudo-racemic substances cannot be sepd. crystallographically but may be sepd. by their thermodynamic properties. The racemic crystals are divided into (a), pseudo-racemic mixed crystals consisting of an isomorphous mixt. of equal parts of right and left substances which have a continuous m. curve (example, camphoroxime which occurs as cubic crystals), (b), pseudo-racemic conglomerates which are lamellar intergrowths of equal parts of right and left substances that give seemingly homogeneous crystals regardless of whether the lamella are macro-, micro-, or sub-microscopic, and whose m. curve is thermodynamically like that of the conglomerates.

A. WANDTKE.

The electron theory in organic chemistry. N. P. McCLELLAND. Cambridge. *Phil. Mag.* 30, 665-75 (1915); cf. *C. A.* 9, 882.—On the theory that the formation of a valency bond between two atoms consists in the removal of one electron from the external ring of each atom to form a new orbit of rotation about the line joining the two atomic nuclei, M. suggests that the absorption of infra-red light is effected by the electrons in this inter-atomic valency orbit, while ultraviolet absorption is due to the remaining "unsatd." electrons in the external rings of the atoms. All compds. containing the C-H linkage have similar infra-red absorption bands. Although a single atom containing a rotating unsatd. electron, as in methylene or CH_2 , is not stable, two such electron orbits have a stabilizing action on each other which is analogous to mutual elec. inductance. Hence C_2H_4 is stable. When the induction effect is small the two electron orbits do not affect each other's absorption bands or chem. reactivity. Thus PhCH_2NH_2 resembles the aliphatic amines and shows the C_6H_5 absorption band; while, owing to the induction effect, PhNH_2 is different in both respects. Among similar compds. a lower frequency absorption corresponds to greater reactivity, e. g., the aldehydes and ketones. In a conjugate system of unsatd. bonds the two central atoms stabilize each other by the induction effect but this cannot affect the first and fourth atoms, so that these are active, as in Thiele's theory. An unsatd. group adjacent to a C-Br bond makes the latter more stable, and similarly makes a C-H bond less stable; but these cannot be predicted from the theory. The theory is shown to be consistent with stereochemistry. A structure for C_6H_6 is proposed in which the C atoms are arranged at the corners of an octahedron formed by alternately raising and de-

pressing the C atoms of the Kekulé ring from the plane of the ring. The connecting valence electrons revolve about centers in the mean plane, while the free valency electrons revolve in planes parallel to it, with the H atoms disposed outside the C's.

G. L. WENDT.

Preparation of optically active fats. III. Synthesis of the four possible optically active butyrins. Inversion of the three-carbon system into the optical antipodes. EMIL ABDERHALDEN AND EGON EICHWALD. Univ. Halle a/S. *Ber.* 48, 1847-65 (1915); cf. *C. A.* 9, 310, 1058.—As was forecast in the earlier papers, it has been found possible, by improving the methods, to obtain material of higher rotation in the prepn. of active epihydrin alc. and aminoglycerol, but the attempts to obtain active aminoglycerol and fats by a shorter method from active dibromohydrin have not all been successful. Amination of *d*-dibromohydrin (replacement of both Br atoms by NH_2) never gave an active product, probably because the Br is not directly replaced but HBr is first split off, with formation of a glycidic ring which then adds NH_3 . Treatment of active epibromohydrin with alc. KI, with KOAc or with Ag or alkali salts of fatty acids also led to inactivation, so that the methods used chiefly by Grün for the prepn. of fats of a definite constitution lose much of their value in proving structures. A method free from doubt consists of treating the hydrochlorides or sulfates of the aminoglycerols with excess of fatty acid chlorides, removing the NH_2 with NaNO_2 and fractionating in a high vacuum to remove the chlorinated glycerols which are always formed as a result of the violent reaction. Even in a high vacuum, however, distn. of active fats often results in complete inactivation, so that it is better to esterify the aminoglycerol in concd. H_2SO_4 with excess of fatty acid and then treat with NaNO_2 . *L*-Epihydrin alc., which is *L*-rotatory in substance, gives by addition of PrCO_2H a monobutyryn which is *d*-rotatory in alc., while on the other hand it yields a *d*-aminoglycerol giving a butyryn which is *L*-rotatory in alc. Although the 2 butyrins cannot be directly compared, as 1 is a mono- and the other a dibutyryn, there is no doubt that an optical inversion has occurred. The ease with which compds. of both the *d*- and *L*-series are formed probably is the reason why no active fats have thus far been found in nature, and it is also very probable that the lipolytic ferments are not specifically adapted to 1 of the possible configurations. As a genetic designation is meaningless in the case of the fats, the prefixes *d*- and *L*- are now used according as the particular compd. is *d*- or *L*-rotatory in substance or in alc., thus involving some changes in the earlier designations. It has been found that if aminodibromopropane *d*-tartrate is heated some time with H_2O on the H_2O bath, HBr is split off and there is considerable loss, so that in recrystg. large amts. (8 kg.) the concn. must be effected *in vacuo*; smaller amts. (2-3 kg.) may be recrystd. on the H_2O bath by adding the required amt. of boiling H_2O and stirring vigorously until the salt dissolves; the latter is thus exposed only 5-10 min. to the higher temp. and the loss of HBr is insignificant. A *d*-epibromohydrin with $[\alpha]_D^{18} 23.06^\circ$ is obtained by slowly pouring, in the course of 5-10 min., 50 g. KOH in 100 cc. cold H_2O into 100 g. active dibromohydrin, at once extg. with Et_2O , drying with Na_2SO_4 , evapg. up to 60° , letting stand at this temp. for some time and distg. *in vacuo* at 40° . *d*-Dipropionyl- α -bromohydrin, from 2 g. *d*- α -bromohydrin ($[\alpha]_D^{18} 4.10^\circ$ in H_2O) and 6 g. $(\text{EtCO})_2\text{O}$, $[\alpha]_D^{18} -2.21^\circ$ in alc. *d*-Di-butyryl- α -bromohydrin, from *d*- α -bromohydrin and excess of PrCOCl , $[\alpha]_D^{18} -2.19^\circ$ in alc. *L*-Epihydrin alcohol (a) (formerly designated as the *d*-compd.), d. 1.1050, $[\alpha]_D^{18} -8.55^\circ$, is obtained in 38 g. yield from 110 g. *d*- α -bromohydrin, $[\alpha]_D^{18} 4.38^\circ$ in H_2O (prepd. by hydrolysis of the HCO deriv. with HCl and freed from HCl by twice evapg. the crude oil with a little alc. and finally heating 0.5 hr. *in vacuo* at 70°) poured into a little more than the calcd. amt. of KOH in the least possible cold alc. and neutralized after 24 hrs. to phenolph. with alc. HCl. From 38 g. of (a) is obtained 34 g.

d-aminoglycerol (*b*), $b_{D,1}$ 134°, $b_{D,18}$ 163° without racemization, $[\alpha]_D^{18}$ 2.42° in H_2O , 17.70° in dil. HCl. The following monoglycerides were prepd. in preliminary expts. from a *d*-(*a*) with $[\alpha]_D^{18}$ 4.02°, 1 g. of which with 1 mol. of the fatty acid was allowed to stand 2 weeks at 37°, treated with Et_2O (except in the case of the monoacetin, which is insol. in Et_2O), filtered, and freed from Et_2O , unchanged acid and (*a*) *in vacuo*. All the resulting fats except the monoformin were active; why the latter was inactive has not been detd. *l*- α -Monoacetin, -propionin, -butyrin, -valerin and -caproin showed $[\alpha]_D^{18}$ -1.14°, -0.83°, -0.63°, -0.530 and -0.40°, resp., in alc. *d*- α -Monobutyryn, from an (*a*) with $[\alpha]_D^{18}$ -8.55°, showed $[\alpha]_D^{18}$ 0.83°. An *l*- α , β -dibutyryn, still containing some Cl, with $[\alpha]_D^{18}$ -1.67° in alc., -1.86° in Et_2O , sapon. no. 632.4, is obtained from 1.5 g. (*b*) in alc. neutralized with alc. HCl, evapd. *in vacuo*, heated 0.5 hr. at 70° *in vacuo*, then 0.5 hr. longer with P_2O_5 in the receiver, then treated with 3 g. $PrCOCl$, poured into H_2O , filtered, treated cold with $NaNO_2$, extd. with Et_2O , washed with soda and dried with Na_2SO_4 ; fractionation in a high vacuum gives a product practically free from Cl but wholly inactive, $b_{D,1}$ 134-6°. When cooled mixts. of 5 g. (*b*) with 15 cc. $PrCO_2H$ and 10 cc. $PrCO_2H$ with 15 cc. concd. H_2SO_4 are brought together, heated 4 hrs. at 65° (protected with a $CaCl_2$ tube), allowed to stand 2-3 days, poured into 100 cc. ice H_2O , covered with Et_2O and treated with concd. aq. KOH, there is obtained 2 g. of *d*- γ -amino- α , β -dibutyryn, basic oil sol. in dil. acids, $[\alpha]_D^{18}$ 1.09° in dil. HCl, 0.47° in alc., at once converted in acids by $NaNO_2$ into *l*- α , β -dibutyryn (best obtained (4 g. yield) without isolating the NH_2 compd.), d. 1.0890, $[\alpha]_D^{18}$ -1.10° in substance, -2.31° in alc., the $[\alpha]$ and sapon. nos. varying somewhat in different preps. *l*- α , β -Dicaproin, obtained in the same way in 6 g. yield from 5 g. (*b*), 25 cc. caproic acid and 15 cc. H_2SO_4 , sapon. no. 359.2, $[\alpha]_D^{18}$ -0.30° in substance, -0.46° in Et_2O , -0.25° in CCl_4 , -0.44° in petr. ether, 0.57° in $CHCl_3$. *l*- α -Lauro- β , γ -dibutyryn, sapon. no. 372.8, α -0.15° in a 1 dcm. tube, is obtained in 0.8 g. yield from 1 g. *l*-dibutyryn (α -1.05°) and 1.1 g. lauryl chloride heated 0.5 hr. on the H_2O bath, allowed to stand over moist KOH, extd. with Et_2O , washed with H_2O , treated with an equal vol. of alc., neutralized with alc. KOH, evapd. *in vacuo*, extd. with Et_2O , boiled with charcoal and dried with Na_2SO_4 . *l*- α -Stearo- β , γ -dibutyryn, m. 15°, inactive. *l*- α -Oleo- β , γ -dibutyryn, sapon. no. 351.9, α -0.07° in a 1 dcm. tube. In crystg. aminodibromopropaned-tartrate *d*-epihydrin alc. with at most α -4.02° in a 1 dcm. tube was obtained from the mother liquors. With *l*-tartaric acid, the *l*-aminodibromopropane, α -0.15° in Et_2O was obtained from the *dl*-compd. after several crystns. *l*-Aminoglycerol (*c*) is best obtained by inversion of *d*-epibromohydrin (*d*) into the *l*-series; 55 g. (*d*), α 37.25°, is slowly poured into 500 cc. of 15% HCl below 20°, then shaken 1 hr. with 100 cc. concd. HCl, extd. with Et_2O , washed with soda, dried with Na_2SO_4 and fractionated *in vacuo*; this gives 62 g. *d*- α -bromo- γ -chloropropan-2-ol, $b_{D,18}$ 88°, d. 1.7069, $[\alpha]_D^{18}$ 0.64°; 62 g. of this are shaken with 30 g. KOH in 60 cc. cold H_2O and extd. with Et_2O , giving 23 g. *l*-epichlorohydrin, d. 1.2007, $[\alpha]_D^{18}$ -25.61°, best distd. under 360° (b. 92-3°) to 260 mm. (b. 80-90°). This gives a *d*-formyl- α -chlorohydrin with α 4.10°, hydrolyzed by 15% HCl to a *l*-chlorohydrin, $[\alpha]_D^{18}$ -1.88° in H_2O , 25 g. of which yields 8 g. of a *d*-epihydrin alc. with d. 1.1054, $[\alpha]_D^{18}$ 7.69°; 1.5 g. of this with 2 g. $PrCO_2H$ gives 1.1 g. of a *l*-monobutyryn, sapon. no. 347.9, $[\alpha]_D^{18}$ -0.84° in alc., while 6.5 g. of the alc. yields 6 g. (*c*), $[\alpha]_D^{18}$ -14.08° in dil. HCl. *d*-Dibutyryn, sapon. no. 495.8, d. 1.0890, $[\alpha]_D^{18}$ 1.01°.

CHAS. A. ROULLIER.

Alkylation of pyrroles. III. K. HESS, F. WISSING AND A. SUCHIER. Univ. Freiburg i/Br. *Ber.* 48, 1865-84 (1915); cf. C. A. 8, 2706; Plancher and Tanzi, C. A. 9, 1477.—By the following modifications of the methods described in the literature, the yields of 2,3,5-trimethylpyrrole (*a*) has been materially increased. 2,3,5,4- $C_4HN-Me_3CO_2Et$ (Knorr and Hess, C. A. 6, 92) is obtained in 78.5 g. yield from 75 g. HON:

CMeAc + AcCH₂CO₂Et in 450 cc. AcOH at 90-5° treated in the course of 2 hrs. with 225 g. Zn dust, the Zn being boiled up 3 times with 100-cc. portions of AcOH after being filtered; 40 g. of the ester in 10 g. ice and 40 cc. concd. H₂SO₄ are shaken with 20 cc. of 20% H₂SO₄, heated 1.5 hrs. on the H₂O bath, cooled to -10°, treated with somewhat more than the calcd. amt. of cold 33% NaOH at such a rate that the temp. rises to 30° (about 15 min. required for the operation), distd. with steam, salted out, extd. with Et₂O and distd. *in vacuo*; this gives 17.8 g. (a). 200 g. of this are converted into the MgBr compd., treated with the equiv. amt. of EtBr, dild. to about 1 l. with Et₂O, boiled 50 hrs. (carefully protected from moisture), decompd. with ice H₂O, treated with excess of NaOH, the aq. and Et₂O layers distd. with steam, the distillate salted out, repeatedly extd. with Et₂O and the Et₂O soln., after coupling with diazobenzenesulfonic acid, is worked up as described in the earlier paper. There is thus obtained 150 g. of a product b₁₁ 52-103°, giving a strong pine-splinter reaction and divided by repeated distn. into 3 fractions: (1) 40 g., b₂₁ 53-4°, gives no pine-splinter reaction; (2) 10 g., gives no pine-splinter reaction after boiling 12 hrs. with 30 cc. concd. HCl and then b₂₁ 85-6°; (3) 20 g., b₂₁ 114-5°, gives a strong pine-splinter reaction. If it is desired to obtain only the chief product (1), the crude oil is best boiled with concd. HCl to destroy the pyrrole derivs. (1) is 2,3,5-trimethyl-3-ethylpyrrolenine (b), M₂-Et-C.CH: CMe.N: CMe, b₇₁₂ 158-9°, b₇₁₂ 155-6°, has a very characteristic C₈H₁₁N-menthol-

like odor, is extraordinarily volatile and is apparently not identical with Ciamician and Anderlini's product b. about 160° (*Ber.* 21, 2858 (1888)); on long standing in the air it becomes slightly yellowish; 0.2207 g. dissolves in 5.3 cc. H₂O at 25° and partially seps. on warming; a cold satd. aq. soln. gives with dil. I-KI a yellowish green oil, with KI-HgI₂ a thick, white amorphous ppt., with CdI₂ an amorphous ppt. like freshly pptd. AgCl, with alc. picric acid a cryst. *picrate*, C₁₈H₁₈O₇N₄, changes color 72°, decomp. 188-90°. *Chloromercurate*, (C₉H₁₁N.HgCl₂)₂.HCl, needles, changes color 120°, m. 122°, obtained from 0.5 g. base in 15 cc. H₂O acidified with HCl and treated with 15-6 cc. of 7% HgCl₂; by changing the concn. of the reacting substances, another Hg salt, m. 78°, is obtained. *Chloroplatinate*, m. 195°, decomp. immediately thereafter. *Chloroaurate*, softens 57°, m. 65-6°, decomp. on recrystn. Oxidation of the base with alk. KMnO₄ gives (CO₂H)₂. It is practically unchanged by N₂O₂ in alc. Fraction (2) above is a compound, C₁₈H₁₇N (described as C₈H₁₂N in the earlier paper), purified through the *picrate*, C₁₈H₁₈O₇N₄, spears of microscopic elongated prisms from alc., sinters 130°, m. 140-1°. Fraction (3) is 2,3,5-trimethyl-1-ethylpyrrole, resinifies to a dark sirupy mass with extreme ease in the air, being obtained colorless only on distn. *in vacuo* in H, cannot be made to cryst., gives no dye with PhN₂Cl or diazobenzenesulfonic acid, forms a white cryst. ppt. with HgCl₂, yields no *picrate*, is but slightly sol. in H₂O, with faint alk. reaction to litmus, easily volatile with steam. 2,3,3,4-C₄H₉NMe-EtCO₂Et (Vecchi, *C. A.* 8, 3019) is obtained in 77 g. yield from 63 g. HON: CMeCOEt, 85 g. AcCH₂CO₂Et and 400 cc. AcOH at 100° treated with 200 g. Zn dust in the course of 45 min., heated 1 hr. on the H₂O bath and the Zn dust extd. 6-8 times with 200-cc. portions of hot AcOH; 50 g. of this, on decarboxylation with H₂SO₄, yields 24.5 g. 2,5-dimethyl-3-ethylpyrrole, b₂₁ 112°, b₂₁ 121°, quickly turns brown in the air, hardly sol. in H₂O, with faint alk. reaction to litmus, yields in cold Et₂O an amorphous, flocculent, yellow-red *picrate*, with excess of HgCl₂ a flocculent ppt., with Me₃NC₆H₄CHO a crimson color. When the Me₃EtC₄HNMgI from 36 g. of this compd., 7 g. Mg and 46 g. MeI in 120 cc. Et₂O is treated with 41 g. MeI in 50 cc. Et₂O, heated 48 hrs. at 40°, decompd. with ice, extd. with Et₂O, the Et₂O evapd., the oily residue added to the aq. layer, the mixt. acidified with concd. HCl, boiled to disappearance of the pyrrole reaction, made strongly alk. with NaOH, steam distd., salted out, extd. with Et₂O and distd. *in vacuo* obtained 5.1 g. b₂₁ 80-95°, and 5.8 g. b₂₁

95-100°. From the 1st two fractions by repeated distn. was obtained a compd. identical with (b), while the 3rd fraction yielded phyllopyrrole; this shows that the Et group in (b) is in the 3-position. In prep. 2,4,5,3-C₄HNMe₃EtCO₂Et by K. and H.'s method, the yield was increased to 76% by very slowly adding the Zn dust and keeping the temp. at 100-10° and this with 40% H₂SO₄ on the H₂O bath gave 55% of the 2,4,5-C₄H₂NMe₃Et; two 28 g. portions of this, each treated with the Grignard reagent from 5.5 g. Mg, 26 g. EtBr and 200 cc. Et₂O, then boiled 48 hrs. with 25 g. EtBr and worked up as above, gave 37 g. crude oil yielding 9 g. b₇₃₅ 70-3°, b₇₃₅ 173°, of a compound C₁₆H₁₇N, which by analogy with (b) is assigned the structure MeEtC.CH:CEt.N:CMe; 0.100 g. dissolves in 10.0 cc. H₂O at 22° and partly seps.

on warming. *Picrate*, bright yellow ppt. from alc., changes color 160°, contracts 170°, m. 190°, decomp. above 200°. *Chloromercurate*, C₁₆H₁₇N.2HgCl₂, needles from H₂O, m. 115°. *Chloroplatinate*, orange cryst. ppt. from H₂O, m. 169° (decompn.). *Chloroaurate*, yellow oil from H₂O, soon becoming coarsely cryst., m. 97-8°; from alc. it seps. in long table-like prisms with 0.5 mol. solvent, m. 215° (decompn.). Doubt having been cast by Oddo and Mameli (C. A. 9, 788) on the assumption by H. and W. that the C₄H₂NEt obtained by them is identical with Ciamician and Zanetti's (Ber. 22, 660(1889)) and Dennstedt's (Ber. 23, 2563(1890)), H. and W. have converted their compd. into the Ac and cinnamyl derivs. and proved its identity with D.'s compd.

CHAS. A. ROUILLER.

Characterization of halopyrroles. II. K. HESS AND F. WISSING. Ber. 48, 1884-6(1915); cf. C. A. 8, 2706.—To a mixt. of 8 g. Mg, 36 g. EtBr and 22 g. pyrrole in 250 cc. Et₂O at -17° is slowly added 27 g. Br in 250 cc. cold Et₂O, the temp. rising to -14°; the product is at once decompd. with ice H₂O, freed from Et₂O on the H₂O bath and distd. *in vacuo* at 50-60°; with the H₂O there distils an oil sepg. on the cold walls of the receiver in C₁₀H₈-like crystals which, drained off, spread on clay and placed in a vacuum desiccator over P₂O₅, decompd. in about 5 min. with a light explosion, deposition of C and evolution of HBr. The white compd., still moist, when brought near a Bunsen flame, deflagrates explosively with formation of HBr, C and NH₄Br. Although it could not be obtained in a state suitable for analysis, H. and W. have no doubt it is *bromopyrrole*. If the reaction mixt., after decompn. with H₂O and removal of the Et₂O, is distd. under atm. pressure, decompn. takes place and there distils over with the steam a *bromodipyrrole*, C₈H₇N₂Br, a bright refractive oil, smelling strongly of CHCl₃; quite unstable. Addition of I to a pyrrolemagnesium soln. at once produces a deep-seated decompn. and no definite product can be isolated. C. A. ROUILLER.

A new oxidation method. II. Action of aldehydes on hydramines of the pyrrolidine and piperidine series. K. HESS, F. MERCK AND CL. UBRIG. Univ. Freiburg i/B. Ber. 48, 1886-906(1915); cf. C. A. 8, 934.—The conversion of *sec*-hydramines of the pyrrolidine series, NH.CH₂.CH₂.CH₂.CHCHROH, into tertiary aminoketones,

MeN.CH₂.CH₂.CH₂.CHCOR, by HCHO has been extended to hydramines with primary alc. groups and to aldehydes other than HCHO. The 1st product is doubtless an aldehyde-ammonia addition product, HOCH₂N.CH₂.CH₂.CH₂.CHCHROH; at a

higher temp. the CHOH group is oxidized and the >NCHOH—simultaneously reduced to >NCH₂—. 1-[α-Pyrrol]-2-ethanol, b_{0.735} 95-9°, b_{0.735} 104-6°, b₁₅ 138-42° (appreciable decompn.), is obtained in 6.2 g. yield when 75 cc. of an Et₂O soln. of 12 g. Mg and 60 g. EtBr is treated with 33 g. pyrrole in 20 cc. cold Et₂O, then with 50 cc. C₆H₆, freed from most of the Et₂O *in vacuo*, heated to 40-50°, slowly treated with 22 g. ethylene oxide in 50 cc. C₆H₆ (the reaction being so regulated that the soln. is kept

gently boiling), heated 2-3 hrs. at 100-10°, the C_6H_6 layer decanted off, the suspension of basic Mg salts repeatedly shaken with Et_2O , faintly acidified with dil. H_2SO_4 , again extd. 2-3 times with 30-cc. portions of Et_2O , the C_6H_6 - Et_2O exts. shaken with 50 cc. H_2O , dried with potash, evapd. *in vacuo*, taken up in 30 cc. Et_2O , freed from tar by addition of gasoline (b. 45°) until no more dark particles sep., and distd. in a high vacuum in H; it is very difficultly volatile with steam; its aq. soln. is neutral to litmus; in the air it gradually turns brown and after a time deposits a solid resinous mass; it has a characteristic pyrrole odor. When 2.89 g. in 10 cc. $AcOH$ are shaken in H with 1.0-1.5 g. Pt sponge, 4 atoms H are absorbed in 18-20 hrs.; at the same time there is some esterification. Accordingly, after filtering the Pt and washing to neutral reaction, the filtrate is treated with 20 cc. HCl , concd. on the H_2O bath to a thick syrup to sapon. the ester and resinify any unattacked pyrrole, taken up in 30 cc. concd. HCl , allowed to stand with 3 g. Sn foil until the latter is dissolved, dild. with 400 cc. H_2O , freed from Sn with H_2S (which also brings down the pyrrole resin), concd., supersatd. with alkali and repeatedly extd. with $CHCl_3$; there is thus obtained 1.5-2.1 g. 1-[α -pyrrolidyl]-2-ethanol, b_{100} 78-80°, strongly refractive viscous oil of a disagreeable sperm-like odor, eagerly absorbs CO_2 from the air; 1.4 g. in 6 cc. H_2O , acidified with HCl , heated 4 hrs. at 115-20° with 2 cc. of 40% $HCHO$, gives the compound $MeN.CH_2.CH_2.CH_2.CH-$

CH_2CHO , mobile refractive oil of a narcotic but unpleasantly penetrating odor, b_{11-1} 79-80°, sol. in cold H_2O and partially sepg. on warming, reduces cold NH_3 - $AgNO_3$, yields a *picrate*, indistinct crystals from alc., sinters 177°, m. 181°. If 1 g. of the alc. in 5 cc. H_2O (without HCl) is heated 3 hrs. at 110-24° with 1 cc. of 40% $HCHO$, the product is the tertiary *hydramine* base, $MeN.CH_2.CH_2.CH_2.CHCH_2CH_2OH$, b_{14} 110-2°,

viscous oil of fainter odor than the secondary base; yield 0.5 g. When 13 g. α,α' -picolyethanol in 50 cc. hot alc. are slowly poured upon 41 g. Na, then treated with 450 cc. alc. in small portions, heated 45 min. at 130-40°, treated with 210 g. cold concd. HCl , filtered from the $NaCl$, concd. *in vacuo*, taken up in 30 cc. of 40% $NaOH$, shaken 2-3 times with 20 cc. $CHCl_3$, dried with potash, evapd. *in vacuo* at room temp. and rubbed with Et_2O in ice- $NaCl$, the syrup partially solidifies, yielding 5 g. of the α -form of 1-[α,α' -picolidyl]-2-ethanol, polygonal tables from Et_2O , having a fatty luster when dry, m. 99°, b_{21} 112-20°. The mother liquors on fractionation yield 2 g. of a liquid β -form, b_{21} 115-7°, viscous basic oil, together with by-products, b_{17} 65-98°, from which was isolated α -methyl- α' -ethylpiperidine. The above α -form and $HCHO$ in HCl at 137-40° quant. give the compound $MeN.CHMe.CH_2.CH_2.CH_2.CHCH_2CHO(a)$,

b_{11} 84-5.5°, strongly basic oil of narcotic odor, produces violent headaches when inhaled, becomes yellowish on long standing in corked tubes, sol. in H_2O in all proportions and partially sepd. from not too dil. solns. on warming, easily volatile with steam, reduces NH_3 - $AgNO_3$ on gentle warming, Fehling soln. almost not at all on boiling, yields an oily *phenylhydrazone* solidifying to needles; *picrate*, prisms and tables from alc., m. 178°; with NH_3OH the aldehyde regenerates the *sec*-hydramine base; at the same time $HCHO$ is formed. In the same way, 2.5 g. of the β -form of the hydramine with $HCHO$ gives 1.3 g. of an isomeric aldehyde, $C_9H_{17}ON$, b_{21} 85-7°; *picrate*, m. turbid 135°, clear 145-6°. From 10 g. 1-[α -piperidyl]-2-ethanol heated 4 hrs. at 120-5° with somewhat more than the calcd. amt. of $HCHO$ in faintly acid soln. is obtained 9.5-10 g. of 1-[α -N-methylpiperidyl]-2-ethanol, mobile oil, b_{10} 82-4°, does not become colored on standing, sol. in cold H_2O , partially seps. on warming, has the typical narcotic, alkaloidal odor of hygrine and related compds., reduces NH_3 - $AgNO_3$ on gentle warming but Fehling soln. only faintly on boiling. *Picrate*, prisms from alc., sinters 150°, m. turbid 154°, clear 158°. From 5 g. of 1-[α -pyrrolidyl]-1-ethanol and $HCHO$

is obtained 4.7 g. of the *ketone*, $C_7H_{15}ON$, mobile volatile oil, b_m 56–7°; *picrate*, sinters 172°, m. 174–5°. In the same way, 2 g. of the hydramine in 4 g. H_2O and 1 g. concd. HCl, heated 3 hrs. at 100–5° with 1.4 g. AcH, gives 0.6 g. of the *ketone* $EtN.CH_2.CH_2.CH_2.CHAc$, b_{17} 68–70°, while 2.6 g. of the hydramine, 12 cc. alc., 2.6

g. concd. HCl and 2.5 g. BzH heated 4 hrs. at 120° yields 2.1 g. of the *benzyl compound* $C_{15}H_{17}ON$, b_m 139–41°; *picrate*, sinters 160°, m. turbid 163°, clear 166°. From 100 g. butyrylpyrrole (obtained in 123 g. yield from C_4H_9NMgBr (from 125 g. pyrrole) and $PrCOCl$ by Oddo's method), reduced with 285 g. Na and 2 l. alc., is obtained 22–4 g. of 1-[α -pyrrolidyl]-1-butanol, b_{14} 67–9°, b_{15} 102–4°, seps. from petr. ether (b. below 50°) in needles, m. about 60°; 6 g. in 12 cc. H_2O and concd. HCl, heated 4 hrs. at 125–30° with 4.8 g. of 40% HCHO, gives the *ketone* $C_9H_{17}ON$ (b), b_{11} 83–5° (b_{12} 83–5° is also given), partially sol. in cold, almost wholly insol. in warm H_2O , easily volatile with steam, reduces warm $NH_3 \cdot AgNO_3$; when it is boiled with dil. HCl there distils over a N-free substance, neutral to litmus, of aromatic and aldehyde odor, swimming on the H_2O in oily drops. The distillate reduces warm $NH_3 \cdot AgNO_3$. The ketone with NH_2OH regenerates the original butanol. *Picrate*, prismatic rodlets from alc., m. turbid 103°, clear 110°. Na and alc. do not attack the ketone; Na-Hg in H_2O , kept neutral to faintly acid with HCl, partially reduces it to the tertiary hydramine. 1-[α -Piperidyl]-2-propanol, b_{11} 136–40°, is obtained in 7.2 g. yield from 20.8 g. of the *pyridyl compound*, b_{11} 112–5° (obtained in 3–5% yield from picoline and AcH), or practically quant. from the pyridyl compd. with H and Pt sponge in AcOH in 15 hrs.; 7.2 g., heated 4 hrs. at 115–28° with 5 g. of 40% HCHO, 5 cc. HCl and 3 cc. H_2O , gives 3.5 g. of the *ketone* $C_9H_{17}ON$, b_{11} 82–4° (slight decompn.), b_{12} 210° (only slightly increased decompn.), does not become colored even on long standing in corked tubes. *Chloroaurate*, prismatic columns from alc.-petr. ether, slowly sinters 100°, m. turbid 115–6°, clear 139°. *Picrate*, bright yellow prismatic needles from alc., sinters 148°, softens 155°, m. turbid 160–1°. The ketone is apparently identical with Piccinini's isomethylpelletierine (*Rend. accad. Lincei*, 8, II, 176(1899)), but the latter has not been described with sufficient exactness to make this certain. That aldehyde-ammonias undergo intermol. oxidations, like the intramol. oxidation assumed for the hypothetical intermediate product in the above reactions, is indicated by the Plöchl-Leuckhart reaction, whereby aldehydes and ketones heated with HCO_2NH_4 yield primary, secondary and tertiary amine bases. In the alkylation of NH_3 by HCHO, the reaction is assumed to be as follows: $>NH + HCHO \rightarrow >NCH_2OH \rightarrow >NMe + HCO_2H$, the HCO_2H yielding the 2nd Me group: $>NMe + HCHO + HCO_2H \rightarrow >NMeCH_2OH + HCO_2H \rightarrow >NMe_2 + CO_2$, etc., HCO_2H is more easily oxidized to CO_2 than $-CHOH-$ to $-CO-$ in the above intramol. oxidations, for 2.6 g. 1-[α -pyrrolidyl]-1-propanol in 6 cc. H_2O , heated 4–5 hrs. at 110–5° with 1 g. HCO_2H and 1.8 g. of 40% HCHO, gives 1.3–1.5 g. of the *hydramine base*, $MeN.CH_2.CH_2.CH_2.CHCH(OH)Et$, b_{14-5} 83°, less sol. in warm than in cold H_2O .

Picrate, long needles of microscopic rectangular prisms and rhombs, sinters 150°, m. 153–4°. In contrast with the ease with which the group $-HOCH.N<$ loses O, it was found that the group $>NCH_2-$ easily takes up O with formation of aldehyde and a lower alkylated amine: $>NCH_2- + O \rightarrow >NCH(OH)- \rightarrow >NH + -CHO$. Thus, when, according to Luboldt (*Arch. Pharm.* 236, 22 (1898)), scopoline is demethylated by treatment with the amt. of $KMnO_4$ calcd. for oxidation to CO_2 , HCHO is formed; the yield of demethylated product, norscopoline, is minimal, whereas if NH_2OH is used the yield is almost quant.: the reaction may therefore be written $C_{17}H_{19}(NMe)_2 + O \rightarrow C_{17}H_{19}(NCH_2OH)_2 \rightarrow C_{17}H_{19}N +$ reaction of NH_2OH on (a) and (b) shows that the oxidation

of the hydramine bases to the aminoketones and -aldehydes may also be reversed; it is believed that the mechanism of this reaction may be represented thus: ($R = -N.CH_2.CH_2.CH_2.CH-$) for (b): $MeRCOPr + H_2O \rightleftharpoons MeRC(OH)_2Pr \rightleftharpoons$

$HOCH_2RCH(OH)Pr \rightleftharpoons HRCH(OH)Pr + HCHO$. III. Action of aldehydes on primary hydramines. K. HESS AND CL. UBRIG. *Ibid* 1974-85.—At low temps., NH_3 alcs. with primary NH_2 groups react with aldehydes with loss of H_2O in the sense of Schiff bases, the reaction being reversible; e. g., $Me_2C(NH_2)CH_2CH(OH)Me(a) + HCHO \rightleftharpoons Me_2C(NHCH_2OH)CH_2CH(OH)Me(b) \rightleftharpoons Me_2C(N:CH_2)CH_2CH(OH)Me(c) + H_2O$. At higher temps., however, this condensation reaction is almost completely suppressed in favor of 2 competing reactions: (b) + $HCHO \rightarrow Me_2C(NHMe)CH_2CH(OH)Me(d) + HCO_2H$, and (d) + $HCHO \rightarrow Me_2C(NMeCH_2OH)CH_2CH(OH)Me(e) \rightarrow Me_2C(NMeCH_2)CH_2Ac(f)$. Since this reaction leads to the formation of the methylene deriv. (c) instead of a *sec*-amino ketone, it was attempted to prevent the formation of the group $-N:C<$ by substituting 1 of the H atoms of the NH_2 group with CO_2Et ; with $HCHO$ the resulting urethans gave the corresponding alkylated urethans in which the $CHOH$ group had been converted into the CO group: $Me_2C(NHCO_2Et)CH_2CH(OH)Me(g) + HCHO \rightarrow Me_2C[N(CH_2OH)CO_2Et]CH_2CH(OH)Me(h) \rightarrow Me_2C(NMeCO_2Et)CH_2Ac(i)$. Thus far, the CO_2Et group has not been removed from these compds. *Methylenediacetonealkamine*(c), $b_{11} 45-7^\circ$, $b_{710} 150-5^\circ$ (slight decompn.), was formerly (C. A. 8, 934) thought to be $Me_2C(NHMe)CH_2Ac$, but is decompd. with the greatest ease by boiling with H_2O into $HCHO$ and (a); it is obtained more easily than under the conditions formerly described, the yield being 1.3 g. from 2 g. (b) and 1.4 g. of 40% $HCHO$ in acid soln. heated 4.5 hrs. at 50° ; from 8 g. (a) and 6 g. $HCHO$ 4.5 hrs. at $115-20^\circ$ the yield is 7.5 g. *Picrate*, spears from 50% alc., sinters 130° , liquefies 138° , m. clear $138-9^\circ$. When two 6-g. portions of (a) are heated 4.5 hrs. at $142-5^\circ$ each with 13.4 g. $HCHO$ and 2 cc. H_2O , then dild. with 15 cc. H_2O and extd. with Et_2O there is obtained 7.8-8.5 g. oil, $b_{11} 42-73^\circ$, sepd. by distn. into 1 g. (c), *methylldiacetonealkamine*(d), $b_{11} 73-5^\circ$, and *dimethylldiacetoneamine* (f), $b_{11} 59-61^\circ$, mobile refractive oil of narcotic odor, whose *picrate* sinters $180-1^\circ$, m. 183° . From 8 g. (a) heated 4.5 hrs. at $115-20^\circ$ with 9.5 g. of acidified 40% AcH is obtained 7 g. of *ethylenediacetonealkamine*, $b_{11} 42-7^\circ$, quickly volatilizes in the air, quite volatile with Et_2O vapors, gives AcH with hot H_2O ; *picrate*, sinters about 147° , m. 152° . *Benzylidene compound*, in 9 g. yield from 10 g. (a) and 10 g. BzH in 40 cc. of 95% alc. acidified with concd. HCl and heated 7 hrs. at 90° , $b_{0.001} 94-5^\circ$, $b_{0.022} 87-8^\circ$, $b_{11} 139-40^\circ$ (slight decompn. even in a high vacuum), yellow oil of a faintly basic, not unpleasant odor; *picrate*, prismatic needles from alc., sinters 166° , m. $170-1^\circ$; *hydrochloride*, from the base and concd. HCl , somewhat hygroscopic, m. 199° . With $H_2NCONHNH_2.HCl$ and $KOAc$ in H_2O the base in a few sec. gives $PhCH:NNHCONH_2$. It cannot be reduced to the $PhCH_2$ compd. by Na and alc. From 10 g. (a) in 9 g. soda and 25 cc. H_2O shaken with 9.3 g. $ClCO_2Et$ until the odor of the latter disappears is obtained 11.5 g. of the *urethan* (g), thick oil, $b_{11} 142^\circ$; 5.2 g. of this in 11 g. of 40% $HCHO$ and 2 cc. H_2O heated 12 hrs. at $145-50^\circ$ in a shaking bath gives 3 g. of the *base* (i), $b_{11} 123-5^\circ$, gives $HCH:NNHCONH_2$ with semicarbazide; in its prepn. HCl must be excluded, otherwise much resinification occurs. Alc. impedes the reaction, 1.4 g. unchanged (g) being recovered after heating 2 g. of it with 1.2 g. of aq. 40% $HCHO$ and 4 cc. alc. 4 hrs. at $173-5^\circ$; if the temp. is kept at $203-8^\circ$ for 4 hrs., however, the reaction takes a different course and there is obtained about 1 g. of the *methylene compound* $C_{11}H_{18}O_2N_2$, b_{11} about $165-70^\circ$, seps. from C_6H_6 -petr. ether in triclinic crystals, m. 132° . The *urethan* $PrO_2CNHCH_2CH_2OH$, from $NH_2CH_2CH_2OH$ and $ClCO_2Pr$, $b_{11} 150-1^\circ$; 9.2 g. heated 7 hrs. at 145° with 6.1 g. of 40% $HCHO$ and 5 cc. H_2O yields, together with 3.5 g. unchanged alc., 3.5 g. of the *compound* $PrO_2CNMeCH_2CHO$, b_{11}

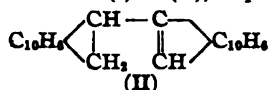
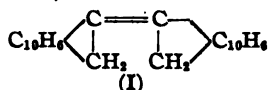
103-5°, refractive mobile oil of pleasant, ester-like, basic odor, reduces warm NH_4AgNO_3 , yields an oil phenylhydrazone which soon crystals. *1-Phenylethan-1-ol-2-amine*, $m. 30-5^\circ$, $b_{710} 160^\circ$, is obtained in 2-3 g. yield from 20 g. $\text{PhCH}(\text{OH})\text{CN}$ in 200 cc. of cold 50% alc. kept just acid with HCl while being treated with 750 g. of 5% Na-Hg in small portions; 2.6 g. in 5 g. soda and 10 cc. H_2O gives with 2.1 g. ClCO_2Et 3.6 g. of the *urethan*, pearly leaflets from 50% alc., $m. 86^\circ$; 3.6 g. of this heated 12 hrs. at 140-5° with 5.2 g. of 40% HCHO yields 2.1 g. of the compound $\text{BzCH}_2\text{NMeCO}_2\text{Et}$, $b_{16} 181-3^\circ$, thick oil of a faintly basic aromatic odor; its aq. soln. is neutral to litmus.

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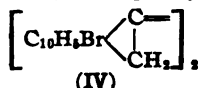
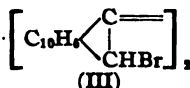
Synthesis of *N-methylhexahydro- α,α' -lutidinedicarboxylic acid*. K. HESS AND F. WISSING. Univ. Freiburg i. Br. *Ber.* 48, 1907-12(1915).—From 10 g. lutidine, $b_{710} 142-4^\circ$, gently boiled with 60 g. KMnO_4 in 1500 cc. H_2O until colorless, filtered, and concd. on the H_2O bath to incipient sepn. of salt and treated with concd. HCl , is obtained 7.6 g. lutidinic acid (a), $m. 226^\circ$; 0.100 g. dissolves in 8 cc. of 60% AcOH at 40°; 8 g. in 500 cc. hot alc. poured upon 80 g. Na , heated with addition of more alc. if necessary until the Na is dissolved, cooled, treated with 370 g. concd. HCl , freed from alc., treated at 60-70° with 60 cc. of 20% NaNO_2 , and extd. with Et_2O in a Kempf extractor, gives 2.9 g. of *nitroso acid*, granular crystals from Et_2O , gives a strong Liebermann reaction, converted in concd. aq. soln. by HCl gas into 1.9 g. of a mixt. (probably *cis-trans* isomers) of *hexahydro- α,α' -lutidinic acid hydrochlorides* (b), decomps. about 290-5°, consisting of microscopic regular hexangular tables and prismatic needles. If, on the other hand, to 120 cc. of 10% aq. gum arabic, 100 cc. of 10% H_2PtCl_4 , 75 cc. of 1% colloidal Pt soln. and 305 cc. H_2O , satd. with H , is added 15 g. (a) suspended in 900 cc. AcOH and the mixt. hydrogenated under 3 atm. at 40°, the calcd. amt. of H is absorbed in 15 min.; on concg. the resulting soln. *in vacuo* at 50° to 200-300 cc., dialyzing through parchment (changing the dialyzate every 24 hrs.), concg. *in vacuo* and adding dil. HCl , only 1 form of (b) is obtained; yield, 17.5-18 g. from 18.5 g. (a); three 2.1-g. portions, each heated 4 hrs. at 135-40° with 4.5 g. of 40% HCHO and 8 cc. H_2O , concd. to incipient crystn. and supersatd. with concd. HCl , yield 5.5 g. of the *N-methyl acid hydrochloride* $\text{C}_8\text{H}_{14}\text{O}_4\text{NCl}$, polygonal tables from 90% alc., $m. 225-6^\circ$ (decompn.), hygroscopic in the air; converted by freshly pptd. Ag_2CO_3 in H_2O into the free acid, flat 4- and 6-sided tables with 1 mol. solvent from hot H_2O , $m. 225^\circ$ (incipient decompn.), *Copper salt*, $\text{C}_8\text{H}_{11}\text{O}_4\text{NCu}\cdot\text{H}_2\text{O}$, from the acid in 1% aq. soln. boiled 0.5 hr. with freshly pptd. CuO , thread-like azure needles, changes color about 235°. Alkylation of 8.5 g. piperidine by heating 4 hrs. at 110-5° with 10 g. of 40% HCHO (cf. Eschweiler, *Ber.* 38, 881(1905)) gave quant. about equal parts of methylpiperidine, $b_{710} 105-7^\circ$, and *methylenebis(piperidine)*, $b_{14} 103-4^\circ$. C. A. R.

A new transformation of acenaphthylene and synthesis of biacenaphthylidine, a new yellow hydrocarbon. J. DOLINSKI AND K. DZIEWONSKI. Acad. Sci., Cracow. *Ber.* 48, 1917-31(1915); cf. C. A. 9, 211.—When 50 g. acenaphthylene in 120 g. AcOH and 0.5 cc. HCl (d. 1.19) is heated 1-2 hrs. on the H_2O bath, there gradually seps. about 40 g. of a mixt. of polymerization products, *cryst. biacenaphthylidene* (a) and a yellow amorphous substance (b); it is powdered and extd. repeatedly, first with cold, then with hot C_6H_6 , (b) dissolving in the cold and (a) sepg. from the hot exts. in bright yellow leaves (yield, 20%). If it is not desired to isolate (b) but only to obtain (a) in good yield, it is better to treat 50 g. acenaphthylene in 500 cc. hot AcOH with 80 g. picric acid in AcOH and 5 cc. concd. HCl , heat 10 hrs. on the H_2O bath, filter the resulting *picrate* of (a) and *cryst.* it from xylene; it seps. in crimson needles with metallic luster, and is converted by NH_4OH into the free (a); yield, 37-40%. (a), after repeated crystn. from C_6H_6 or its higher boiling homologs, forms golden yellow leaves or tables, $m. 277^\circ$ (cor.), sol. in cold concd. H_2SO_4 with blue to greenish blue color; its solns.

show intense violet-blue fluorescence, most marked when very dil. (e. g., 0.00125%), quickly disappearing when the soln. is exposed to strong sunlight, the color at the same time changing from bright yellow to orange. On the other hand, in the dry state or in soln. in the dark, (a) is quite stable. Mol. wt. in boiling PhNO_2 , 297–306. From all its properties, D. and D. conclude (a) has the structure (I) or (II), or possibly both,



especially in soln. *Picrate*, $\text{C}_{24}\text{H}_{16.2}\text{C}_6\text{H}_5(\text{NO}_2)_3\text{OH}$, m. $216-7^\circ$. Heated to the b. p. in AcOH with excess of $\text{Na}_2\text{Cr}_2\text{O}_7$, (a) gives naphthalic anhydride almost quant. With HI (d. 1.5) and red P 8 hrs. at $180-5^\circ$, it gives 7,7-biacenaphthyl. When 2 g. (a) in 300 cc. boiling CS_2 is heated 1 hr. on the H_2O bath with 2.3 g. Br. in CS_2 and the resulting ppt. is washed with cold and then with hot C_6H_6 , there is obtained 80% of the 8,8-dibromo derivative (III), hair-like, orange-yellow needles, decompd. by long treatment



with boiling C_6H_6 , much more quickly in higher boiling solvents, gradually dissolving with dark red color, losing HBr and forming an exceeding easily sol., amorphous, red-brown compd.; in a capillary, (III) decomp. about 203° and dissolves easily in cold concd. H_2SO_4 with dark green, almost black color; with $\text{Na}_2\text{Cr}_2\text{O}_7$ in boiling AcOH it forms naphthalic anhydride almost quant. A by-product formed in small amt. in the prepn. of (III) is α, α' -dibromobiacenaphthylidene (IV), obtained in better yield by adding to 1.5 g. (a) in 1 l. CHCl_3 1.2 g. Br in CHCl_3 , allowing to stand 12 hrs., and extg. the resulting mixt. of (III) and (IV) with boiling C_6H_6 ; (IV) seps. from the C_6H_6 in hair-like yellow needles, easily sol. in org. solvents, m. 310° (decompn.), difficultly sol. in cold H_2SO_4 with bright green color, oxidized by $\text{Na}_2\text{Cr}_2\text{O}_7$ in AcOH to α -bromonaphthalic anhydride. From 2 g. finely divided (a) (prepd. by pptg. from 15 cc. hot PhNO_2 with 150 cc. alc.) suspended in 50 cc. AcOH and allowed to stand 12 hrs. in the dark with 10 cc. HNO_3 (d. 1.5) is obtained α, α' -dinitrobiacenaphthylidene, dark red needles from PhNO_2 , does not m. 360° , deflagrates on a Pt foil, oxidized by CrO_3 to α -nitronaphthalic anhydride. (b) is the chief product (70–80%) of the acid polymerization of acenaphthylene when the latter is treated directly in hot AcOH with concd. HCl; it forms no picrate and is purified by repeated pptn. from cold C_6H_6 with alc.; it is exceedingly sol. in cold CHCl_3 , C_6H_6 , PhNO_2 , Me_2CO , etc., difficultly in Et_2O , AcOH, alc. and ligroin, easily in H_2SO_4 with olive-green color, softens 180° , m. $185-90^\circ$, changes to dark or brown-yellow on long exposure to light, almost quant. oxidized to naphthalic anhydride by CrO_3 ; compn., $(\text{C}_{12}\text{H}_8)_n$; mol. wt. in boiling PhNO_2 , 755, in freezing CHBr_3 , 738–76. It is designated by D. and D. as an *allo-polyacenaphthylene*. C. A. R.

Additions to two earlier communications (oxonium bases with the character of alkalis, and the iodides of methylphenazonium). F. KEHLMANN. Univ. Lausanne. *Ber.* 48, 1931–3(1915).—The trimethylfluorescein bicarbonate described in C. A. 9, 324, has since been analyzed and the mol. ratio dimethoxyfluorane: CO_2 found to be 1:1, showing that the compd. is really a bicarbonate. The prediction in C. A. 8, 1283, that if the green periodide of methylphenazonium is semiquinoid, it should be possible to prep. it from the green semiquinoid iodide by addition of mol. I according to the equation $\text{C}_{12}\text{H}_{11}\text{N}_2\text{I} + \text{C}_{12}\text{H}_{11}\text{N}_2\text{I} + \text{I}_2 = \text{C}_{24}\text{H}_{22}\text{N}_4\text{I}_4$ has been verified; when mol. amts. of the semiquinoid iodide and I in just enough boiling alc. are cooled, fine, dark needles of the comp. $\text{C}_{24}\text{H}_{22}\text{N}_4\text{I}_4 \cdot \text{EtOH}$ quickly sep.; they are in all respects identical with the compd. previously described.

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Constitution and color. IV. Color of the azo compounds and their salts. F. KHERMANN. Univ. Lausanne. *Ber.* 48, 1938-8(1915); cf. *C. A.* 8, 110.—As a result of the study of the azines it might be expected that the azo compds., since they are doubly unsatd. and each of the N atoms may independently become pentavalent by addition, would yield two series of salts with strong acids; this has been confirmed. PhN:NPh in ordinary concd. H_2SO_4 is intensely golden yellow, without a tinge of red even in thick layers, while in acid with 25% SO_3 it is deep red in thick and greenish yellow in thin layers, the latter color persisting only a few min. as sulfonation rapidly sets in and the color quickly becomes identical with that in ordinary concd. acid. If the golden yellow soln. is dild. in stages with H_2O , the color becomes lighter without change in tone and finally disappears, with sepn. of the free PhN:NPh , while the soln. of the SO_3H acid under the same conditions finally becomes of a very slightly intense bright orange-yellow, the sulfate being hydrolyzed and the faintly colored aq. soln. of the free SO_3H acid resulting. The solns. of $p\text{-H}_2\text{NC}_6\text{H}_4\text{N:NPh}$ (a) in acid of 25% SO_3 content and in ordinary concd. acid are the same optically as those of PhN:NPh ; on dildn. of the latter there appears at a certain stage a blue-red color fading out only on addition of much H_2O and depositing the free azo compd. The solns. of chrysoidine (b) in fuming and in 98% H_2SO_4 are both golden yellow; dildn. with a little H_2O produces the same blue-red color as with (a), while much H_2O gives an orange-yellow color and neutralization with NH_4OH gives the somewhat lighter color of the free base (b). These facts may be explained thus: the orange-yellow PhN:NPh with concd. acid forms, without a true deepening ("Vertiefung") of the color but with a strong increase in its intensity, a golden yellow monoacid salt; with fuming acid, the 2nd N atom also adds acid with distinct deepening of the color; on the entrance of a SO_3H group in 1 of the Ph nuclei, the N combined with this nucleus loses its additive power and the resulting salt has the structure $\text{HO}_3\text{SC}_6\text{H}_4\text{N:N(HX)Ph}$. The phenomena in the case of (a) point to the existence of 2 series of salts. Since the triacid red and diacid golden yellow salts are optically the same as the diacid red and monoacid golden yellow salts of PhN:NPh the auxochromic action of the NH_2 group seems to be masked. The triacid salt has the structure $\text{PhN(HX):N(HX)C}_6\text{H}_4\text{NH}_2\text{X}$, the diacid salt probably $\text{PhN(HX):NC}_6\text{H}_4\text{NH}_2\text{X}$ since the NH_2 group in the form of the sulfate acts like a SO_3H group in decreasing the additive tendency of the azo N directly combined with the nucleus to which it is attached, while in the monoacid salt the NH_2 group, being free, deepens the color and at the same time increases the additive power of the azo N combined with the nucleus to which it is attached, so that the salt has the structure $\text{PhN:N(HX)C}_6\text{H}_4\text{NH}_2$. Moreover, if in the formation of the monoacid salt from the intensely orange-yellow (a) it were the NH_2 group which adds the acid, the resulting salt should be of about the same color as PhN:NPh ; the deepening of the color which in fact occurs indicates that the salt formation takes place at the chromophore, i. e., the azo N. In the case of (b), it is apparently impossible to obtain a tetra-acid salt. The golden yellow tri-, the blue-red di- and the orange-yellow monoacid salts have the structures $2,4\text{-(NH}_2\text{X)}_2\text{C}_6\text{H}_3\text{N:N(HX)Ph}$, $2,4\text{-(NH}_2\text{X)(NH}_2\text{)C}_6\text{H}_3\text{N:N(HX)Ph}$ and $2,4\text{-(NH}_2\text{X)-}$ $(\text{NH}_2)\text{C}_6\text{H}_3\text{N:NPh}$.

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Behavior of amino acids towards neutral salts in aqueous solution. P. PFEIFFER, with J. WÜGLER AND FR. WITKA. Univ. Zurich. *Ber.* 48, 1938-43(1915); cf. *C. A.* 9, 2652.—To det. whether the neutral salt compds. of NH_2 acids described in the earlier papers exist only in the solid state or also in aq. soln. in equil. with their components and complex ions, the soly., rotation and mol. wt. of NH_2 acids in the presence of neutral salts were detd. All 3 methods indicate that a part of the acids combine in the solns. with the salts and their ions, so that in aq. albumin solns. containing salts, especially blood serum and related media, neutral salt compds. undoubtedly exist. In all

to the electrolytes, indicated by the pptn. of Hg from Nessler's reagent, the consumption of KMnO_4 and the pptn. of Hg_2Cl_2 from HgCl_2 ; these reducing products are not formed at the cathode for the H evolved corresponds exactly with the current as measured in the coulometer. As in the Kolbe electrolyses, increase in the concn. of the soln. has a favorable influence, indicated by the increase in the ratio $\text{CO}_2:\text{H}_2\text{SO}_4$. Although these quant. results point to a Kolbe electrolysis, the synthesized product cannot be isolated from the mixt. of different K salts. Accordingly, 35 10-cc. portions of 7.5 *N* $\text{NH}_4\text{O}_2\text{SCH}_2\text{CO}_2\text{NH}_4$ were electrolyzed with 2 amp.-hrs. at cooled Pt electrodes with a density of 2 amp./sq. cm., then acidified with H_2SO_4 , boiled as long as HCHO was evolved (many hrs.), concd., the crystals (a) sepg. (chiefly $(\text{NH}_4)_2\text{SO}_4$), boiled with excess of $\text{Ba}(\text{OH})_2$, treated with CO_2 and filtered; the filtrate on concn. deposited a small amt. of $\text{CH}_3(\text{SO}_3)_2\text{Ba} \cdot 2\text{H}_2\text{O}$. The mother liquor from (a) was likewise boiled with $\text{Ba}(\text{OH})_2$; the BaSO_4 carried down with it most of the Ba sulfoacetate, while the filtrate contained more of the latter salt, $(\text{CH}_3\text{SO}_3)_2\text{Ba}$ (4 g. of which was isolated), and an easily sol. mixt. of salts (of $\text{HO}_2\text{SCH}_2\text{OH}$ and $\text{HO}_2\text{SCH}_2\text{O}$?), and $\text{Ba}(\text{NO}_3)_2$ (from the oxidation of the NH_3). The acidified electrolyzed soln. evolves HCHO when boiled and H_2SO_4 is simultaneously formed; this is explained by the hydrolysis of the hypothetical $\text{HO}_2\text{SCH}_2\text{O}$. The evolution of CO during the electrolysis and of SO_2 on boiling the acidified soln. is explained thus: $\text{HO}_2\text{SCH}_2\text{O} + \text{O} = \text{CO}_2 + \text{H}_2\text{SO}_4$; $\text{HO}_2\text{SCO}_2\text{H} = \text{CO}_2 + \text{H}_2\text{SO}_4$. When the free $\text{HO}_2\text{SCH}_2\text{CO}_2\text{H}$ is oxidized at a cooled Pt anode in a clay cell and a Pb cathode, CO_2 and unused, partly ozonized O are evolved at the anode, and H_2SO_4 and some HSO_4 are formed in the soln.; the ratio $\text{CO}_2:\text{H}_2\text{SO}_4$ is not quite 2:1, but no by-products could be detected. The current yield increases with increasing concn. and is 48% in 3 *N* soln. From a 6 *N* soln. of $\text{KO}_2\text{SCH}_2\text{CH}_2\text{CO}_2\text{K}$ with 35 amp.-min. at an anode density of 2 amp./sq. cm. are obtained 0.6293 g. H_2SO_4 , 0.3868 g. CO_2 , 0.1358 g. C_2H_4 and 0.0040 g. CO . AcOH was detected qual. and on boiling the acidified soln. HCHO , SO_2 and H_2SO_4 were found. The same results were obtained with the NH_4 salt but no $(\text{CH}_3\text{CH}_2\text{SO}_3\text{H})_2$ could be detected. A soln. of the NH_4 salt containing the free acid, when electrolyzed, freed from sulfates with BaCl_2 , acidified and boiled, gave AcH and AcOH , together with a little HCHO ; Ba sulfoacetate was also isolated, but no evidence of the presence of $(\text{CH}_3\text{CH}_2\text{SO}_3\text{H})_2$ was obtained. A 6 *N* soln. of MeSO_3K , electrolyzed with 52.5 amp.-min. at an anode density of 2 amp./sq. cm., gave only CO_2 at the anode, and H_2SO_4 , with a little HSO_4 in the liquid; on boiling, HCHO was evolved. The ratio $\text{CO}_2:\text{H}_2\text{SO}_4$ was 1:0.669. Electrolysis of free $\text{CH}_3(\text{SO}_3\text{H})_2$ in 10 *N* or more dil soln., of the acid K salt in 2 *N* soln., or the NH_4 salt in the presence of NH_4OH gave only CO_2 and H_2SO_4 (in acid soln. some O_2 and HSO_4 were also formed). $\text{CH}_3(\text{SO}_3)_2\text{Ba} \cdot 2\text{H}_2\text{O}$, thus far always described as slender rhombic tables, seps. from acid solns. in long needles, a drop of 2 *N* HCl or NaOH added to the neutral soln. producing the exclusive formation of the needles or tables, resp. Assuming the momentary existence of the free radicals $\text{HO}_2\text{SCH}_2\text{—}$, the above products obtained in the electrolysis of $\text{HO}_2\text{SCH}_2\text{CO}_2\text{H}$ give the following picture of the mechanism of the reaction: Shortly after the electrolysis begins, the originally neutral soln. becomes alk., CO_2 being split off and remaining in soln. as bicarbonate; this furnishes the condition which is a prerequisite of the Hofer-Moest reaction. The first product is probably $\text{HO}_2\text{SCH}_2\text{—} + \text{OH}' + \oplus = \text{HO}_2\text{SCH}_2\text{OH}$, which on further oxidation yields $\text{HO}_2\text{SCH}_2\text{O}$ and then $\text{HO}_2\text{SCO}_2\text{H}$ and finally $\text{H}_2\text{SO}_4 + \text{CO}_2$. As more and more H_2SO_4 is formed, the alkalinity diminishes, to be sure, but sulfates are also formed in increasing amts. and these, as well as an alk. reaction, favor the H.-M. reaction, and moreover, the acidity of the soln. favors the formation of the simplest, final oxidation products; both of these factors impede the formation of the Kolbe electrolysis product. The formation of C_2H_4 and $\text{CH}_3(\text{SO}_3\text{H})_2$ may possibly be represented thus: $2\text{HO}_2\text{SCH}_2\text{—} = \text{CH}_2\text{—} + \text{CH}_2(\text{SO}_3\text{H})_2$; $2\text{CH}_2\text{—} = \text{C}_2\text{H}_4$.

CHAS. A. ROULLIER.

Action of the Grignard reagent on tertiary pyrroles. Answer to B. Oddo. K. HESS. Univ. Freiburg i. Br. *Ber.* 48, 1969-74(1915); cf. C. A. 8, 2706; Oddo, C. A. 9, 73.—O.'s statements have been confirmed insofar as the non-formation of C_2H_6 from *N*-methylpyrrole and the Grignard reagent is concerned, the formation of C_2H_6 (in Et_2O soln.) observed by H. having been due to the presence of traces of moisture and not, as believed by O., of unmethylated pyrrole, as chem. pure C_4H_8NMe , indifferent towards K, was always used. It has been found that unmethylated pyrrole reacts vigorously in Et_2O with $AcCl$, in the absence of a G. reagent, with formation of acetylpyrrole, so that the reactivity of $AcCl$ towards *N*- C_4H_8NMe shows nothing contrary to the reactions of C_4H_8N itself and permits of no conclusion as to its reactivity in the presence of the G. reagent. Another fact contrary to O.'s assertion that C_4H_8NMe does not react with an ethereal soln. is the non-formation of $MeEtCHOH$ in the presence of $AcCl$, and, furthermore, no C_2H_6 is evolved when an acid chloride is added to *N*- C_4H_8NMe and $EtMgBr$ in Et_2O , this occurring only on decompn. with H_2O . The fact that an acid chloride and a G. reagent do not react with each other in the presence of C_4H_8NMe shows beyond doubt that the C_4H_8NMe and G. reagent first react in some way, probably forming an addition product sol. in Et_2O , so stable that it is not attacked by the acid chloride. H. represents the reactions thus: $N-C_4H_8NMe + EtMgBr \rightarrow C_4H_8NMe::BrMgEt + RCOCl + H_2O \rightarrow N, \alpha-C_4H_8NMeCOR + MgBrCl + C_2H_6$, and $C_4H_8N + EtMgBr \rightarrow C_4H_8N::BrMgEt \rightarrow N-C_4H_8NMgBr + RCOCl \rightarrow \alpha-C_4H_8NCOR$. The latter scheme is further confirmed by the fact that an *N*-acetylpyrrole is never obtained; the assumption that an *N*-acyl compd. is first formed and rearranges into the C-deriv. is rendered improbable by the low reaction temp. (36°).

CHAS. A. ROUILLER.

Action of derivatives of the three-carbon series on pyrrole. II. Preliminary. KURT HESS AND HEINRICH FINK. Univ. Freiburg i. Br. *Ber.* 48, 1986-2005(1915); cf. C. A. 8, 127.—When epichlorohydrin (a) and K pyrrole (b) are brought together, the (b) apparently first adds to the ethylene oxide group and the resulting product then loses KCl : $CH_2(C_4H_8N)CH(OK)CH_2Cl \rightarrow CH_2(C_4H_8N)CH.CH_2O$ (c) + KCl .

This is indicated by the fact that monochlorohydrin and (b) give only propylene oxide, C_4H_8N and KCl , the (b) merely acting as an alkali; and furthermore in the prepn. of (c) a dimer (d), $CH_2(C_4H_8N)CH.CH_2O.CH(CH_2C_4H_8N).CH_2O$, is formed as a by-

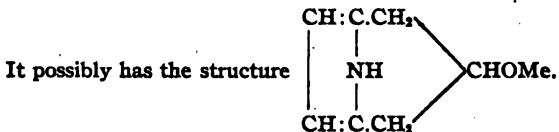
product. The best conditions for the prepn. of 1-*N*-pyrrolpropane 2,3-oxide (c) are the following: 305 g. (a) in 400 cc. very dry Et_2O at 40° is slowly treated with vigorous stirring in the course of 3.5 hrs. with 250 g. finely powdered (b), kept just at a boil, with turbinating, for 5 hrs., shaken with 400 cc. H_2O , the aq. layer acidified with 20% H_2SO_4 (20-30 cc.), filtered from the slight amt. of tar, shaken twice with 50 cc. portions of Et_2O , the combined Et_2O solns. washed with H_2O until neutral, dried with potash and fractionated *in vacuo*; yield, 80-90 g. unchanged (a), 136-40 g. (c) and 22 g. (d). (c), b_{11} $93-4^\circ$, mobile oil slowly becoming yellow, has a decided mustard oil-like odor, gives no ppt. with picric acid. (d), b_{16} $195-200^\circ$, thick oil easily becoming somewhat yellow, difficultly sol. in cold or hot H_2O with neutral reaction to litmus, can be distd. under atm. pressure, gives a strong pine splinter test, quite stable towards concd. HCl , dissolving in the cold with yellow color and not darkening even on boiling, insol. in dil. HCl ; mol. wt. in freezing $C_{10}H_8$, 227-45. When 43 g. $(ClCH_2)_2CHOAc$ (e) are added with vigorous turbinating to a suspension of 52 g. freshly prepd. (b) in 100 cc. boiling abs. C_6H_6 , boiled with turbinating 4 hrs., freed from C_6H_6 *in vacuo*, extd. with Et_2O and fractionated, there are obtained 20-5 g. (c) and 7-9 g. (d), while the residue insol. in Et_2O , when dried, dissolved in just the necessary amt. of cold H_2O and acidified

with cold dil. H_2SO_4 , yields a *diacetylpyrrole*, b_{16-7} 105° , solidifies to rectangular prismatic tables sepp. from petr. ether in prisms, m. 55° , difficultly sol. in cold and hot H_2O with faintly acid reaction to litmus, easily sol. in alkalies and reprecipitated by acids, gives AcOH when boiled with acids, gives a deep dark red color with alc. FeCl_3 , yields a cryst. K salt. The (e) is probably first split into (a) and AcCl in the above reaction. Grignard reagents do not act on (c) as might have been expected from the reactions with ethylene and propylene oxides (cf. C. A. 10, 467); there is first formed an addition product which takes up H_2O and decomps., giving *1-N-pyrrolyl-2-hydroxy-3-bromopropane* (f), $\text{C}_4\text{H}_4\text{NCH}_2\text{CH}(\text{OH})\text{CH}_2\text{Br}$, which is formed only after acidifying with H_2SO_4 and therefore cannot be ascribed to the formation of free HBr . To the G. reagent from 2.4 g. Mg and 12 g. EtBr in 50 cc. Et_2O are slowly added 12.3 g. (c) in the course of 20–5 min., the mixt. warmed 1–2 hrs. at 60° , poured upon ice, the Et_2O poured off, the aq. emulsion of Mg salts repeatedly washed with Et_2O , the aq. soln. acidified, again extd. with Et_2O , the exts. dried with potash and distd.; there is thus obtained 15 g. of (f), b_{14-1} $137-9^\circ$ (slight decompn.). If, on the other hand, after prepg. the G. reagent in the least possible amt. of Et_2O and dilg. with 100 cc. C_6H_6 , the (c) in an equal vol. of C_6H_6 is added and the mixt. is boiled 9 hrs., there is also obtained 1.5–2.0 g. of a *pyrrole alcohol*, $\text{C}_4\text{H}_4\text{NCH}_2\text{CH}(\text{OH})\text{Pr}$, b_{14} $115-7^\circ$. When 68.1 g. (f) in 100 cc. Et_2O are slowly treated with the G. reagent from 8 g. Mg and 40 g. EtBr , there is a vigorous evolution of C_6H_6 ; the resulting alcoholate is treated with 25.2 g. AcCl in 30 cc. Et_2O , the clear soln. decanted from the pptd. Mg salt, washed with H_2O until neutral and dried with potash; it leaves on cautious evapn. the *ester* $\text{C}_4\text{H}_4\text{NCH}_2\text{CH}(\text{OAc})\text{CH}_2\text{Br}$, thick syrup of pleasant, faintly aromatic odor, becomes pink in the air and after a time completely resinifies, decomps. completely at 125° under 11 mm.; the product from 58 g. (f), heated 15 min. with 6.6 g. Na in dry MeOH, allowed to stand 12 hrs., concd. *in vacuo*, dild. with 150 cc. H_2O and extd. with Et_2O yields 31.4 g. oil free from halogen, consisting of several products, only 1 of which has thus far been isolated: *1-N-pyrrolyl-2-hydroxy-3-methoxypropane* (g), b_{12} 143° . The *p*-nitrobenzoate of (f), prepd. like the acetate, m. $79-80^\circ$; 1.7 g. dissolves in 20 cc. hot alc. and seps. in indistinctly cryst. form; from Et_2O on slow evapn. it seps. in quadratic cubes. From 40 g. (c) heated 15 hrs. in a shaking bath at 100° with 200 cc. H_2O in a N atm. is obtained 40.5 g. of the *glycol*, $\text{C}_4\text{H}_4\text{NCH}_2\text{CH}(\text{OH})\text{CH}_2\text{OH}$, thick oil, b_{16} $167-8^\circ$, has a bitter taste; placed in excess of cold H_2SO_4 and slowly allowed to warm up to room temp., it soon becomes a faint pink; after a time, when cautiously dild. with H_2O , made alk. with NaOH and distd. with steam, it gives (c) quant.; treated in MeOH with MeI and Ag_2O , it gives a mixt., b_{17} $110-23^\circ$, of (g) and the isomeric 2-Me ether (see below). *1-N-Pyrrolyl-2-hydroxy-3-chloropropane* (h), b_{11} $109-10^\circ$, b_{19-10} 122.5° , is obtained in 156 g. yield from 131 g. (c) in 20–30 g. portions in 100–25 cc. cold Et_2O slowly satd. with HCl gas; five 30-g. portions are each shaken 48 hrs. with 30 g. dry Ag_2O and 45 g. MeI (0.5 of the Ag_2O being added the first day and the other 0.5 in 2 portions the 2nd day), filtered, dried, treated with dry HCl gas in ice-salt to convert the (c) formed into the chlorohydrin (the current of HCl is stopped as soon as the odor of HCl becomes perceptible), quickly freed from excess of HCl with H_2O , then from most of the Et_2O by cautious distn., and distd. with steam (for the product from 80 g. (h), the distn. was continued 75 min. and 1.5 l. distillate collected, most of the Me ether being in the distillate); both distillate and residue are salted out and exhaustively extd. with the least possible amt. of Et_2O ; the ext. from the distillate is fractioned and the portion b_{12} above 107.5° is combined with the ext. of the residue and again methylated as above, the process being repeated as long as the fraction b_{12} above 107.5° makes it profitable; there is thus obtained 105–15 g. of *1-N-pyrrolyl-2-methoxy-3-chloropropane* (i) b_{20} $103.5-5.0^\circ$, mobile oil of flowery odor; there is also obtained 0.9 g. of *1,3-dichloro-2-methoxypropane* (j),

b_{10} 48–50° (see below). When 30 g. pyrrole, dried with potash and freshly distd., are slowly treated at 140° with 3.4 g. K, then, in a slow current of dry H, with 15 g. (i), kept 2.5 hrs. at 120–30°, dild. with 50 cc. H₂O, neutralized with *N* H₂SO₄ and extd. with Et₂O, there are obtained 14 g. unchanged pyrrole, 2–2.5 g. of a compound.

probably $\text{N} \cdot \text{CH} : \text{CH} : \text{CH} : \text{C} \cdot \text{CH}_2 \cdot \text{CH}(\text{OMe}) \cdot \text{CH}_3$ (k), b_{20} 73–4°, mobile oil of intense,

not unpleasant odor, and 2.8–3.5 g. of 1,3-di-*N*-pyrrol-2-methoxypropane, b_{20} 149.5–50.5°. From 5 g. (i) heated 4.5 hrs. at 130–5° with 12 cc. of 20% KOH in MeOH and 10 cc. MeOH are obtained 1–1.5 g. (k) and 1.3–1.6 g. of 1-*N*-pyrrol-2-methoxy-3-hydroxypropane, b_{20} 105–8°. *sym*-Dichloropropanehydrin methyl ether (j), mobile, refractive, very volatile liquid of refreshing odor, b_{20} 47.5°, b_{140} 159–9.5°, is obtained in 55.4 g. yield, together with 5–7 g. unchanged (ClCH₂)₂CHOH, when 50 g. of the latter and 85 g. MeI are treated with 45 g. Ag₂O in small portions during the course of about 1 day, allowed to stand overnight, filtered, washed with Et₂O, and the filtrate and washings just satd. with HCl. The ester, ClCH₂COCH₂OAc, b_{16} 112–4°, is obtained in 16–7 g. yield from 30 g. (ClCH₂)₂CO in the least possible amt. of AcOH boiled 20 min. with 30 g. KOAc in 100 cc. AcOH, neutralized with concd. soda below 5° and exhaustively extd. (12 hrs.) with Et₂O. From 59 g. (b) suspended in 60 cc. dry C₆H₆ treated in H at 90° with 40 g. (ClCH₂)₂CHOMe in the course of 1 hr. and heated 0.5–1.0 hr. longer with turbinating at 90°, there are obtained (i) and an isomer, b_{11} 104.5–6.0°, stable only in closed vessels, quickly darkens in the air, has a faint pyrrole odor,



CHAS. A. ROUILLER.

Phenylfumaric acid. G. KARL ALMSTRÖM. Univ. Upsala. *Ber.* 48, 2009–10 (1915).—Phenylmaleic anhydride (Alexander, *Ann.* 258, 76(1890)), boiled 6 hrs. with excess of 2 *N* NaOH, acidified, extd. with Et₂O, evapd. and crystd. from C₆H₆, gives phenylfumaric acid, felted needles, m. 128–9° (gentle gas evolution), easily sol. in H₂O with very bitter taste, quickly reduces KMnO₄, reddens litmus, is dibasic with phenolph. as indicator, seps. from H₂O in needles with 2 mols. solvent, m. 80–100°; the anhydrous acid decomps. on melting into H₂O and phenylmaleic anhydride. Barisch's observations (*J. prakt. Chem.* 20, 187(1879)) therefore do not apply to phenylfumaric acid.

CHAS. A. ROUILLER.

Constitution of the phenolaldehyde salts. II. H. PAULY. Würzburg. *Ber.* 48, 2010–8(1915); cf. *C. A.* 9, 2253; Hantzsch, *C. A.* 9, 1332.—Contrary to H.'s statement, the hemihydrate, as well as the anhydrous form, of the acid Na₂ salt of *o*-OHC-C₆H₄CO₂H, is pure white; the yellow color attributed to it by Ettling (*Ann.* 35, 241 (1840)) was due to traces of the neutral yellow salt. It was prepd. by treating 2.44 g. OHCC₆H₄CO₂H in 10 cc. of 60% alc. with 9.5 cc. of *N* NaOH and washing with Me₂CO and Et₂O. The anhydrous form was prepd. by H.'s method (*Ber.* 39, 3089 (1906)); the yellow color which it assumes in moist air can be washed out with Me₂CO and Et₂O. That this color is due to the neutral salt resulting from hydrolysis is shown by warming either form of the acid salt with H₂O; there at once sep. fine oily drops, a strong odor of OHCC₆H₄CO₂H is evolved and the soln. becomes yellow. The possibility of the existence of solid colored *m*-phenolaldehyde salts has been proved. Thus, 0.4 g. pure white isovanillin, prepd. free from traces of 3,4-(HO)₂C₆H₃CHO through its MeO₂C compd., and subsequent hydrolysis with aq. C₆H₅N, when treated in 10 cc. MeOH and 20 cc. Et₂O with an equiv. amt. of NaOMe in MeOH, then with 50 cc.

Et_2O and allowed to stand, yields the *sodium salt* in S-yellow needles. Again, 1.5 g. isovanillin in 8 cc. AcOH treated dropwise with 1.6 g. Br in 4 cc. AcOH give a *bromo-isovanillin*, dazzling white needles from alc., m. 208° , forming a colorless anil which gives a yellow melt, while with NaOMe in MeOH and subsequent addition of Et_2O it yields a strongly yellow cryst. *sodium salt* regenerating the colorless aldehyde with acids. Since even the most recent work seems to confirm the impossibility of the existence of *m*-quinoids, the above facts overthrow the last evidence in favor of the theory that the colored salt of phenolaldehydes are quinoid. The remainder of P.'s answer to H. contains no new exptl. material.

CHAS. A. ROUILLER.

Action of certain acid reagents on the substituted ureas and thiazole. II. F. B. DAINS, R. C. ROBERTS AND R. Q. BREWSTER. *J. Am. Chem. Soc.* 38, 131-40 (1916); cf. *Ibid.* 22, 181 (1900).—Benzodi-*o*-tolylamidine, $\text{PhC}:(\text{NC}_6\text{H}_4\text{Me})\text{NHC}_6\text{H}_4\text{Me}$, from mol. proportions of BzCl and $\text{CO}(\text{NHC}_6\text{H}_4\text{Me})_2$ heated 4 hrs. at 170° , needles from alc., m. $87-8^\circ$. Isovalerdiphenylamidine, from iso-AmCOCl and $\text{CO}(\text{NHPh})_2$ at 140° , m. 103° (possibly identical with the compd. obtained by Hofmann from iso-AmCO₂H, PhNH₂ and PCl_5 ; cf. *Jahresb.* 1865, 416); chloroplatinate, yellow, m. 207° ; picrate, m. $144-5^\circ$. Isovalerdi-*m*-tolylamidine, needles, m. 102° ; yellow chloroplatinate, m. 214° . *p*-Tolyl compound, m. $91-2^\circ$; hydrochloride, m. 175° ; chloroplatinate, m. 199° . *m*-Nitrobenzo-di-*p*-tolylamidine, yellow needles from alc., m. 137° . AcCl and $(\alpha\text{-C}_{10}\text{H}_7\text{-NH})_2\text{CS}$ at 90° give $\text{C}_{10}\text{H}_7\text{NCS}$ and $\text{C}_{10}\text{H}_7\text{NHOAc}$ and with BzCl at 160° are obtained the corresponding Ph compds., only traces of basic products being formed. Similarly, phthalyl chloride and $\text{CS}(\text{NHPh})_2$ at 160° yield chiefly PhNCS and phthalanil, with a small amt. of $(\text{PhNH})_2\text{C}:\text{NPh}$, while $\text{CO}(\text{NHPh})_2$ gives chiefly phthalanil, although the odor of PhNCO and COCl_2 are also noticeable; no amidine is formed. $\text{CS}(\text{NHPh})_2$ and Ph_2NCOCI at $110-20^\circ$ smoothly form PhNCS, $(\text{PhNH})_2\text{C}:\text{NPh}$, Ph_2NH and COS; similar results are obtained with di-*p*- and -*o*-tolylthioureas, and with $\text{CO}(\text{NHPh})_2$; cf. Dixon, *J. Chem. Soc.* 75, 405 (1899). From 2 mols. $\text{PhNHCSN}^+\text{EtPh}$, 2 mols. $\text{C}_6\text{H}_5\text{N}$ and 1 mol. COCl_2 in C_6H_6 are obtained $\text{C}_6\text{H}_5\text{N.HCl}$ and carbonylbis(diphenyl-ethylthiourea), $\text{CO}(\text{NPhCSN}^+\text{EtPh})_2$, needles from alc., m. 166° , not desulfurized by HgO in boiling C_6H_6 . Triphenylmethylurea, m. 105° , is obtained, together with PhNCS, from PhNHCONMePh and Ph_2NCOCI at 150° ; similar results are obtained with $\text{PhNHCONMePh} + \text{MePhNCOCI}$ and $\text{PhNHCON}^+\text{EtPh} + \text{Ph}_2\text{NCOCI}$. α,β -Diphenyl- α -methyl- β -ethylurea, from $\text{PhNHCON}^+\text{EtPh}$ and PhMeNCOCI at $150-60^\circ$ or from PhNH^+Et , PhMeCOCl and $\text{C}_6\text{H}_5\text{N}$ at 140° , m. 74° . $\text{PhN}:\text{C}(\text{NHPh})\text{SMe}$ heated 15 min. on the H_2O bath with a little more than 1 mol. Ac_2O yields acetylisothiodiphenylurea methyl ether, $\text{PhN}:\text{C}(\text{N}^+\text{AcPh})\text{SMe}$, cubes from dil. alc., m. 71° , only slightly sol. in dil. acids, forms no solid hydrochloride with HCl gas in C_6H_6 and no picrate; alkalis regenerate the original ether; it is also obtained from 2 mols. of the latter, allowed to stand in C_6H_6 with 1 mol. AcCl. *m*-Nitrobenzoylisothiodi-*o*-tolylurea ethyl ether, from $\text{MeC}_6\text{H}_4\text{N}:\text{C}(\text{NHC}_6\text{H}_4\text{Me})\text{SEt}$, $\text{O}_2\text{NC}_6\text{H}_4\text{COCl}$ and $\text{C}_6\text{H}_5\text{N}$, m. 122° , non-basic, decompd. by boiling alc. KOH into EtSH, $\text{CO}(\text{NHC}_6\text{H}_4\text{Me})_2$ and $\text{O}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$. *m*-Nitrobenzoylisothiodiphenylurea methyl ether, m. 101° . All attempts similarly to replace the anilido H by the grouping R_2NCO at the temp. of boiling C_6H_6 failed, while at higher temps. an alkyl chloride, mustard oil and trisubstituted urea are formed. Thus, $\text{PhN}:\text{C}(\text{NHPh})\text{SMe}$ and Ph_2NCOCI heated 4 hrs. at 150° give MeCl, PhNCS and PhMeNCONHPh . *o*-Tolylmethylphenylurea, from $\text{MeC}_6\text{H}_4\text{N}:\text{C}(\text{NHC}_6\text{H}_4\text{Me})\text{SEt}$ and PhMeNCOCI at 150° , needles from gasoline, m. 117° , also obtained from *o*- $\text{H}_2\text{NC}_6\text{H}_4\text{Me}$ and PhMeNCOCI at 125° . α,α -Diphenyl- β -*o*-tolylurea, from $\text{MeC}_6\text{H}_4\text{N}:\text{C}(\text{NHC}_6\text{H}_4\text{Me})\text{SEt}$ and Ph_2NCOCI , m. 85° . By modifying the conditions it is possible to obtain from allylthioureas and acyl chlorides not only the thiazoles but also their acyl derivs. Thus, mol. proportions of $\text{C}_6\text{H}_5\text{NHCN}^+\text{HPh}$, $\text{C}_6\text{H}_5\text{N}$ and BzCl allowed to

stand in C_6H_6 yield α -allyl- β , β -benzoylphenylthiourea, m. 125° ; on concg. the C_6H_6 soln. with heat, it decomps. quant. into C_6H_5NCS and $BzNHPh$. With $AcCl$ instead of $BzCl$, only C_6H_5NCS and $AcNHPh$ were obtained, but $AcCl$ and p - $BrC_6H_4NHCSNHCH_3$ gave α -allyl- β -acetyl- β - p -bromophenylthiourea, m. 86° ; heated a few min. above its m. p., it decomps. into C_6H_5NCS and $AcNHC_6H_4Br$ while KOH hydrolyzes it to the original thiourea. *p*-Chloro compound, m. 84° . The rearrangement of $C_6H_5NHCSNHPh$ and $AcCl$ without a solvent into a thiazole deriv. can also be effected with $BzCl$ after 30 min. on the H_2O bath. *2-p*-Bromophenylamino-5-methyl-4,5-dihydrothiazole, from $BrC_6H_4NHCSNHCH_3$ and $AcCl$ heated 20 min., or from the thiourea and concd. HCl in a pressure bottle at 100° , m. 107° ; picrate, m. 156° . *p*-Chloro compound, m. 116° ; hydrochloride, m. 226° . *m*-Tolyl compound, m. 90° ; picrate, m. 158° . Just as in the isourea ethers, the anilido H in these thiazoles is very reactive towards Ac_2O . *2*-Phenylbenzoylamino-5-methyl-4,5-dihydrothiazole, from the $PhNH$ compd. and $BzCl$ in C_6H_5N , m. 118° , non-basic, hydrolyzed easily to the original thiazole by alc. KOH or cold HCl .

CHAS. A. ROUILLER.

Organic periodides. I. Periodides of phenacetine, methacetine and triphenine. W. O. EMERY. *J. Am. Chem. Soc.* 38, 140-50 (1916).—*Acetphenetidine hydriodide*, $(EtOC_6H_4NHAc)_2HI$, from phenacetine in alc.-free $AcOEt$ treated with HI gas freed from I and H_2O by passing over red P and P_2O_5 , needles, m. $147-8^\circ$. *Acetanisidine hydriodide*, m. $125-7^\circ$. In the case of triphenine no pure HI salt could be isolated; no ppt. was formed on passing HI into the base in $AcOEt$, $CHCl_3$ or C_6H_6 ; evapn. of the solns. spontaneously or by the aid of a blast and gentle heat left a cryst. residue of nearly colorless needles or prisms and periodide-like crystals, easily yielding a periodide on treatment with I in $AcOH$ or $EtCO_2H$. In perfectly dry air, these salts are reasonably stable but immediately yield their acid to H_2O or alc. Treatment of the above bases with I , KI and HCl , I and aq. or aq.-alc. HI of known strength, or of the HI salts with the required amt. of I yields the corresponding periodides. *Acetphenetidine hydriododide*, $(C_{10}H_{11}O_2N)_2HI.I_2$, is obtained only by the last of the above methods, the others yielding mixts. of the base and the tetraiodide; it seps. from $AcOH$ in ruby-red to reddish brown needles, softens $120-1^\circ$, m. $124-5^\circ$. *Tetraiodide*, $(C_{10}H_{11}O_2N)_2HI.I_4$, obtained by all of the above methods and from the diiodide with I , is most conveniently prepd. by a modified form of Scholvién's method for the prepn. of his "Jodphenin," to which he assigns the comp. $C_{10}H_{11}O_2N_2I_4$ (Friedländer, *Fortachr. Theerfarbenfab.* 3, 875); washed with satd. aq. I and dried on clay, it m. $133-4^\circ$; although reasonably stable in the air, it slowly becomes lighter in color and after several months, although the crystals retain their original shape, the residue consists essentially of phenacetine. The periodide I can be detd. quant. by titration with $Na_2S_2O_3$ and the total I by treating in $AcOH$ with satd. aq. SO_2 and pptg. with $AgNO_3$. The compd. affords a practical basis for the quant. sepn. of $AcNHPh$ and phenacetine and by its means as little as 0.5 mg. of the latter base can be qual. detected. *Acetanisidine hydriododide*, m. $142-3^\circ$, is the only periodide which it has thus far been possible to obtain from methacetine; it seps. in several cryst. forms and varying shades of color; as reddish brown leaflets or scales, ruby-red prisms and thick garnet prismatic plates, depending on the temp., concn. and nature of the solvent. It is identical with Piutti's " $C_{11}H_{13}O_2N_2I_4$ " (*Gazz. chim. ital.* 25, 519 (1895)). Although a tetraiodide has not been isolated, there are indications, notably certain color changes in the cryst. products before and after removal from the mother liquors, that it may exist under the proper conditions. *Propiophenetidine hydriododide*, from the base in aq. alc. with I and HI in varying proportions, greenish bronze needles, m. $121-3^\circ$; with I in $AcOH$ it gives the *tetraiodide*, purple-black silky needles, m. $92-4^\circ$.

CHAS. A. ROUILLER.

Role of atmospheric oxygen in the oxidation of glucose with potassium permanganate in the presence of varying amounts of alkali. The products of oxidation. EDGAR J. WITZEMANN. *J. Am. Chem. Soc.* 38, 150-61 (1916); cf. *C. A.* 6, 3089.—Two g. portions of glucose in 1 l. of 0-1.8 *N* KOH were completely oxidized at room temp. in the course of several weeks by adding small amts. of KMnO_4 , shaking occasionally until the KMnO_4 was reduced before adding the next portion and continuing the process until the last portion was reduced only after standing several days. The sole products of oxidation were found to be CO_2 and $(\text{CO}_2\text{H})_2$, both of which were detd. quant., and the KMnO_4 equiv. of the MnO_2 sludge was also detd. by dissolving in $(\text{CO}_2\text{H})_2\text{-H}_2\text{SO}_4$ and titrating the excess of $(\text{CO}_2\text{H})_2$ with KMnO_4 . Calcn. of the amt. of KMnO_4 which should have been used to give the amts. of oxidation products found showed that the amt. of KMnO_4 actually consumed was less than the calcd., the discrepancy increasing with increase in the KOH used. This was not due to a reduction of the KMnO_4 to a lower oxide than MnO_2 , analysis of the MnO_2 sludge showing that the KMnO_4 deficit due to this cause was very small, in no way parallel with the deficit shown by the above calcn. and moreover disappeared completely when the amt. of KOH originally used and that formed from the KMnO_4 was sufficient or more than sufficient to form the neutral salts of the oxidation products. The KMnO_4 deficit increases rapidly with increasing KOH concn. up to a soln. originally 0.114 *N* with respect to KOH and about 0.05 *N* at the end of the expt.; with further increase in concn. of the KOH the deficit markedly decreases. The deficit may be explained in 3 ways: (1) A large proportion of the MnO_2 is further reduced and subsequently oxidized back by the air to MnO_3 ; (2) the alkali serves as a catalyst in facilitating the oxidation by atm. O of the glucose and the products of its reaction with alkali; the Mn^{II} compds. may play a role in this catalysis; (3) a combination of (1) and (2). "There is nothing in the literature to indicate that (1) can be a material factor in the phenomenon, but there is much evidence for the truth of (2). Up to the soln. originally 0.0280 *N* with respect to KOH, the yields of CO_2 and $(\text{CO}_2\text{H})_2$ were 100 and 0%, resp.; in 0.042 *N* KOH, 98 and 2%; in 0.056 *N* KOH, 88 and 12%; in 0.071 *N* KOH, 72 and 28%, the amt. of $(\text{CO}_2\text{H})_2$ increasing to a max. of 42% in 1.82 *N* KOH. The 28% yield is obtained when the amt. of available KOH is sufficient to form the neutral salts of the oxidation products, so that the $(\text{CO}_2\text{H})_2$ formed is protected from further oxidation, $(\text{CO}_2\text{K})_2$ being stable towards KMnO_4 . If the observations of Smolka (*Sitzb. Akad. Wiss., Wien* 95, II, 5 (1887)), viz., that with insufficient KMnO_4 in the absence of alkali 1 mol. glucose yields 1 mol. of $(\text{CO}_2\text{H})_2$ and 4 mols. CO_2 , held true in all cases, the max. yield of $(\text{CO}_2\text{H})_2$ would be only 33%, but glucose in the presence of alkalies and absence of O undergoes changes and is finally broken up into shorter chains tending to give quant. 1 mol. $(\text{CO}_2\text{H})_2$ and 1 mol. CO_2 with strongly alk. KMnO_4 ; the amt. of $(\text{CO}_2\text{H})_2$ in excess of 33% in the above expts. with excess of alkali, may, as far as is now known, be roughly taken as a measure of the amt. of such a decompn. CHAS. A. ROUILLER.

II. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

FRANK P. UNDERHILL.

Nephelometric study of the proteins of cerebrospinal fluids. I. Relation of englobulin, total globulin and total protein to the Wassermann reaction. J. A. F. PFEIFFER, P. A. KOBER AND C. W. FIELD. *Proc. Soc. Exp. Biol. Med.* 12, 153-7 (1915).—The results with total protein estns. show, assuming that figures above 0.05% indicated pathological increase, that 34 cases out of 51 agreed with positive Wasser-

mann reactions, while 48 out of 54 agreed with negative Wassermann reactions. Similarly, the figures for the *total globulin* estns. showed, assuming 0.02% or less as normal, that 24 cases out of 31 agreed with positive Wassermann reactions, while 44 out of 54 cases agreed with negative Wassermann reactions. The *euglobulin* content seemed to show remarkably close agreement with the Wassermann test; those above 0.004% agreed with a positive Wassermann test in 14 out of 16 cases, and those below 0.004% agreed with a negative Wassermann reaction in 33 out of 35 cases. Of these 4 discrepancies, the authors state that they had good reason to doubt the figures obtained in at least 2 cases.

V. C. M.

Thermodynamical objections to the mechanical theory of life. H. S. REDGROVE. *Chem. News* 112, 271-3(1915).—With the substitution of the theory of dynamic isomerism for that of tautomerism, a strong support for the mechanical theory of life is destroyed. Since any tautomeric substance is in equil., the mol. heat of combustion of the keto and enol forms should agree with neither that calcd. for the one form nor for the other. This is found to be the case with aldehydes and ketones; while other carbonyl containing compds., e. g., esters, acids, carbonyl sulfide, etc., give theoretical values in agreement with the observed. The laws of thermodynamics are not universally valid; they serve to distinguish the world of mechanism from the world of life. The theoretical possibility that intelligence may contravene the laws of entropy is destructive of its theoretical universality. Indeed the law of evolution is contrary to the law of increase of entropy.

R. L. SIBLEY.

Further studies on Pikelharing's pepsin. W. E. RINGER. Univ. Utrecht. *Z. physiol. Chem.* 95, 195-258(1915); cf. *C. A.* 6, 1445.—Pikelharing's pepsin has no iso-electric point; in acid soln. it is always negatively charged. Pepsin binds proteins and albumoses but not amino acids. It binds those substances upon which it exerts an enzymatic action. Such bound pepsin has an iso-electric point; but the enzyme is not completely united and the free part wanders towards the anode. The union of H and Cl ions with pepsin does not differ greatly from the union with albumoses. In dil. acid solns. more H is bound than Cl, but with increasing concn. of acid the 2 values are more nearly the same until, when 0.1 N HCl is used, the values are equal. The fact that the enzyme never moves towards the cathode may be explained by the relation of the amts. of protein and enzyme or by the supposition that in acid medium the compd. is completely dissociated or nearly so. That pepsin possesses a flocculation optimum is also probably due to the protein component. Either the enzyme is bound to the protein at this point or the enzyme is pptd. with the protein. The same is true of the peculiar reaction of coagulation, when the enzyme is rapidly heated in HCl soln. There is a close relation between the action of pepsin and the swelling of protein. In HCl the swelling max. is at p_H 2.5, while the optimum reactivity of pepsin is at p_H 2.1. The reaction optimum for pepsin is, in general, different in solns. of different acids. A study was made of oxalic, lactic, acetic, citric acids, HCl, H_3PO_4 , and H_2SO_4 . In concd. solns. of AcOH pepsin is inactive. Salts with strong hydrophile ions should have a greater retarding effect on peptic activity. The retardation was found to be citrate < acetate < Cl < ClO_3 < NO_3 < CNS < SO_4 .

C. J. WEST.

Compounds obtained by the decomposition of proteins by nitric acid. II. CARL TH. MÖRNER. *Z. physiol. Chem.* 95, 263-309(1915).—Earlier work (*C. A.* 9, 917) reported the isolation of methylsulfonic acid. The following compds. have been isolated from the various mother liquors: (A) oxalic acid, (B) *p*-nitrobenzoic acid, (C) benzoic acid, (D) terephthalic acid, (E) trinitrophenol. The amts. of oxalic acid isolated were (given in %): from serum protein 28.6, from egg white protein 20.9, from casein 26.5, from ovomucoid 36.8, from hemoglobin 22.5, from keratin 40.9, from glutin 28.6. The average is about 30%. Oxalic acid is destroyed by heating at 80°

with 60% HNO_3 . Results are given for various periods of heating and various concns. of acid. The amt. of oxalic acid formed by the action of varying concns. of HNO_3 upon the different amino acids was detd. Serine, cystine, tyrosine and tryptophan give from 14 to 40% acid when treated with 60% HNO_3 . When treated with HNO_3 of d. 1.50, the following %s of oxalic acid were obtained: glycocoll 11, alanine 51, valine 3, leucine 8, aspartic acid 33, glutamic acid 5, arginine 21, lysine 19, phenylalanine 3, histidine 3, proline 36, oxyproline 51, leucylglycine 15, hippuric acid 3, asparagine 28, ornithine 12. Crude *p*-nitrobenzoic acid was obtained as follows: from serum protein 1.8%, egg white protein 3.1, casein 2.1, ovomucoid 0.8, hemoglobin 2.9, keratin 1.2. The source of this acid is principally phenylalanine. It was purified as follows: 1 g. of the acid was dissolved in 6-8 cc. *N* NH_4OH , filtered, dild. to 15 cc. and 5 cc. concd. MgCl_2 soln. added, and the resulting salt recrystd. from 5 parts H_2O . Because of the ease of isolating *p*-nitrobenzoic acid it may possibly be used as a means of estg. the amt. of phenylalanine in those proteins where the amt. present is small. Ethyl acetate dissolves 2.8 g. acid per 100 cc. at 17°; H_2O , 0.013 g.; 20% HNO_3 , 0.033 g.; 30% HNO_3 , 0.039 g.; 60% HNO_3 , 0.085 g. At 100° 0.8% sublimes after 30 hrs., at 150° 16.6% after 6 hrs. The Mg salt contains 8 mols. H_2O , of which 7 are removed by drying *in vacuo* for 7 days. This salt is more insol. than the Mg salt of benzoic and the 2 isomeric mono- NO_2 acids. Only small amts. of benzoic acid are isolated from the crude *p*-nitrobenzoic acid. The amts. of terephthalic acid found were: from serum protein 0.17%, egg white protein 0.10, casein 0.07, ovomucoid 0.08, hemoglobin 0.10, keratin 0.16. The amts. of picric acid obtained were: from serum protein 0.54%, egg white protein 0.71, casein 0.81, ovomucoid 0.48, hemoglobin 0.67, keratin 0.48. The picric acid probably has its source in tyrosine, phenylalanine and, to a less extent, in tryptophan.

C. J. WEST.

Iodoprotein. ADOLF OSWALD. Zürich. *Z. physiol. Chem.* 95, 351-2(1915).—A colorless iodoprotein may be obtained by dissolving protein in alkali, cooling to 0°, adding an excess alkali and an excess of a soln. of KI-I. It is then dialyzed free of ionizable I and pptd. with dil. AcOH .

C. J. WEST.

Behavior of amino acids toward neutral salts in aqueous solution (PFEIFFER) 10.
Dental porcelains (WATTS) 19.

B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

A modification of Rose's method for the estimation of pepsin. MAURICE H. GIVENS. U. S. Pub. Health Service, Hyg. Lab., *Bull.* 101; *Am. J. Pharm.* 87, 541-9 (1915).—G. recommends the following method: Strain the gastric contents through cheesecloth. Measure 2 cc. by means of an Ostwald pipet into a 25 cc. stoppered volumetric cylinder, and dil. to the mark with distd. H_2O . Measure into each of 7 small test tubes (1 × 10 cm.) with an Ostwald pipet, 1 cc. of a 0.25% filtered pea globulin in 10% NaCl soln. Add to each tube 1 cc. of 0.6% HCl , also by means of an Ostwald pipet. Allow the tubes to stand about 5 min., until the max. turbidity develops. Add to the first 5, distd. H_2O as follows: to (1) 0.9 cc., to (2) 0.8 cc., to (3) 0.7 cc., to (4) 0.6 cc., to (5) 0.2 cc.; to (6) and (7) no H_2O . Rapidly add to each test tube the following amts. of the 1: 12.5 gastric juice, to (1) 0.1 cc., to (2) 0.2 cc., to (3) 0.3 cc., to (4) 0.5 cc., to (5) 0.8 cc., to (6) 1.0 cc., and to (7) 1.0 cc. of boiled juice. These measurements can be accurately made with a 1 cc. pipet graduated in 0.01 cc. Immerse all tubes for 15 min. in a water bath at 50 to 52°. At the end of this time, the tube is selected which is clear and contains the least amt. of dil. gastric juice. Upon this basis, the peptic activity is calcd. as the number of cc. of 0.25% globulin digested by 1 cc. of undild. gastric juice. For example, if tube (2) containing 0.3 cc.

of a 12.5 times dild. juice be clear, then the result would be expressed: Peptic activity = $12.5 (1 + 0.3) = 41.2$. W. G. GAESSLER.

An easy method of detecting *S. pallida* and other spirochetes. ALFRED C. COLES. *Brit. Med. J.* 2, 777(1915).—The method depends upon the principle that, in a medium of low refractive index, structures colored with a fluorescent dye stand in relief against a dark background. Geimsa's stain, dild. with an equal vol. of MeOH or acetone is used. A film is prepd. with the serous exudate from a primary sore. A few drops of the dild. stain are placed on the film and 10 vols. of water added at once; the film is kept in this mixt. for 10–15 min. The prepn. is observed through an 8 mm. objective and a No. 4 or 5 ocular. A dark ground is obtained by fitting an ordinary condenser with a Travis expanding stop. A paraffin lamp is used for illumination.

A. H. RAHE.

A simple method for the cultivation of anaerobic organisms. LYN DIMOND.

Brit. Med. J. 2, 778(1915).—An adaptation of Buchner's well-known method. The apparatus consists of test tubes placed as shown in the figure.

A. H. RAHE.

A practical method for estimating the protein content of cerebrospinal fluid. J. A. F. PFEIFFER. *Med. Record* 89, 66(1916).—Three cc. of a 4% soln. of sulfosalicylic acid are placed in a test tube 1 cm. in diam., and 5 cc. of spinal fluid added without mixing when, if an excess of protein is present, a white ring appears. An approx. estimate of the amt. of excess protein is obtained by comparison with a series of tubes containing a const. amt. of the reagent and varying quantities of fluid.

A. H. R.

A simple apparatus for the quantitative determination of extremely small amounts of albumin. RICHARD WEISS. *Schweiz. Apoth. Ztg.* 53, 646–7(1915); see *C. A.* 9, 3260.

S. WALDBOTT.

A new method for the production of general analgesia and anesthesia with a description of the apparatus used. D. E. JACKSON. St. Louis. *J. Lab. Clin. Med.* 1, 1–12(1915).—The method involves a continuous process of rebreathing of the gaseous or volatilized anesthetics from which the exhaled CO₂, etc., have been removed, and to which O is constantly added in suitable proportions. A description of the app. is given.

H. G. W.

Hydrogen-ion acidity. THOMAS H. KELLY. Cincinnati Gen. Hosp. *J. Lab. Clin. Med.* 1, 194–6(1915).—Discussion of the Fischer method for detg. the H-ion concn. of urine, and the method of Levy, Rowntree and Marriott for blood. Both methods were found satisfactory for clinical purposes.

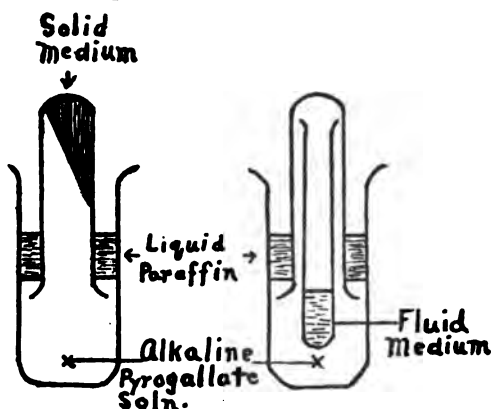
H. G. W.

Apparatus for the culture of yeast used for the determination of various sugars by fermentation (TRAMBICS) I.

C. BACTERIOLOGY.

ERNEST D. CLARK.

Studies in bacterial metabolism. XI. Observations on the proteolytic enzyme of *Bacillus proteus*. A. I. KENDALL AND A. W. WALKER. Chicago. *J. Infect. Dis.* 17,



442-53(1915).—The bacillus proteus forms a sol. proteolytic enzyme in plain broth and plain gelatin. The mature enzyme may be obtained in an active state free from bacteria by filtering the culture through sterile Berkefeld filters. The enzyme appears to be a preparatory enzyme in the sense that it prepares protein for assimilation by the bacteria; it has no role in the intracellular utilization of the protein by the bacteria. The liquefaction of the gelatin by the bacteria-free enzyme is not accomplished by the liberation of NH_3 ; deamination is an independent phenomenon associated with the intracellular utilization of the products of proteolysis by the organisms themselves. The proteolytic enzyme does not appear in an active state in media containing a utilizable carbohydrate; it appears only when protein or protein derivs. are being utilized for energy by *B. proteus*. Dextrose added to broth or gelatin cultures of *B. proteus* prevents the formation of the enzyme: under these conditions the enzyme would appear to be unnecessary for the metabolism of the bacteria, because they are acting chiefly upon the dextrose. Amts. of dextrose up to 0.3% prevent the formation of the enzyme until the sugar is exhausted; then the bacteria must utilize protein constituents of the medium for energy and consequently enzyme formation begins promptly. Larger amts. of dextrose than 0.3%, which cannot be wholly exhausted by the bacteria, permanently prevent the formation of the enzyme. It is thought that the accumulation of the products of fermentation of dextrose, principally organic acids, create environmental conditions which inhibit the metabolism of the organisms and eventually lead to their death. Dextrose in itself does not materially inhibit the activity of the mature bacteria-free enzyme; sterile dextrose gelatin is as rapidly and completely liquefied as plain gelatin. It is admitted that these observations do not preclude the possibility that conditions other than those obtaining in the expts. recorded may influence the formation of the enzyme.

JULIAN H. LEWIS.

The effects of bacterial metabolism on the antigenic properties and serologic reaction of bacteria. J. P. SIMONDS. Chicago. *J. Infect. Dis.* 17, 500-9(1915).—The immune serum produced by injecting rabbits with dead typhoid bacilli grown on dextrose media contained a higher titer of agglutinins than that produced by injecting those grown on sugar-free media. The dextrose strain is more easily agglutinated than the sugar-free strain, even with the heterologous serum. The dextrose strain was more readily engulfed by leucocytes than the sugar-free strain, even in the presence of serum immune to the sugar-free strain. But the % of leucocytes engaged in phagocytosis was greater in the presence of the homologous than of the heterologous serum. The dextrose strain is much more easily destroyed by normal serum than the sugar-free strain. The results obtained by using immune serum were very confusing and lacking in uniformity. The cause of this was found to be a variation in the amt. of lysins in different specimens of normal guinea-pig serum used as complement and in the effect of this normal lysin on the dextrose and sugar-free strains. The potency of the endotoxin of the dextrose strain was much less than that of the sugar-free strain. It is suggested that these expts. explain the favorable results reported by Coleman (*C. A.* 9, 1801) with his high calory diet in typhoid fever. The large carbohydrate component of the diet leads to a greater storage of carbohydrate in the liver and other tissues which may render the infecting strains of typhoid bacilli more susceptible to the action of the normal and immune lysins of the blood and may also reduce the potency of its endotoxin.

JULIAN H. LEWIS.

Treatment of septic wounds by continuous oxygenation or irrigation. W. A. WOOD. *Brit. Med. J.* 2, 503(1915).—A method is described for continuous oxygenation of wounds, with O under pressure of 3 or 4 lbs. The gas is enclosed in an impervious rubber bag.

A. H. RAHE.

A classification of the meningococci based on group agglutination obtained with monovalent immune rabbit sera. ARTHUR W. M. ELLIS. *Brit. Med. J.* 2, 881-4 (1915).—Agglutination tests on 46 strains of meningococci from various sources indicated that all of these belonged to one or the other of two types, according to their reaction to monovalent immune rabbit sera. A. H. RAHE.

Grouping of the strains of meningococcus. JOSEPH A. ARKWRIGHT. *Lister Inst. Brit. Med. J.* 2, 885-8 (1915).—Thirty strains of meningococci fell into 2 main groups according to results of agglutination tests. Five other strains appeared to be of intermediate type. The two main types corresponded to Dopter's classification of meningococci and parameningococci. A. H. RAHE.

Sterilization of catgut. RENÉ GUYOT. *J. pharm. chim.* 12, 152-7 (1915).—Ether is used as the antiseptic. The process is described in detail. S. WALDBOTT.

New method of detection of typhoid bacilli in stools. P. GAUTIER. *Rev. méd. de la Suisse Romande; Schweiz. Apoth. Ztg.* 53, 522-4 (1915).—The new method of Carnot and Weill-Hallé (*Presse méd.* March 25, 1915) is based on the mobility of the Eberth bacillus through a 10 cm. layer of sterilized sand contained in one arm of a U-tube. The other arm is filled with sufficient bouillon entirely to cover the sand. The bouillon is colored with neutral red, then inoculated in the part of the tube free from sand, and the app. left in the incubator at 37° for 18 hrs. The color of the liquid in the arm free from sand will then be yellow fluorescent, due chiefly to colon bacilli. The liquid above the sand is either red and slightly cloudy, indicating the presence of the mobile Eberth bacillus; or yellow, due to the likewise mobile paratyphic bacilli; or the liquid is red and clear, indicating the entire absence of the bacilli named. G. finds by 30 expts. that the method is reliable only when additional tests are made with the liquids obtained, *viz.*, agglutination of the bacilli by antityphic or antiparatyphic sera; also the prepn. of pure cultures by reinoculation. The mobility of the colon bacillus through the sand, though less than that of Eberth's, may complicate the method; also its failure, at times, to turn the color from red to yellow within 18 hrs. S. WALDBOTT.

D. BOTANY.

CARL L. ALSBERG.

Ash composition of upland rice at various stages of growth. P. L. GILE AND J. O. CARRERO. Porto Rico Agr. Exp. Sta. *J. Agr. Research* 5, 357-64 (1915).—Ash analyses of upland rice were made at intervals from early stage to complete maturity. Percentages of K_2O , P_2O_5 , and S in ash of the whole plant above ground decreased with the age of the plant, while SiO_2 increased and N in the dry matter decreased. As compared with 103 days, when the panicles were just out, the mature plant above ground at 123 days with the seeds ripe contained an equal amount of CaO , MgO , and P_2O_5 , slightly more Fe, S, Cl, N, and SiO_2 , much less Na_2O , and considerably more K_2O . Percentages of Fe in the ash of the green leaves and straw decreased regularly and markedly with the age of the plant, while the percentages of Fe in the ash of the whole plant above ground remained fairly const. after the 26-day-old sample. Previous to flowering, the percentages of dry matter in the green plant and of ash in the dry matter seemed to be influenced by the effect of the weather on the growth of the plant. W. H. FRY.

Carbohydrate transformations in sweet potatoes. HEINRICH HASSELBRING AND LON A. HAWKINS. Bureau of Plant Industry. *J. Agr. Research* 5, 543-60 (1915).—In the carbohydrate transformations in stored sweet potatoes starch is first converted to reducing sugar and cane sugar is synthesized from the reducing sugar. The rates of starch hydrolysis and of sugar synthesis in a general way conform to the van't Hoff

temp. rule for rates of chem. reactions. At high temps. the reactions are rapid at first, but soon become slower and approach an end point. At low temps. the rates are slower and the end point is so shifted as to permit a greater concn. of sugar. The reactions are continuous. In the growing sweet potato the concn. of sugar remains comparatively low. The extensive conversion of starch into sugar appears to be inhibited by the activity of the vines. When the vines are destroyed and the flow of materials to the roots is thus interrupted, the carbohydrate transformations characteristic of stored sweet potatoes are begun, even if the roots are left in the ground.

W. H. FRY.

Influence of the electric state of plants on absorption by their roots of nutritive substances from dilute solutions. D. CHOUGHAK. *Russ. J. exp. Landw.* 16, 249-69 (1915).—A very feeble elec. current was passed through wheat plants immersed in a very dil. nutrient soln. The rate of absorption of both cations and anions is thus modified. As for the cations, the rate remains const. regardless of the intensity of the current when the plants are bound to the positive pole; but when bound to the negative pole the rate increases at first very quickly, with intensity of current, up to a certain point, then increases feebly or becomes const. The inverse takes place with the anions. These variations of rate are not due to electrolysis. The increase of absorption due to increase of current intensity increases much more rapidly than the quantity of ions that increased intensity could liberate according to Faraday's law. Analogous expts. were made with dead wheat plants and similar results were obtained. This leads to the supposition that some substances of the roots, probably colloidal, become polarized, taking charges of different sign and quantity and having limiting values. These charges are directly observable when a current is not passed. If 2 Pt threads are bound to the posts of a capillary electrometer, a difference of potential is shown. This difference is modified by the addition of any salt to the liquid. This variation of potential changes the rate of absorption of cations and anions according to the same rule as the current.

W. H. FRY.

Oxidases and their inhibitors in plant tissues. IV. Flowers of iris. W. R. G. ATKINS. *Sci. Proc. Roy. Dublin Soc.* 14, 317-26(1915).—Peroxidase reactions in buds and mature flowers differ neither in distribution nor in intensity. Withered flowers gave erratic results. The stigmatic surface and central vein of the style gave well marked reactions in almost every case and in none was there a complete absence of peroxidase activity. The reactions of the enzyme in the veins and epidermis of 82 different specimens belonging to different groups towards benzidine and α -naphthol were investigated. In order to investigate the influence of light on the peroxidase activity some blossoms of iris were picked and one fall immediately examd. The flowers were then placed in total darkness with the stalks in water and after 24 hrs. a second fall was removed and the third after 66 hrs. The results showed that darkness permitted the accumulation of peroxidase in an active condition and even leads to the formation of organic peroxidases in some species. The effect increases slowly with time. Almost complete absence of peroxidase activity from flowers of a dark claret color was observed and as the pigment is produced as the result of the enzyme action, this anomaly was explained by assuming the production of an inhibitor. An attempt was made to ascertain whether yellow or blue light was the most injurious to peroxidase production but no difference was observed and the peroxidase reactions in both were more intense because of diminution of light.

R. L. SIBLEY.

The pigments of fruits in relation to some genetic experiments on *Capsicum annuum*. W. R. G. ATKINS AND G. O. SHERRARD. *Sci. Proc. Roy. Dublin Soc.* 14, 328-34(1915).—The colors of the capsicum fruits are due to pigments located in plastids

contained in the epidermis as well as in the deeper tissues. The difference in the depth of the color seemed to be due to the size or thickness of the cell wall and to the variations in packing with chromatophores. Peroxidase is most active in the unripe fruits and is probably connected with changes that take place on ripening. The action of the oxidases in the ripe fruit is largely checked by inhibitors developed in the epidermis and in all underlying cells. The age of the fruit seems to be the most important factor in deciding the degree of activity of the oxidases although the color of the fruit seemed to vary with the activity of the enzyme. No positive tests for tyrosinase were obtained. The soly. of the pigments in the different org. solvents was detd. and it was found that upon sufficient diln. the colors usually approached one another almost to the point of matching, thus proving that the pigments of an individual color were not mixts.

R. L. SIBLEY.

Osmotic pressure in plants. IV. Constituents and concentration of the sap in the conducting tracts, and in the circulation of carbohydrates in plants. H. H. DIXON AND W. R. G. ATKINS. *Sci. Proc. Roy. Dublin Soc.* 14, 374-91(1915); cf. *C. A.* 4, 2655; 8, 198.—Sap pressed from the branches and roots of various trees during different months of the year was examd. cryoscopically, electrically, and chemically. The f. p. of the nonelectrolytes, mostly carbohydrates, was found by detg. the f. p. of the original sap and the cond. of the soln., then detg. the f. p. of a soln. of KCl having the same cond., and subtracting this value from the original f. p. In this way the concn. of carbohydrates is found to be from 1.5 to 6%, depending on the sugar present. Sap so obtained is contaminated, as pressure bursts the cells in the wood, and forces out chromogen, and an oxidase. The sap is acid to litmus. The wood was therefore centrifuged, and a colorless neutral liquid obtained, which, however, depressed the f. p. as much as a 0.25% soln. of glucose. Sap centrifuged from *Acer pseudoplatanus* in August, was found to contain carbohydrates. The mol. concn. of carbohydrates in the transpiration stream of deciduous trees is greater than that of the salts. As the stream rises, the amt. of dissolved electrolytes diminishes. This diminution is probably due to the fact that they are used in the various processes of metabolism. A theory of the function of the living elements of the wood is given. V. Seasonal variations in the concentration of the cell sap of some deciduous trees. *Ibid* 445-61.—Samples of plant tissue from the roots and leaves of 3 different trees were collected throughout the year frozen in liquid air and the sap pressed from them. The f. p. and the cond. of this sap were detd. and the lowering due to carbohydrates and electrolytes was then calcd. During the period when the leaves were on the tree, the osmotic pressure rose from 13.5 to 16.5 atms., this rise being due to increased concn. of electrolytes, but at least $\frac{1}{3}$ of this pressure was due to sol. carbohydrates.

R. L. SIBLEY.

Fumigation experiments to determine the effect of highly diluted sulfur dioxide on a growing grain crop. A. E. WELLS. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 213-307(1915).—W. reports in detail with numerous illustrations, tables, and notes a series of fumigation expts. in which the number of fumigations, time, concn. of SO_2 , humidity, and temp. were varied. The S content of foliage fumigated with SO_2 was in all cases greater than that of the foliage in the corresponding check plats. In some of the expts. the S content was greater in the foliage that had received the higher concn. Considerable difference existed in the S content of the foliage of the checks: one set of checks = 0.34 to 0.52%; another set = 0.15 to 0.22%. These data confirm the opinion that the detn. of the S content of vegetation is not alone sufficient to det. the extent of the damage that the vegetation may have endured by SO_2 , for great differences are found in the S content of normal uninjured vegetation.

In reference to the claim that whenever crops of hay have been subjected to SO_2 fumigation and bleached, the S content is increased to the extent that the crops are injurious to animals feeding thereon, it is stated, that if such a condition does exist it certainly is not due to the increase of S content, for there are differences in the S content in normal unfumigated foliage as great as between bleached and normal foliage. The foliage from the plants fumigated with heavy SO_2 fumes had no greater S content than did the check, indicating that no SO_2 vapor was absorbed and that no fume was pptd. The S was present as sulfates or in other stable compds. The increase of the S content in fumigated grain (kernels) over that in check grain, although determinable, is very slight. Lab. expts. confirmed the data obtained in the field by showing that the disappearance of SO_2 from a mixt. of that gas and air held in a closed container in contact with vegetation is very rapid. Lab. expts. confirmed the field expts. in showing that the injury produced by SO_2 vapor, or dry SO_2 fume, is comparatively slight, if any takes place at all. Only when the SO_2 unites with H_2O to form acid particles does any injury result. Injury then can take place only when these acid particles are brought into contact with the leaves and are pptd. there. In this case the injury is confined solely to those spots where the acid particles are pptd., and is one of corrosion or desiccation at those spots, not of bleaching. Cf. Tatlock and Thomson, *C. A.* 8, 2559; cf. also *C. A.* 10, 446.

F. W. SMITH.

Components of the corn germ. E. WINTERSTEIN AND F. WÜNSCHE. Zurich. *Z. physiol. Chem.* 95, 310-36(1915).—16.48 kg. material gave 8 kg. Et_2O ext., 2.08 kg. alc. ext., and 6.76 kg. fat-free material. The corn germ contained 96.22% dry substance, 53.44 and 54.2% (2 samples) fats, containing 2.11% lecithin (1.14% of the original material). The alc. ext. contained 0.54% lecithin. The ether ext. contained 1.81% unsaponifiable matter. The ash content was 1.37%. The material after extrn. with Et_2O and alc., contained 4.47% total N (in terms of dry substance) and 4.26% protein N. The material after extrn. with Et_2O contained 3.93% protein N, 0.32% basic N and 0.46% other N. The germ substance contained 7.93% H_2O -sol. material, but no sol. carbohydrates. A pentose content of 0.13% was found, which was increased to 0.85% after autolysis. The unsaponifiable matter was sitosterin. The crude fat contained 79.55% higher fatty acids, and 2.90% lower acids, of which 0.08% was butyric and 0.24% acetic acids. The alc. ext. of the fat-free material contained 0.66% of lecithin, containing 2.87% P, and 3.91% N, which gave on hydrolysis both choline and colamine. The yield of inositol-phosphoric acid was 0.25%; that of H_2O -sol. proteins not coagulated by heat was 0.08%; of globulins, 0.02%; of alkali-sol. proteins, 4.8%. Upon hydrolysis the alkali-sol. protein yielded alanine, proline, leucine and phenylalanine, besides an acid, isolated as the copper salt, $\text{C}_4\text{H}_5\text{NO}_4\text{Cu} \cdot 2.7\text{H}_2\text{O}$ (dried over H_2SO_4), decomps. 230° ; in moist air the salt contains 4.5 mols. H_2O , of which 3.34 mols. are lost over H_2SO_4 *in vacuo* after 20 min., and 3.63 after 1 hr. Dried at 140° it contains 0.5 mol. H_2O , which is lost at 150° . The basic fraction contained humin N 0.59, NH_3 0.62, histidine 3.49, arginine 4.92, lysine 3.39, amino acid N 4.99%. The embryo does not contain protease. The aq. ext. of the autolysis contained 2.29% sugar (as glucose), 0.77% polysaccharides (as glucose), but no glucoside; the pentose content was 0.85%. The amt. of organic bases present is small. A base, $\text{C}_{17}\text{H}_{23}\text{N}_3\text{O}_4 \cdot 2.5\text{H}_2\text{O}$, was isolated as the sulfate, which was decompd. at 145° , and contained 33% of NH_3 -N. It may be a purine deriv. with 2 NH_2 groups.

C. J. WHEAT.

Plant life in the Selby smoke zone (BLANKINSHIP) 9. Sulfur dioxide injury to plants in the Selby smoke zone (JONES) 9. Determination of sulfur in plant foliage (BARTLELLS) 9. Disappearance of sulfur dioxide from dilute mixtures with air (BARTLELLS) 9.

E. NUTRITION.

PHILIP B. HAWK.

NORMAL.

Vitamines and accessory food material. H. BORUTTAU. *Deut. med. Wochschr.* 41, 1208-12 (1915).—A general presentation of the subject with no new contribution.

S. AMBERG.

Studies on growth. II. On the probable nature of the substance promoting growth in young animals. CASIMIR FUNK AND ARCHIBALD B. MACALLUM. *J. Biol. Chem.* 23, 413-21 (1915).—It was not found possible to maintain growth in young rats on a diet of casein, starch, sugar, agar, salts and butter. After a few weeks the rats declined and died. The addition of brewer's yeast to this mixt. made it a complete diet and growth proceeded at a normal rate in the rats to which it was fed. I. G.

The resumption of growth after long-continued failure to grow. THOMAS B. OSBORNE AND LAFAYETTE B. MENDEL. New Haven. *J. Biol. Chem.* 23, 439-54 (1915).—The growth impulse, or capacity to grow, can be retained and exercised at periods far beyond the age at which growth ordinarily ceases. In the case of albino rats in which increment of body-wt. ordinarily ceases before the age of 300 days, resumption and completion of growth were readily obtained at an age of more than 550 days. The satisfactory resumption of growth can be attained not only after stunting by underfeeding, but also after the cessation of growth which results when the diet is low in protein or contains "incomplete" proteins. The rate at which growth is resumed is normal or even greater than normal for animals of that size. The size or age at which the stunting is effected does not alter the capacity to resume growth. Such stunting does not necessarily cause the loss of the procreative functions.

I. GREENWALD.

The preparation of protein-free milk. H. H. MITCHELL AND R. A. NELSON. Univ. Illinois. *J. Biol. Chem.* 23, 459-67 (1915).—Mice could not be maintained on diets of purified foodstuffs and the salt mixt. of McCollum and Davis (C. A. 8, 3673). The difference may be due to the fact that rats of McC. and D. were allowed to eat pine shavings, whereas the mice of M. and N. were kept in paper excelsior. The difference in the species may also account for the difference in the results obtained. Expts. in which the "protein-free milk" of Osborne and Mendel was used were very successful but, as about 0.5 of the N of this material is present as protein (cf. C. A. 7, 635), other methods of preparing "protein-free milk" were sought. CCl_3COOH was useful. Two portions of 10 g. of skim-milk powder were dissolved in 150 cc. H_2O and 12 cc. 50% CCl_3COOH were added. The mixt. was filtered and the ppt. washed. The filtrates were boiled 0.5 and 1 hr., respectively, filtered again and evapd. to dryness. All the acid had then been removed and the products contained, respectively, 0.401 and 0.420% N and 7.5 and 5.0% ash. The latter product did not give the biuret, Adamkiewicz or Millon reactions, nor a ppt. with picric acid or $\text{H}_4\text{Fe}(\text{CN})_6$, and only a slight ppt. with tannic acid. Phosphotungstic acid produced a rather heavy ppt. A few expts. indicated that it was as effective in maintenance as the "protein-free milk" of O. and M.

I. GREENWALD.

Gastrointestinal studies. II. Studies on the relative digestibility and utilization by the human body of lard and hydrogenated vegetable oil. C. A. SMITH, RAYMOND J. MILLER AND PHILIP B. HAWK. Jefferson Med. Coll. *J. Biol. Chem.* 23, 505-11 (1915).—A hydrogenated cottonseed oil was as satisfactorily digested and utilized by normal men as was lard.

I. GREENWALD.

ABNORMAL.

Prolonged and accurately timed intravenous injections of sugar. Preliminary report. R. T. WOODYATT, et al. Chicago. *J. Am. Med. Assoc.* 65, 2067-70 (1915).

—The rate of utilization of glucose in the body is detd. by finding the greatest rate at which glucose can be steadily injected into a vein without causing glucosuria. Tolerance is measured in g. of glucose per kg. of body wt. per unit of time, a result impossible to attain when administered by mouth or by a single intravenous injection, the latter representing a very high rate of injection for a very short time. The app. used is described. By its use one can pump any liquid from water to 80% glucose sirup at a rate of from 10 cc. to 5 l. per hr. It was found that a normal rabbit, dog, or man could utilize between 0.8 and 0.9 g. of *d*-glucose per kg. of body wt. per hr. without glucosuria or diuresis for an indefinite time. The authors state as "an accomplished fact" that a man weighing 70 kg., when resting quietly in bed, may receive and utilize 63 g. of glucose by vein per hr. without glucosuria, thus showing the feasibility of intravenous nutrition by glucose, and suggesting expts. with amino acids and polypeptides. It is shown that the liver is not a barrier through its "glycogenic function" to prevent sugar which is absorbed from the bowel from being lost in the urine. The belief that any large amt. of glucose, given by vein, always causes glucosuria and diuresis is an error based on clumsy methods of study. Tolerance figures are given for certain diseases. The tolerance limit for levulose was found to be 0.15 g. per kg. and hr., or one-sixth that of glucose; for galactose 0.1 g., and for lactose it approaches 0. If glucose is given by vein faster than 0.9 g. per kg. and hr., glucosuria results, then usually a little later diuresis. If the given rate of injection causes glucosuria at all, it begins to do so within 30 min. As the rates of glucose injection are increased above tolerance, the rates of overflow in the urine also increase according to mathematical laws, the glucosuria becoming constant at some level characteristic for the rate of injection. It may require several hrs. for this level to be established. If 1.7 g., or double the tolerant figure is given, the glucosuria, when constancy is attained, is about 0.17 g. per kg. and hr., which confirms the older view that increasing the concn. of food in the tissues increases the rate of utilization of glucose. An injection of 5.4 g. per kg. and hr. causes a tremendous diuresis; a 10 kg. dog passed 2800 cc. urine in 8 hrs. In giving intravenous injections of glucose too great dehydration (thirst), also too great mechanical work for the heart by too much water must be avoided. These results can both be obtained by knowing the wt. of glucose which enters the body per hr. and what vol. of water is moved by such a rate of sugar injection. Extensive clinical applications are suggested.

L. W. RIGGS.

Carbohydrate utilization in diabetes. Based on studies of the respiration, urine and blood. ELLIOTT P. JOSLIN. Nutrition Lab., Carnegie Inst. *Arch. Intern. Med.* 16, 693-732(1915).—The errors due to inaccurate methods of calcg. the carbohydrate in the diet, collection of the urine, etc., are pointed out. Attention is also called to the errors that may be due to retention of H_2O (and of glucose), retention of the N of protein after the glucose derived therefrom has been excreted, etc. From a study of the respiratory exchange and of the urinary excretion of a number of patients in which these sources of error were guarded against, J. concludes that even the severest diabetic retains some power of oxidizing glucose and that this power can be increased by suitable measures, particularly by the Allen treatment (*J. Am. Med. Assoc.*, 63, 939(1914); *Boston Med. Surg. J.* 175, 241(1915)). The diminution in the excretion of acetone and β -hydroxybutyric acid and the increase in respiratory quotient of the fasting diabetic may be due to the ability of the pateint to burn stored carbohydrate, to the oxidation of retained β -hydroxybutyric and acetoacetic acids or simply to the diminution in metabolism, which lessens the amt. of material from which these acids can be formed.

I. GREENWALD.

The carbohydrate metabolism in hyperthyroidism as determined by examination of blood and urine. H. R. GREYELIN. Presbyterian Hosp., New York. *Arch. Intern.*

Med. 16, 975-88(1915).—In moderately severe types of hyperthyroidism, hyperglucemia occurred in about 90% of the cases examd. In milder cases, normal values for blood sugar were usually found. Glucosuria, particularly after the administration of 100 g. glucose, was frequent. After administration of glucose, mild cases showed hyperglucemia, but not glucosuria. The return to normal blood-sugar values is the more delayed the greater the severity of the disease. Administration of thyroid to patients with myxedema (normal blood sugar) induced hyperglucemia. The findings are considered to be of considerable diagnostic significance. I. GREENWALD.

The chlorides in diabetes after pancreatectomy. JAMES ELAZER LEBENSOHN. Univ. Chicago. *J. Biol. Chem.* 23, 513-20(1915).—After pancreatectomy in dogs there was no change in either the absorption or excretion of NaCl. I. GREENWALD.

Metabolism in pellagra. V. C. MYERS AND M. S. FINE. New York. *Am. J. Med. Sci.* 114, 705(1913).—The general procedure in the 14 cases studied was to exam. the gastric contents for acidity and peptic activity before and after the 7-10 day metabolism period. A lacto-vegetation diet that was practically purine-free was employed; it consisted of 91 g. protein, 71 g. fat, and 460 g. carbohydrate, yielding approx. 2800 cal. Tables are given showing: (1) The comparison of the figures from gastric analysis with those of the detns. of indican and alkyl sulfates in the urine, and with those of the detns. of indole and skatole in the feces. (2) Av. daily compn. of the urine including N and S partitions and inorg. constituents. (3) Av. daily intake of food with N balance. (4) Av. daily compn. of feces. (5) Analyses of daily urines and daily N balances. The ability of these patients to utilize various foodstuffs appears to be about normal. Low creatinine and small creatine excretions were observed. An acidity was present in 8 of the 14 cases, a condition generally associated with entire absence of pepsin, or pepsin present in minute amts. Indicanuria was marked and was excessive in cases with gastric inefficiency. Though the alkyl sulfate hardly parallels the indoxyl potassium sulfate, the amts. eliminated are much higher where an acidity exists, and they hold a higher ratio to the inorg. sulfates. The feces contained abnormal amts. of indole and skatole, especially the latter. These findings point to some unusual bacterial conditions in the intestine. About 25 references to literature are given. L. W. RIGGS.

Intestinal digestion in man after excision of a large part of the lower intestine. N. A. GUREVICH. *Russ. Vrach* 14, No. 38(1915); *J. Am. Med. Assoc.* 65, 2128.—This study was made 7 months after the removal of 159 cm. of the ileum. Carbohydrates were normally assimilated; only 52% of the N was assimilated and fats were but partially digested. The patient was gaining in wt. in spite of a persistent diarrhea. L. W. RIGGS.

F. PHYSIOLOGY.

ANDREW HUNTER.

Diuresis and milk flow. H. STERNBOCK. Agr. Exp. Sta., Univ. Wisconsin. *J. Agr. Research* 5, 561-8(1915).—Expts. on goats lead to the following conclusions: Urea administered in a diuretic dose is able to decrease temporarily the flow of milk. Upon repeated administration the increased intake of H₂O which follows the impoverishment of the tissues with respect to H₂O balances the draft imposed by the diuretic, and the milk secretion comes back to normal. NaCl with its diuretic as well as laxative effect is unable to depress milk secretion under normal conditions, as it simultaneously calls forth an excessive thirst, which increases the H₂O intake. With the decreased flow of milk caused by a diuretic the % of solids is increased. Fat here is the principal variable. The mammary gland shows no tendency to absorb and subsequently to excrete additional urea absorbed by the circulation. It is difficult to interpret the results

sometimes obtained with alfalfa hay as due to diuresis alone if urea diuresis can be taken as a type.

W. H. FRY.

Composition of human milk in Australia. I. H. S. H. WARDLAW. *J. Proc. Roy. Soc. N. S. Wales* 49, 169-98(1915).—Analyses of human milk drawn from 103 women 2 to 11 days after delivery are tabulated. By an examn. of the relative frequencies of occurrence of the various percentages of the constituents found in the samples analyzed, W. has deduced the "most probable value" for each constituent. The percentage of fat varies quite evenly from 1.2 to 4.5; that is, no large number of women produced milk in which the fat percentages showed a tendency to group themselves about any particular value. The av. percentage of fat for the entire series was 3.14. Over 50% of the results for protein were between 1.6 and 2.2, the most probable value being 1.9%. For solids not fat and not protein, 60% of the results were between 6.7 and 8.7, giving a most probable value of 7.6%. The grouping of the percentages was still more pronounced with the total solids and solids not fat, the most probable values being 12.8 and 9.8%, resp. The av. percentage of fat increased from 2.84 to 4.13 during the first 11 days of nursing, while the av. percentage of protein decreased from 3.30 to 1.69 during the same period. The age of the woman, number of pregnancies, vol. of sample (the breast being completely emptied), the time since the last withdrawal of milk, and the breast from which the sample was taken appeared to have no distinct effect on the compn. of the milk examd. The total protein in the first 53 samples was detd. by the method of Sikes (1906). In the remaining samples this method was modified by using an aliquot part of the aq. layer of the liquids obtained in the estn. of fat by the Röse-Gottlieb method. This procedure has the advantage of estg. both fat and protein in the same sample, also the protein estn. is made in a liquid from which the fat is completely removed.

L. W. RIGGS.

Colloidal sodium urate in urine. BECHHOLD. *Pharmazentisches J.* 54, 264(1915); *J. pharm. chim.* 12, 230(1915).—B. proves the presence of colloidal Na urate in urine, and det. its amt. by means of the ultrafilter to be 25% of colloidal salt referred to total urates. Uric acid, if in normal amt., is partly decompd. by uric acid ferments, and partly eliminated through the kidneys. If it is in excess, calculi are formed. As long as they are in cryst. state, they may dissolve and pass the membrane of the malpighian bodies, but will not do so when they are in the colloidal state.

S. WALDBOTT.

Acetone content of milk. N. O. ENOFLDT. Stockholm. *Z. physiol. Chem.* 95, 337-50(1915); cf. *C. A.* 9, 2100, 2548.—The proteins of the milk were pptd. by tannic acid (100 cc. milk, 240 cc. distd. H₂O and 40 cc. 10% tannic acid) and the filtered soln. distd. 15 min. to remove the acetone. This was detd. by the usual method of analysis. The acetone content of cow milk varies from 1.45 to 2.42 mg. per l. The total daily amt. varies from 6.81 to 23.11 mg. Colostral milk does not differ from normal milk in its acetone content. Mare's milk contains 0.48-0.97 mg. acetone per l., sheep 0.48-0.68 mg., goat 0.97-1.45 mg., human milk 0.48-1.16 mg.

C. J. W.

Adrenaline concentration in the blood of mammals. PAUL TRENDLENBURG. Univ. Freiburg. *Arch. exp. Path. Pharm.* 79, 154-89(1915).—The concn. of adrenaline in normal carotid blood of rabbits is not higher than 1:1 to 1:2 "milliards."

C. J. WEST.

The relation of salivary to gastric digestion. LESLIE A. I. MAXWELL. Univ. Melbourne. *Biochem. J.* 9, 323-9(1915).—Colloidal starch adsorbs pepsin, thereby hindering its activity. One of the important functions of the ptyalin of the saliva is to hydrolyze the starch to non-colloidal forms.

B. HOROWITZ.

G. PATHOLOGY.

H. GIDEON WELLS.

Natural hemolysins in normal horse serum. FRED BOERNER. Philadelphia. *J. Infect. Diseases* 17, 497-9 (1915).—Because of its relation to the complement fixation test for glanders in horses, B. detd. the natural hemolysins in normal horse serum. Of 200 sera examd. for antishoop hemolysins, 1.5% were found capable of producing complete destruction of 1 cc. of a 25% suspension of these cells in the amt. of 0.4 cc. Natural hemolysins for the cells of the guinea pig, hog, goat, cat, white mouse, rabbit, chicken and man were not found. Horse serum possesses the property of dissolving the red cells of the dog without the aid of complement. J. H. L.

The effect of anaphylactic shock on the cellular reaction of the peritoneum of the guinea pig. FRANCES M. RACKEMANN. New York. *J. Infect. Diseases* 17, 542-53 (1915).—Different counts were first made of the cells in the peritoneal cavity of 22 normal guinea pigs of various weights. The cells found were large and small mononuclears, polymorphonuclears, and eosinophiles. The proportion of the different cells varied considerably in different guinea pigs and no normal could be established. Old guinea pigs tend to show a smaller proportion of small mononuclear cells than do young animals. The peritoneal fluid of guinea pigs sensitized to horse serum contained a higher % of eosinophiles than is found in the normal animal. The reaction of the peritoneum in normal guinea pigs to normal NaCl soln., H₂O, histamine, turpentine, and horse serum is qualitatively the same in each case, and consists in the rapid disappearance of the mononuclear cells and the accumulation within 3 hrs. of polymorphonuclear leucocytes in overwhelming proportions. The peritoneum of the guinea pig sensitized to horse serum reacts to an injection of horse serum differently from the normal inasmuch as the appearance of the polymorphonuclear leucocytes is much delayed. JULIAN H. LEWIS.

The part played by the acid of the gastric juice in the pathological processes of gastric ulcer. CHAS. BOLTON. Univ. Lond. *J. Path. Bact.* 20, 133-58 (1915).—The gastric juice is concerned not only in the initiation of a gastric ulcer, but also in its tendency to spread and to become chronic. It is thus responsible for the anatomical peculiarities which distinguish this ulcer from ulcers in other parts of the body. The gastric juice owes its destructive power primarily to the HCl contained in it, and the damage done to the wall of the stomach varies in proportion to the strength of the acid present. Although the HCl is usually only a factor in the initiation of an ulcer, some damage being inflicted on the gastric cells by other means, it is occasionally, when above 0.39% and combined with motor insufficiency, the actual cause of the ulcer. A gastric ulcer is more likely to spread when the gastric juice is hyperacid than when of normal acidity. The gastric juice is able to attack the connective tissue base of an ulcer by virtue of the HCl contained in it and when hyperacid to produce varying degrees of delay in the healing of the ulcer. This effect is added to when there is retention of the food in the stomach or hypersecretion of the gastric juice. This may explain the condition of delayed healing of acute gastric ulcer in man. It is probable that in human pathology a complete arrest in healing and a resulting chronic ulcer may be brought about, since the exptl. methods available for producing hyperacidity are not so effective as the conditions present in man. Since a gastric ulcer heals with difficulty in proportion to its chronicity the more chronic ulcers may be kept open by normal gastric juice. The exptl. gastric ulcer is delayed in healing by the necrotic condition of its base caused by the HCl, and it is the fibrotic base covered with necrotic tissue which prevents the healing of a human ulcer. Reducing the acidity of the gastric contents will heal a human ulcer. Hyperacidity is concerned with each of the pathological processes of a gastric ulcer. The importance of the part which the acid

plays is not always the same, since there are many different types of ulcer of the stomach brought about by an equal number of different causes. B. bases his conclusions on a considerable amt. of exptl. work with monkeys. A bibliography and a number of plates are appended.

JOHN T. MYERS.

The biochemistry of immunity reactions. CARL H. BROWNING. *Blan-Sutton Institute of Pathol., Middlesex Hosp. Brit. Med. J.* 1, 239-43(1915).—A discussion of the biochemistry of antigens, complement fixation, cytolysis, and the Abderhalden reaction.

M. RINGER.

Immunological studies in pneumonia. RICHARD WEIL AND JOHN C. TORREY. New York. *J. Exp. Med.* 23, 1-10(1916).—The serum derived from human cases of pneumonia was used to sensitize guinea pigs passively. An autolysate of a pneumococcus culture was employed as antigen. By means of Dale's method it was shown with considerable regularity that the blood contains sensitizing antibodies during the course of pneumonia, but none after the crisis.

C. J. WEST.

An experimental study of the effect of cholecystogastrostomy on gastric acidity. ERNEST G. GREY. Boston. *J. Exp. Med.* 23, 15-24(1916).—By means of a cholecystogastrostomy with ligation and division of the common bile duct, the bile was diverted from the duodenum into the stomach. With a diet of meat and water, bile, when present in the stomach throughout the course of digestion, had no appreciable effect on the acidity of the gastric contents.

C. J. WEST.

Atheroma and other lesions produced in rabbits by cholesterol feeding. C. H. BAILEY. Leland Stanford Jr. Univ. *J. Exp. Med.* 23, 69-85(1916).—The feeding of egg yolk or pure cholesterol produces an abundant deposit of anisotropic fat in various organs. From this deposit, in certain organs, characteristic lesions secondarily result.

C. J. WEST.

Intestinal obstruction. V. Proteose intoxication. G. H. WHIPPLE, F. H. RODENBAUGH AND A. R. KILGORE. Univ. of Cal. Med. School. *J. Exp. Med.* 23, 123-35(1916).—Exptl. evidence points to a primary proteose as the essential poison concerned in the intoxication from closed intestinal loops and intestinal obstruction (cf. *C. A.* 9, 2669). Proteose intoxication in dogs gives a picture identical with that described after poisoning with intestinal loop fluid. Proteoses escaping from the blood are excreted in the urine. The toxic proteose concerned in intestinal obstruction has not yet been isolated in the urine but may be excreted by the kidneys.

C. J. W.

Icterus. A rapid change of hemoglobin to bile pigment in the pleural and peritoneal cavities. C. W. HOOPER AND G. H. WHIPPLE. Univ. of Cal. Med. School. *J. Exp. Med.* 23, 137-47(1916).—Hemoglobin can be changed to bile pigment within the pleural and peritoneal cavities. This transformation can usually be demonstrated after 8 hrs. The amt. of pigment formed can in many cases be estimated quant. after 24 hrs. It is probable that endothelium as well as mesothelium can transform hemoglobin into bile pigment.

C. J. WEST.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Reciprocal action of sodium, potassium and calcium ions on frog heart. TAKUZO SAKAI. *Z. Biol.* 64, 505-48(1914); *J. Chem. Soc.* 108, I, 477; cf. *C. A.* 9, 752, 3594. —Increasing the K content of an isotonic soln. perfusing the isolated ventricle of a frog heart results in a decreased rate of beating, lowering of the height of contraction, and inhibition of the "extra systoles." Increasing the proportion of Ca in the perfusion fluid produces exactly the reverse effects. NaCl exerts a similar action to that of KCl, except for lower concns. Reducing the concn. of Na salt below the normal also reduces the height of contraction and the frequency of ventricular beat, and

eventually brings the ventricle to rest. The reciprocal action of Ca and of Na and K salts does not depend wholly on the ratio of their concns., but also on the abs. quantities of the substances present in the perfusion fluid. The sinus differs markedly from the ventricle in its response to changes in the compn. of the perfusion fluid. Increasing the Ca content usually slightly lowers the rate of beat, while other similar variations in the Na and K content of the perfusion fluid do not appear to have any distinct effect.

E. J. C.

A theory of internal disinfection with nascent formaldehyde. WILLIAM N. BERG. *Proc. Soc. Exp. Biol. and Med.* 12, 145-7(1915).—After administration of large doses of hexamethylenetetramine (urotropine) to cows by mouth, this substance appeared in the milk unchanged, *i. e.*, none was decomposed into CH_2O and NH_3 as stated by Klein. When, in addition to the administration of the hexamethylene-tetramine by mouth, the cows received $N/6$ HCl intravenously, small amts. of CH_2O were found in the milk, but these quantities were too small to be effective in disinfection.

WILLIAM N. BERG.

Collected abstracts from the field of pharmacology, July to Sept., 1915. CARL BACHEM. *Bonn. Zentr. inn. Med.* 36, 789-99(1915).—A good bibliography is given.

JOHN T. MYERS.

Terpacid. R. TOPP. *Zentr. inn. Med.* 36, 357-60(1915).—An isomer of camphor, $\text{C}_{15}\text{H}_{26}\text{O}$, is described and several cases in which it was successfully used as a skin disinfectant are given. It does not produce the objectionable effects that camphor does. It tends to reduce blood pressure and heart action.

JOHN T. MYERS.

A preliminary note on chronic poisoning by emetine. H. H. DALE. *Läster Inst. Brit. Med. J.* 2, 895(1915).—Emetine in daily doses of 5 or 10 mg. may be given hypodermically during a limited period to rabbits and cats weighing from 2.5 to 3.5 kg. without apparent harm. When the period is extended, symptoms of intoxication always appear. In rabbits diarrhea and emaciation are the usual effects, while cats develop lethargy and somnolence terminating in coma. The dose employed in D.'s expts. corresponded to one slightly greater than that usually used in human treatment.

A. H. RAHE.

Mercury elimination in bichloride poisoning. KARL M. VOGEL AND O. IVAN LEE. *Med. Record* 89, 58-60(1916); cf. *C. A.* 8, 1596.—A study of Hg elimination based on the work of Lambert and Patterson (*Arch. Intern. Med.* 16, 865(1915)) and on that of Lieb and Goodwin (*C. A.* 9, 2673).

A. H. RAHE.

Soluble radium salts in organic nervous diseases. ALFRED GORDON. Philadelphia. *N. Y. Med. J.* 102, 1225-7(1915).—When sol. Ra salts are injected into the spinal canal of dogs showing flaccid paralysis of the hind quarters, owing to compression of the cord, if the injection is made above the compressed area, muscle spasticity in the forelegs, and respiratory embarrassment, are induced. If the injection is made below the compressed area spasticity occurs in the paralyzed hind legs. Injection into the uncompressed cord induces rigidity in the hind legs. The dose used was 25 micrograms in 2 cc. The compn. of the Ra compd. used is not stated.

A. H. RAHE.

The metabolic influence of the chlorides on certain dermatoses. M. I. D. AND S. A. STEINBERG. Louisville. *J. Cutan. Dis.* 33, 367-72, 467. Discussion of the theories advanced to explain the retention of chloride in nephritis, and of the value of chlorides in treatment of skin eczemas.

Trichloroacetic acid and its uses in dermatology. Philadelphia. *J. Cutan. Dis.* 33, 691-5.—When applied acid forms a dry eschar and thus prevents inva-

agents and ulceration. It is employed successfully in degenerative seborrhoea, pigmentations papillomata and naevi, xanthoma palpebrarum, etc. The method of application in some of these is described. M. RINGER.

Pharmacological investigation of the respiratory center. HERMANN WIELAND. Strassburg. *Arch. exp. Path. Pharm.* 79, 95-117(1915).—A method is given (see original for details) for the accurate detn. of the CO_2 of the alveolar air and the corresponding CO_2 tension of the blood in birds. The threshold value for CO_2 in normal pigeons is under 2%. The sensitiveness of the respiratory center is diminished by urethan and chloral. It is apparently directly stimulated by camphor, coriamyrtin and lobeline, and by CO_2 . C. J. WEST.

Croton resin. R. BOEHM. Univ. Leipzig. *Arch. exp. Path. Pharm.* 79, 138-53 (1915).—Croton oil is light yellow to brownish red in color and has $[\alpha]_D$ from $5^\circ 36'$ to $8^\circ 12'$. Solvents have no influence upon the rotation, which is due to the resin. The oil may be freed of resin by extn. with MeOH in the cold, and is then nearly neutral and optically inactive. The resin is freed from fatty acids by extn. of the petroleum ether-alc. soln. with 10% K_2CO_3 soln., and then adding finely pulverized $\text{Ba}(\text{OH})_2$ to an alc. soln. of the residue. The residue from this extn., completely freed of alc., is then extd. with petroleum ether, which exts. the neutral fat. The resin is a nearly colorless or light yellow powder, m. $80-90^\circ$, and behaves as a colloid. It is sol. in all organic solvents except petroleum ether. The I no. is 76.98; $[\alpha]_D$ varies from 49.96° to 63.23° ; it analyzes for $\text{C}_{26}\text{H}_{44}\text{O}_8$. Completely hydrolyzed by 30% aq. KOH for 12 hrs., it yields fatty acids and amorphous resinous substances. C. J. WEST.

The cause of the increased action of adrenaline upon the blood pressure of rabbits produced by pituitary extracts. HELENE BÖRNER. Univ. Freiburg. *Arch. exp. Path. Pharm.* 79, 218-49(1915).—The pituitary exts. act as a heart poison in rabbits. This causes a greater concn. of adrenaline in the blood and thus produces an increased action upon the blood pressure. C. J. WEST.

The change of the pulse produced by vasoconstrictor agents. K. HÜTHLE. Univ. Breslau. *Arch. ges. Physiol.* 162, 338-58(1915).—A study of the effect of adrenaline, pituitrin, digitalis, and KCl upon the pulse. C. J. WEST.

I. ZOÖLOGY.

R. A. GORTNER.

Action of santonin and its derivatives upon the musculature of worms, and remarks on the action of Oleum chenopodii. PAUL TRENDLENBURG. Univ. Freiburg. *Arch. exp. Path. Pharm.* 79, 190-217(1915). C. J. WEST.

Aplysia poison. FERDINAND FLURY. Univ. Würzburg. *Arch. exp. Path. Pharm.* 79, 250-63(1915).—The milk-white secretion of *Aplysia delipans* has the compn.: H_2O and volatile matter, 94.9%; dry substance, 5.1%; Et_2O -sol., 0.29%; org. substance, 1.4%; mineral matter, 3.7%; NaCl, 2.47%. The violet secretion has the compn.: H_2O and volatile matter, 94.8; dry matter, 5.2; org. substance, 1.6; mineral matter, 3.60; NaCl, 2.92%. The milk-white secretion contains a small amt. of a base. The principal component is a N-free oil, volatile with steam, which seems to be a terpene. The poisonous substance belongs to the nerve and muscle poisons and paralyzes the heart muscle of frogs. The violet secretion is not poisonous. C. J. WEST.

12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

Report on preservatives. A. F. SEEKER. *J. Assoc. Official Agr. Chem.* 1, 210-8 (1913).—A brief review of the literature relating to the detn. of HCO_2H is given and as

a result of a consideration of the proposed methods the Fincke procedure (C. A. 7, 2258) was selected for trial. The accuracy of the method as applied to fruit juices and sirups was confirmed by S. and by 7 other analysts working upon samples of known HCO_2H content. By substituting a suspension of BaCO_3 for the CaCO_3 ordinarily used by Fincke in the absorption of HCO_2H in the distillates, it was found that interference of SO_2 in the material under examn. is eliminated. A. F. SEEKER.

The determination of lead in phosphate and alum baking powders. A. F. SEEKER AND H. D. CLAYTON. *J. Assoc. Official Agr. Chem.* 1, 264-6(1915).—The method depends upon the pptn. of PbS from a soln. of the baking powder containing a large excess of ammonium citrate which prevents the pptn. of phosphates and at the same time allows a quant. sepn. of the PbS ; the latter is converted into PbSO_4 and then into PbCrO_4 , which is weighed. Heat a mixt. of 25 g. baking powder, 25 cc. water and 25 cc. of concd. HCl on a steam bath till the starch is hydrolyzed and practically all the solid material has gone into soln. Add 25 g. of Pb -free citric acid or its equiv. of ammonium citrate, dil. to 500 cc., cool, and render slightly alk. to litmus with NH_4OH , keeping the mixt. cool during this operation. Acidify with a little dil. HCl , sat. with H_2S , allow the sulfides to sep., filter, wash with H_2S water, dissolve the sulfides by the successive addition through the filter of small amts. of hot dil. HCl and dil. HNO_3 , wash with hot water, add 2 cc. of concd. H_2SO_4 to the filtrate and washings, and evap. to white fumes on a hot plate. Cool, add 10 cc. of water, warm to dissolve $\text{Fe}_2(\text{SO}_4)_3$, cool, add 20 cc. of EtOH , allow the mixt. to stand overnight, sep. the PbSO_4 on a filter, wash with EtOH , dissolve in 50% $\text{NH}_4\text{C}_2\text{H}_3\text{O}_2$ made slightly alk. with NH_4OH , wash the filter with a little water, acidify the filtrate and washings with AcOH , and ppt. the Pb as PbCrO_4 . Filter upon a small tared Gooch, wash, dry and weigh as PbCrO_4 . A. F. SEEKER.

Aluminium alloys and their use for canteens and cooking utensils. J. BOGS AND H. WEYLAND. *Z. Nahr.-Genussm.* 30, 300-5(1915).—Al alloys containing 95.81 to 97.49% of Al and 3 or more of the following elements: Cu, Fe, Ni, Mg, Ca and Si, in various proportions, were moistened with distd. water and ordinary tap water and placed in a moist chamber. After 2 days the alloys, especially in cases where tap water was used, were coated with a 0.5 cm. layer of hydrated oxides. In alloys containing Mg this element was found in relatively large amts. in the oxide coating whereas Cu, Ni and Fe when present in the alloys were never found in the coating which in these cases consisted of hydrated Al oxide. The corrosion of the alloys is due to electrolytic action and varies with the relative difference of potential between the various metals constituting the alloy. Thus Mg, Al, Fe, Ni and Cu are attacked in the order named. To confirm these observations a number of small vessels were constructed of pure Al foil. Half of these were filled with pure water and half with 0.6% NaCl soln. Into 2 of the vessels containing water and NaCl soln., resp., Mg turnings were placed, into 2 others short pieces of bright Fe wire, into a third set Cu strips, and a fourth set was used as a blank. The vessels were allowed to remain in a moist chamber for 24 hrs. The Al in the blank tests was not perceptibly attacked. In all the other cases vigorous action had taken place to a greater extent with the NaCl soln. than with the water. Mg had been attacked where it was used, but in the other cases only Al had been corroded. B. and W. conclude that Al alloys containing less than 98% Al are of no value for canteens or cooking utensils. Al of greater purity can easily be prepd. upon a technical scale and should be preferred. H. L. LOURIE.

Report on colors. W. E. MATHEWSON. New York. *J. Assoc. Official Agr. Chem.* 1, 470-2(1915); cf. C. A. 9, 3105.—The work in 1914 was largely an attempt to extend the methods of coal-tar color analysis to the commonly occurring natural coloring matters such as those in the juices of cherries, blackberries, raspberries, cur-

raints, grapes and huckleberries. These coloring matters, though extd. in relatively small amt. by amyl alc. from acid solns., were found to be quite readily changed by heating with dil. HCl, substances similar in color reactions but much more sol. in amyl alc. being formed. These derived colors were obtained fairly free from other substances by the following method: Treat the fruit juice with excess of neutral $\text{Pb}(\text{AcO})_2$ soln., which will throw down practically all coloring matter, wash the ppt. with water several times by centrifuging, dissolve the coloring matter by treatment with 10% HCl, and ext. the HCl soln. with amyl alc. to remove the coloring matter taken up by this solvent. Then boil the HCl soln. a few min. and again shake out with amyl alc. The new coloring matter formed by hydrolysis of the glucoside is then extd. in large proportion, and the amyl alc. soln. freed from HCl, PbCl_2 , etc., by washing with water.

L. W. RIGGS.

Permeability of Pukall filters for milk albumins. G. DIERSSELHORST AND F. REISZ. Charlottenburg. *Chem. Ztg.* 39, 901-2(1915).—Expts. using several filters with H_2O and with fresh and boiled milk showed that the modern filters are much less porous than those first manufd., and that the albumins were completely removed from milk, while the mineral salts passed through. From aq. solns. of egg albumen the removal was almost complete.

J. H. MOORE.

Hygienic milk. J. PRITZKER. Frauenfeld, Switzerland. *Schweis. Apoth. Ztg.* 53, 583-6, 593-7, 609-12, 624-8(1915).—Milk is an especially important food in Switzerland. The amt. used is highest in Lucerne, 0.92 l. per person per day. The chem. characteristics of milk are given. Thöni (*Centralbl. f. Bakt. Parasitenk. Infect.* 74, Heft 1-2(1914)) proved the presence of tubercle bacilli in 8% of Bern market milk. P. makes a strong plea, quoting Lührig (cf. *C. A.* 6, 1321) and Burri (*C. A.* 6, 260), for the keeping of filth out of milk. Its amt. has been 10 mg. per l. From unclean milkers' hands, 7000 to 25,000 germs per cc. were added to milk; when the hands were rubbed with fat, the number decreased to 200 per cc. (E. v. Freudenreich). P. shows that air of the stable contained from 338,000 to 512,000 germs per m^3 , compared with only 200 to 6500 for the air of the town of F. Pasteurization and sterilization reduce the number of bacteria, but boiling alters the chem. compn. of milk (cf. P. Rupp, *C. A.* 7, 2443). Sterilized milk is held responsible for rhachitis and scurvy in infants. Raw milk obtained and handled with due precautions, is the only proper substitute for mother's milk. S. WALDBOTT.

Digestibility of cell-walls of wood. G. HABERLANDT AND N. ZUNTZ. *Sitz. berl. preuss. Akad.* 1915, 686-708.—The analytical and microscopical results of the expts. show that the cell-walls which have only partially changed into wood, such as is the case in birch wood, are readily digestible by ruminants. A very fine grinding of the wood, originally considered necessary in order to render the contents of the cells accessible, has also been found a useful means for unlocking the cell-walls themselves.

C. A. NOWAK.

The significance of hay meal for the nourishment of animals and man. F. OETKEN. *Wiener Landw. Ztg.* 65, 338(1915).—Analyses of alfalfa and red clover are compared with those of barley, wheat, rye, rye straw and oat straw to show the relative food value of the different products. The legume hay occupies an intermediate position between the grains and straws.

C. F. MILLER.

Treating milk. BERNA MILK CO. Brit., 18,795, Aug. 18, 1914. In order to remove acidity, milk is subjected to the action of an elec. current. Al electrodes are employed and may be kept in motion during the treatment.

Coagulant for milk. M. PIORKOWSKI. Ger., 285,226, Jan. 12, 1913. The coagulant consists of the metabolic products of the yoghurt bacteria, sepd. from the

bacterial bodies. The bacteria are grown, separately, on suitable media, for several weeks, in order to obtain a large yield of the products of metabolism, and these products are sepd. from the bacterial bodies. Preferably the cultures, together or sepd. according to the respective strains, are shaken up with a small amt. of H_2O_2 , with warming; this is repeated, as often as necessary, after repeated heating, and the products are sepd. from the bacteria by centrifugalization. Also, from the cultures, obtained by continued cultivation, suspended in physiological salt soln., the products may be pptd. by means of Fe_2Cl_3 , the ppt. being warmed, shaken with physiological salt soln., filtered through a bacterial filter, and the filtrate, containing the desired products, being purified by centrifugalization. After each treatment with H_2O_2 the sediment of bacteria remaining in the centrifuge contains still sufficient antigens (*i. e.*, substances which can produce lactic acid) to justify its further use. On the contrary, the residual bacteria after the treatment with Fe_2Cl_3 are exhausted and no longer useful. The cultures may be filtered directly through bacteria filters. The clear filtrate contains, then, likewise, the products of metabolism of the bacteria; nevertheless the prepn. is less active.

Permanent fruit extracts. H. THOMS. Ger., 285,304, June 20, 1914. The exts. contain the aromatic substances and the ferments of the fruit juices unaltered. The juices, obtained in the usual manner by compression of the comminuted fruit, are dialyzed in cooled chambers to reduce the acid content, then evapd. to the desired density in vacuum app. free from metal, at a low temp. not destructive to the ferments. Upon dialysis the aromatic substances and the ferments do not pass through the membrane, but the acids do pass through in part. *E. g.*, a fruit juice obtained by the cold extn. of pineapple, and containing about 0.9% free citric acid, is allowed to flow through a system of cooled chambers, constructed like a filter press, of parchment walls, and surrounded by chambers of pure H_2O . A portion of the free acid diffuses into the chambers filled with H_2O . The acid content of the pineapple juice is in this manner reduced in a short time to 0.3-0.2%, which upon evapn. *in vacuo* no longer exerts an injurious action upon the ferments of the pineapple. The exts. are recommended for the manuf. of refreshing beverages, marmalades, etc., and find application pharmaceutically in the form of pastilles, tablets and capsules.

Continuous production of preserved potato. C. WARTH. Ger., 285,315, June 6, 1913. See Brit., 3,531 (*C. A.* 9, 2160).

Baking dough from oil seeds. F. MÜLLER. Ger., 285,332, Feb. 28, 1914. Coherent masses could not be obtained from almonds and other oil-containing seeds, with the use of large amts. of flour, say 15-20%, since with a small amt. of H_2O the mass becomes too solid and hard, and with a larger amt. of H_2O the mass spoils readily. A coherent easily worked mass, with a large amt. of flour, can be obtained by first working up the flour with a little H_2O or milk to a stiff dough, rolling this out to thin sheets, and baking them at a low oven temp. The baked product is rubbed up to a fine powder, and 15-20% of this powder is added to the mass prepd. from the oil-containing seeds and sugar. The mass, and the cakes prepared therefrom, are said to be very palatable.

Apparatus for the culture of yeast used for the determination of various sugars by fermentation (TRAMBICS) I.

14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

History of the manufacture of mineral water. OTTO VOGEL. Düsseldorf. *Chem. Ztg.* 39, 928(1915).—Quotation from an article published in 1803. J. H. MOORE.

Determination of specific electric conductivity in examination of potable waters. M. FORNAINI. Rome. *Ann. chim. applicata* 4, 150-82(1915).—Detns. were made on a large number of waters. The formula used was that of Kohlrausch, $0.75K \cdot 10^6 =$ quantity of salts in mg. contained in 1 l. of water, K being the sp. elec. cond. F. discusses the influence of temp., and, on the basis of the formula $K_{18} = K_t / (1 + 0.023 \cdot [t - 18]) = Km$, gives a table of values of m_t for temps. from 0° to 25° . He also discusses the influence of dissolved gases, of organic substances in soln., of substances in the colloidal state, of the saline compn., and of the concn. The sp. elec. cond. of the waters was compared with the dry residue by wt. at 110° . F. shows that the coeff. 0.75 in Kohlrausch's formula is too high, and that more concordant results are obtained by using the value 0.71, or by correcting the value from Kohlrausch's formula on the basis of the hardness of the H_2O ; approximations better than $\pm 5\%$ were thus found. Waters with a value of cond. $K_{18} \cdot 10^6$ below 200 give unreliable results, because at such dilns. the errors of observation first become appreciable, unless special precautions are taken that make the method impracticable. With waters where the value $K_{18} \cdot 10^6$ is above 700, anomalies become greater and more frequent, on account of the less dissociation of the salts in soln. and because of the greater complexity of the saline solns. In such cases the water should be dild. with twice-distd. H_2O or with distd. H_2O of known cond. and proper corrections made. A cond. of $K_{18} \cdot 10^6 = 700$ corresponds to a value of 500 mg. per l., considered by most hygienists as the max. tolerable limit for a good potable water. The detn. of the sp. elec. cond. gives an indication of the amt. of salts in soln., according to F., more approx. correct than values of dry residue obtained by wt., although each method has its proper place; but where rapidity is a desideratum the detn. of the sp. elec. cond. may advantageously substitute that of the dry residue by wt. In detg. small variations of compn., as in continuous hygienic supervision of an aqueduct, spring, etc., the detn. of cond. together with that of 1 saline constituent, e. g., Cl, furnishes a more refined and rigorous means than detn. of dry residue by wt. An extended bibliography of references to the literature is appended. S. LEVY.

Detection of free carbonic acid in water. L. W. WINKLER. *Z. angew. Chem.* 28, I, 376-8(1915).—To 100 cc. of a fresh sample of water add 2 drops of a 10% $CuSO_4$ soln. In the presence of free CO_2 the water will remain clear for at least 10 min. This test, however, is not adapted to soft water which should be tested preferably by adding 10 drops of a 1% soln. of alizarin in alc. A bluish red color indicates an absence of free CO_2 , while a pure yellow color indicates the presence of a large amt.

W. F. LANGELEIR.

Waters of Beaucens. F. GARRIGOU. *Compt. rend.* 161, 144-6(1915).—This water, which is valued highly on account of its therapeutic properties, contains salts of Pb, Zn, Sb, As, Sn and Cu.

W. F. LANGELEIR.

Experiment with natural water-softening zeolite. R. N. KINNIARD. *Eng. Record* 72, 794(1915).—A natural hydrous calcium aluminium silicate was used in the expts. Waters having carbonate and sulfate hardness of 300 were softened. Filtration through 2 ft. of material at a rate of 2 gal. per min. per sq. ft. gave satisfactory results. K. suggests treatment similar to rapid sand filtration. Salt for regeneration of the zeolite would be about 2.5 c. per 1000 gal.

FRANK BACHMANN.

Wooden filters prove economical for temporary exposition water supply. E. C. EATON. *Eng. Record* 72, 748-51(1915).—Water for the Panama-Pacific International Exposition was secured from several sources. The estd. daily requirements were from 1.4 to 2.5 mil. gal. The water-works system consisted of a sump and five deep wells delivering water to a filtration plant, a main pumping station, pumping water through a 12-in. steel pipe line to a height of 365 ft., a distance of 19,300 ft., a reservoir of 3 mil.

gal. capacity and a gravity pipe line to the Exposition grounds, 5,200 ft. long. The water was treated with 1 grain per gal. $\text{Al}_2(\text{SO}_4)_3$, which was applied by an automatic controlling device, settled, filtered and then treated with 3 lbs. Cl per mil. gal. The cost of operation per 1000 gal. water treated was 6.426 c. The analysis showed *B. coli* positive in 10 cc. of the raw water and a bacterial count of 100, while the treated water showed no *B. coli* and a count of about 12. FRANK BACHMANN.

Pressure chamber equalizes wash-water distribution at Miraflores filters. GEORGE C. BUNKER. *Eng. Record* 72, 787-9(1915).—The raw water is a mixt. of Chagres River and Gatun Lake water. On account of odors the raw water is aerated. An av. of 192 lbs. alum per mil. gal. is added and the water allowed to settle, after which it is filtered. The filtered water is treated with 20 lbs. CaOCl_2 per mil. gal. which eliminates the *B. coli* and reduces the bacterial count on nutrient agar to an av. of 7 per cc. The unique feature of the plant is the design of the filters, a detailed description of which is given. FRANK BACHMANN.

Cubic performance. LESLIE C. FRANK. *Eng. Record* 72, 751-2(1915).—This term is intended to designate the rate of volumetric work done by sewage and water treatment devices. It is defined as the number of unit volumes of liquid treated per unit volume of device in a unit time. FRANK BACHMANN.

Oxidation of sewage without the aid of filters. III. E. ARDERN AND W. T. LOCKETT. *J. Soc. Chem. Ind.* 34, 937-43(1915); cf. *C. A.* 8, 2207, 2766; 9, 679.—Manchester sewage was aerated in 50-gallon casks. Nitrification was not completed during each aeration. In 4 weeks enough sludge was obtained to give satisfactory results with 8 hours' aeration. Data as to amt. of sludge produced were inconclusive. Mineral precipitates were added to the sludge, but no advantage ensued; a deflocculating action was frequently observed. Expts. in gallon bottles indicated that the volume of air necessary may be as low as 6 cu. ft. per hr. per sq. ft. of tank area. The best proportion of sludge to sewage is given as 2:3 for Manchester sewage. Estimated cost of air per million gal.: minimum \$1.98, max. \$4.92, with electricity at 1 c. per kw. hr. F. W. MOHLMAN.

A new electrolytic method of sewage disposal. J. C. OLSEN. *Met. Chem. Eng.* 13, 735-9, 793-7(1915).—An efficiency test was made of an electrochemical plant recently installed at Elmhurst in New York City. The process comprizes essentially electrolytic treatment, coagulation with lime, sedimentation and sludge removal. The cell is $24\frac{1}{4} \times 3 \times 2\frac{3}{4}$ feet in size and its nominal capacity is 500,000 gal. per day. The sewage flows through the cell under pressure, the retention period being approx. one minute. The quantity of current used varies between 22.5 and 44.7 coulombs, equiv. theoretically to the liberation of 1.21 and 2.31 cc. of O per liter of sewage treated. The total active surface of the electrode plates is 64.5 sq. ft. The range of current density is from 0.6 to 0.8 amp. per sq. ft. for one set of electrodes of which there is a total area of 48.9 sq. ft., and 1.9 to 2.6 amp. per sq. ft. for the smaller plates of which there is a total active area of 15.6 sq. ft. Hydrated lime equivalent to 9.1 grains per gal. is added after electrolysis. Sedimentation of the sludge is afforded by two tanks furnishing a retention period of 4 hrs. The analytical data obtained indicate that the treatment produces a very satisfactory effluent, clear and free from unpleasant odor. Nitrate N is increased from 0.02 to 3.8 p. p. m. Organic N is reduced from 13.8 to 5.5 p. p. m. The estimated cost of operation for a 10 mil. gal. plant is \$12.72 per million gallons divided as follows: Elec. current at 2 cents per kw. hr. \$3.22, lime \$3.00, labor \$3.00, sludge disposal \$2.50, and renewals \$1.00.

W. F. LANGELEIR.

Electrolytic sewage treatment. W. P. MASON, J. C. OLSEN, C. O. MAILLOUX AND P. M. TRAVIS. *Munic. J.* 39, 549, 551-4 (1915); cf. preceding abstract. L. P.

Gas lighting and hygiene. M. VON GRUBER. *J. Gasbel.* 58, 413-21, 429-34 (1915).—A report of the expts. described in *C. A.* 9, 1212, but at much greater length and with full experimental data. W. L. BADGER.

Report of the Selby Smelter Commission (HOLMES) 9. Apparatus for converting sulfur dioxide to sulfur trioxide (WELLS) 1. Disappearance of sulfur dioxide from dilute solutions with air (BARTELLS) 9.

Softening and sterilizing water. H. J. MACGRATH. *Brit.*, 18,867, Aug. 20, 1914. A cylinder containing zeolitic material for softening and sterilizing H_2O , which is supplied through a cock and perforated pipe and is discharged through a pipe, is fitted with a device for supplying a regenerating soln. and washing H_2O controlled by cocks which are connected to the water supply cock so that they cannot be opened unless the water supply cock is closed. The regenerating soln. is prepd. in a tank, which may be made of earthenware, divided by a vertical partition having perforations into 2 compartments, one of which is supplied with H_2O through a ball-cock, and the other of which contains a grid on which a solid regenerating salt, such as $NaCl$ or $K_2Mn_2O_8$, is placed. When the cocks admitting the regenerating soln. and H_2O are opened, the H_2O passes through the zeolites and is discharged. The stream of H_2O serves first to dissolve the salt and carry the soln. through the zeolites, and later to wash out the excess of the soln.

15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

The oxidizing power of soils. F. C. GERRETSEN. *Arch. Suikerind.* 23, 834-47 (1915).—Soils generally have the power of liberating I from solns. of KI. This I may remain free, or may oxidize org. material, or may be added to unsatd. org. substances present. Soils which had a normal oxidizing power were tested before and after sterilizing; the amt. of I liberated decreased noticeably, indicating that in case soils have an oxidizing power it is at least partly due to oxidases. The oxidizing power of a soil was quant. detd. as follows: As rapidly as possible 2 g. were weighed out, ground with 50 cc. H_2O , and rinsed into an Erlenmeyer flask, 5 cc. of 1% KI were added with 6 drops of 1:1 H_2SO_4 allowed to stand 5 min., and centrifuged. One min. generally sufficed for a clear sepn., but the liquid was filtered also as an additional precaution. I was then detd. either with 0.01 N $Na_2S_2O_3$ or, for very small amts., colorimetrically. If larger samples must be used they may be disintegrated by mixing with H_2O and drying at ordinary temps. in a vacuum. This disintegrates the finest clays and no risk is run of destroying enzymes or bacteria. Shorter standing than 5 min. after adding KI decreases the amt. of I liberated, but longer standing than 5 min. does not increase it greatly. Tests on 19 soils are reported. In 6 cases where the stand of cane was good, from 120 to 354 mg. I were liberated from 100 g. soil; in 3 cases where the stand was fair to moderately poor, 79 to 184 mg. were liberated; and in 11 cases where the stand was bad there was no I liberated in 8 cases and up to 47 mg. in the others. The amt. of gaseous O necessary to liberate the av. amt. of I would amount to 30 to 100% of the pore space in a heavy clay soil. Hence it is concluded that the poor stand of cane on strongly reducing soils is due to lack of O at the root tip. In sampling such soils the sample should not be taken from the surface layer. It should be taken in as large pieces and as quickly as possible, and put into a container which can be sealed air-tight. W. L. BADGER.

Osmosis in soils. C. J. LYNDE AND J. V. DUPRÉ. Macdonald College, Quebec. *J. Am. Soc. Agronomy* 7, 283-92(1915); cf. *C. A.* 9, 1524.—It is concluded from experimental data that water moves through clay subsoil from a weak soil soln. toward a strong one. This is ascribed to osmosis. B. E. B.

The nitrogen problem in arid soils. CHAS. B. LIPMAN. Coll. Agr. Univ. Cal. *Proc. Nat. Acad. Sci.* 1, 477-80(1915).—This problem is discussed generally and the following practical bearings are pointed out: The addition and maintenance of a good supply of org. matter by green fertilizing or by the use of barnyard manure must be practiced on all soils deficient in N and org. matter. Nitrogenous fertilizers, when employed on such soils, must be either of the low-grade org. variety such as steamed bone meal, cottonseed meal, and sewage sludge, or else $(\text{NH}_4)_2\text{SO}_4$ must be used. The overheating of the soil, excessive evapn. of moisture, and oxidation of org. matter should be prevented through the use of some kind of straw or manure mulch.

W. H. FRY.

The origin of the "niter spots" in certain western soils. ROBERT STEWART, Univ. Ill., AND WILLIAM PETERSON, Utah Agr. Coll. *Science* 43, 20-4(1916).—A general discussion.

W. H. FRY.

Some suggestions on methods for the study of nitrification. W. P. KELLEY. Univ. Cal. *Science* 43, 30-3(1916).—One % dried blood failed to undergo nitrification in those soils which had not been consistently fertilized with org. manures. When the concn. was reduced to 0.25% or less, vigorous nitrification took place. Similar results were obtained with bone meal and $(\text{NH}_4)_2\text{SO}_4$. Addition of either NH_4OH or $(\text{NH}_4)_2\text{CO}_3$ partially inhibited nitrification even in the low concn. of 5 mg. per 100 g. soil.

W. H. FRY.

The influence of nitrification upon soil fertility. WM. L. OWEN. *Sugar* 17, No. 11, 30-31(1915).—A review of the subject with tables showing the relative nitrification of $(\text{NH}_4)_2\text{SO}_4$ and various other N-carrying substances.

A. GROSS.

The soils of Kentucky. S. D. AVERRITT. Kentucky Agr. Exp. Sta., *Bull.* 193, 129-64(1915).—A general discussion of soils, plant food and fertility from a chemical, physical and biological standpoint. Analyses of a number of soils and subsoils from different areas are given.

B. E. B.

Soils of Franklin County, Ky. S. C. JONES. Kentucky Agr. Exp. Sta., *Bull.* 195, 201-35(1915).—The bulletin contains a soil survey of the county and chem. analysis of various soil types encountered. Total N was detd. by the Kjeldahl method, total P by the $\text{Mg}(\text{NO}_3)_2$ method and total K by the J. Lawrence Smith method. "Available" P, K and Ca were detd. by digesting 200 g. soil in 2 l. 0.2 N HNO_3 for 5 hrs. at room temp. Acidity was detd. by the method of Hopkins.

B. E. B.

Determination of arsenic and lead in soil. C. F. SHAW AND E. E. FREE. Report Selby Smelter Commission. Bur. Mines, *Bull.* 98, 455-6(1915); cf. *C. A.* 10, 446.—Arsenic was detd. by digesting a weighed sample of the well-mixed, dried soil with H_2SO_4 for several hrs., transferring to a Marsh app., and comparing with standard mirrors. **Lead:** Digest 500 to 1000 g. of the dry soil, first with HNO_3 , then with AcOH and AcONH_4 . After each digestion, wash with H_2O by decantation and on a filter. To the filtrate from the HNO_3 digestion add $\text{K}_2\text{Cr}_2\text{O}_7$, filter, dissolve the ppt. in HNO_3 , add H_2SO_4 and sep. Pb as PbSO_4 ; dissolve the PbSO_4 ppt. in AcOH and AcONH_4 , ppt. PbS with H_2S , filter, dissolve in HNO_3 , and reppt. as PbSO_4 . Usually it is necessary to repeat twice or more the purification by successive pptn. with H_2S and H_2SO_4 . Treat the filtrate from the AcOH digestion directly with H_2S , and purify the ppt. by repptn. as sulfide and sulfate as above. Both ppts. are finally weighed (separately or together) as PbSO_4 .

F. W. SMITH.

The reaction of soil and measurements of hydrogen-ion concentration. L. J. GILLESPIE. Washington, D. C. *J. Wash. Acad. Sci.* 6, 7-16(1916).—Procedures were devised for the electrometric and colorimetric detn. of H-ion concn. in soil admixed with 2 parts of water, and 22 soils of various types and reactions were examd. by means of these procedures. The H-ion exponents so detd. were from 4.4 to 8.6. In 19 cases, 2 different indicators could be used for each colorimetric test, and in these cases there was a good agreement between the results so obtained. In all cases there was a good agreement between the electrometric and the colorimetric results. The expts. are being continued. (Author's abstract.) L. J. GILLESPIE.

A proposed rapid method for the analysis of limestone for agricultural processes. A. S. BEHRMAN. State Univ., Lexington, Ky. *J. Ind. Eng. Chem.* 8, 42-5(1916).—One g. of the rather finely crushed sample is weighed into a 200 cc. Phillips beaker. Into this is pipetted 50 cc. standard 0.5 N HCl, followed by a few drops of a 3% H_2O_2 soln. A small porcelain crucible is set loosely in the top of the beaker, and the whole placed on the water bath. After remaining at this bath temp. (86°) for 30 min. the beaker is removed from the bath and cooled. When almost or completely cooled, 5 g. of dry NH_4Cl are added and dissolved by agitation; some macerated filter paper is also introduced. 25 cc. of a standard 0.5 N NH_4OH soln. are then added slowly with shaking. The beaker is stopped with a rubber stopper, agitated well and let stand for 15 min. Filtration is now made as rapidly as possible through an ashless filter into a 350 cc. Erlenmeyer flask, and the ppt. washed thoroughly with a neutral 10% soln. of NH_4NO_3 until all the NH_3 is in the filtrate. The ppt. is ignited and weighed. The wt. thus obtained represents the insol. residue, plus the Al and ferric oxides. The filtrate and washings from the insol. residue and NH_3 ppt. are titrated with standard 0.5 N HCl, using methyl orange as an indicator. From the HCl required to put the carbonates into soln., and from the total carbonates (found by subtracting the insol. residue and ignited NH_3 ppt. from 100), can be calcd. the % of Ca and Mg carbonates present. This method may be employed where only an approximation is desired. NH_3 pptns. may be made quantitatively in the cold, in the presence of NH_4 salts, and with the aid of some macerated filter paper to facilitate coagulation. 0.5 N HCl soln. may be heated, under the proper conditions, for 30 min. or more on the water bath (86°), without loss of HCl. NH_4Cl exerts an inhibitory action upon the pptn. of $CaCO_3$ to a much greater extent than is generally ascribed to it. W. H. FRY.

Acid soils and the effect of acid phosphate and other fertilizers upon them. S. D. CONNER. *J. Ind. Eng. Chem.* 8, 35-40(1916).—Various acid constituents of soils show different degrees of reactivity with different bases, also with the same base when free or when combined with different acids. The acidity developed when acid soils or silicates are treated with neutral salt solns. is more probably due to chem. exchange of bases than to physical selective adsorption. Ignition of acid soils also destroys the acidity. Much of the harmful acidity of acid soils is due to the presence of toxic acid salts of Al and Fe. The immediate effect of the addition of sol. fertilizer salts of the strong acids (HNO_3 , HCl and H_2SO_4) to acid soils, is to increase the sol. acid salts of Al and Fe. Treatment with acid phosphate reduces soil acidity. This is probably due principally to a combination of the sol. H_2PO_4 with the acid salts of Al and the consequent formation of insol. non-acid compds. A new soil acidity method, in which the catalysis of ethyl acetate is taken as the measure of the sol. soil acidity, is used along with the KNO_3 method, and the lime-water method of Veitch.

W. H. FRY.

The determination of availability of nitrogenous fertilizers in various California soil types by their nitrifiability. C. B. LIPMAN AND P. S. BURGESS. Calif. Agr. Expt. Sta., *Bull.* 260, 107-27(1915).—The nitrification studies embraced 29 soil types and 14

different forms of N. The different forms were not always tried with all soils. The low-grade form of N fertilizers, like cottonseed meal, steamed bone meal, goat manure, garbage tankage, and sewage sludge were most readily and economically transformed into nitrates. The high-grade forms, *e. g.*, dried blood, high-grade tankage, and fish guano were not transformed so favorably in the arid soils. However, when plenty of org. matter and an alk. reaction prevail the above materials are changed to better advantage. $(\text{NH}_4)_2\text{SO}_4$ was the most readily available of the inorganic forms.

B. E. B.

The fertilizer value of ashes. R. THIELE. *Gartenwelt* 19, 460-1(1915).—The article gives general information on the compn. and fertilizer value of the ashes of various woods, hard and soft coal and peat. It is much more economical to use artificial fertilizers than ashes. The favorable action of soot is attributed to the protection it affords the vegetation against insects by virtue of its odor, to the increase in the soil heat brought about by its color, and to the NH_4 salts and CaO it contains.

C. F. MILLER.

Combating of hedge-mustard in a new light. L. HILTNER. *Wiener Landw. Ztg.* 65, 380(1915).—Expts. lead H. to believe that the impetus given to crops in fields where weeds have been killed by spraying with FeSO_4 , is to be attributed to the green fertilizing action of the weeds rather than to any action on the part of the FeSO_4 , as is ordinarily claimed. Beside increasing the supply of org., humus-forming substances in the soil, both hedge-mustard and rape gather N, which becomes available to the crop plants soon after they have been plowed under or killed with FeSO_4 soln. The best results are obtained if the spraying is done when the weeds have two or three leaves.

C. F. MILLER.

Further observations on the combating of weeds with kainite and several other chemical agents. T. REMY AND J. VASTERS. *Landw. Jahrb.* 48, 137-69(1915); *Chem. Zentr.* 1915, II, 551; cf. *C. A.* 8, 3702.—Through further expts. the former observations have been fully confirmed. FeSO_4 and CaCN_2 are less effective than kainite.

C. F. MILLER.

Report of the Selby Smelter Commission (HOLMES) 9. Possible sources of potash in America (CAMERON) 18.

Fertilizers. WETCARBONIZING, LTD. *Brit.*, 18,838, Aug. 19, 1914. A dressing for soils is prepd. by subjecting peat while wet to a heat treatment at a temp. of at least 60° without evapn., to render its H_2O readily expressible. The treated peat may be caused to absorb NH_3 .

16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Free and combined lactic acid in wine. T. ROETTGEN. *Z. Nahr.-Genussm.* 30, 294-9(1915).—Continuing his work previously published (*C. A.* 8, 547, 1484) R. has detd. free and total lactic acid in 40 different wines, using both the original and a modified Möslinger method for the latter detn. The modified method is as follows: Remove volatile acids from 50 cc. wine by distg. with steam, using a fractionating column containing glass beads and collecting 200 cc. of distillate. Acidify the wine residue with 5 cc. of 1:4 H_2SO_4 and ext. for 24 hrs. with ether in a continuous liquid extractor, add 30 cc. water to the ether ext. and carefully remove the ether by evapn. Add sufficient $\text{Ba}(\text{OH})_2$ soln. to the aq. residue so that it remains slightly alk. after

heating for 15 min. on a water bath, neutralize with 0.25 *N* HCl, evap. to 10 cc. and introduce into a 100 cc. vol. flask, rinsing the dish with 5 cc. of hot water, followed by 95% EtOH, and make up to mark with the latter. Cool to 15°, shaking frequently, allow to remain at that temp. for 1/2 hr., again make up to mark with EtOH, allow to stand for an additional 2 hrs. at 15°, filter into a graduated cylinder kept at 15°, note the vol. of the filtrate, and evap. the latter to dryness in a Pt dish, ignite the residue, cool and titrate with 0.25 *N* HCl, the amt. of the latter required representing the lactic acid present in the aliquot. Free lactic acid was detd. in the same way, omitting the addition of H₂SO₄ to the residue from the steam distn. of the wine. The modified Möslinger method possesses 2 advantages over the original in that the error due to the vol. of the ppt. upon treatment of the Ba salt soln. with EtOH is much smaller, and there is no chance for the formation of EtOH-sol. Ba salts due to heating sugars with Ba(OH)₂. The results obtained upon the 40 wines by the modified method for total lactic acid were in most cases slightly higher (max. 0.04 g. per 100 cc.) than by the original Möslinger procedure, these differences probably being within the limit of exptl. error. Calcd. from the difference between free and total acid no combined lactic acid was found in many of the samples, the balance showing only small amts. (max. 0.04 g. per 100 cc.), which may also be within the limit of exptl. error.

A. F. SEEKER.

Simple working up of raw sugar in the distillery. F. POLEDNIK. *Wiener Landw. Ztg.* 65, 380-1 (1915).—P. has modified the method ordinarily used so that the fermentation only requires approx. 48 hrs. He gives directions for carrying out the process. 1750 kg. potatoes (16% starch), 60 kg. barley and 400 kg. raw sugar yielded 421-3 l. alc.

C. F. MILLER.

Remarks on A. Marbach's new process for the production of yeast from sugar and mineral salts. A. Kossowicz. *Oesterr. Chem. Ztg.* 18, 87 (1915); cf. Marbach, *C. A.* 9, 1967.—Referring to Marbach's claim of credit for this process, K. points to his own work done 14 years ago (*Z. landw. Versuchsw.* 1903) and to Pasteur's work in 1858.

ARTHUR LEDERER.

17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

Tierkohle. E. MERCK. *Apoth. Ztg.* 30, 367 (1915).—The statement is made that this product can now be supplied of a degree of purity sufficient to satisfy all medicinal demands. The accompanying directions for testing the product go considerably beyond those laid down by Wiechowski.

W. O. E.

Causticum hahnemanni and calcium causticum segini. ERW. RICHTER. *Apoth. Ztg.* 30, 437 (1915).—A critic of the Homeopathic Pharm. methods for prep. these products.

W. O. E.

The British Pharmacopoeia '1914. F. DÜSTERBEHN. *Apoth. Ztg.* 30, 445-7, 456-8, 465-7, 472-4 (1915).—A critical discussion of the numerous changes and innovations noted in the work.

W. O. E.

The conservation of glycerol. ERNST RICHTER. *Apoth. Ztg.* 30, 451-2 (1915).—Various suggestions are offered relative to restricting the use of glycerol in pharm. preps.

W. O. E.

The formation of araroba (crude chrysarobin) in andira araroba aguiar. O. TUNMANN. *Apoth. Ztg.* 30, 517-9, 525-6 (1915).

W. O. E.

Powdered iron containing copper and sulfur. ED. LUECKER. *Apoth. Ztg.* 30, 550-1 (1915).

W. O. E.

Testing and evaluation of tannin albuminates. D. SCHENK. *Apoth. Ztg.* 30, 577-8(1915); cf. Linke, *Ibid* 1910, No. 66.—Various procedures are discussed and data given covering several commercial samples. W. O. E.

The necessity for more exact procedures in examining medicaments. P. BOHRISCH. *Apoth. Ztg.* 30, 590(1915).—Several examples are given showing the desirability of improving the Ger. Pharm. methods. W. O. E.

Hyoscyamus cultivated in Minnesota: moisture, ash and alkaloidal content. E. L. NEWCOMB AND M. H. HAYNES. *Am. J. Pharm.* 88, 1-3(1916).—It has been found that a satisfactory germination of the seed of *Hyoscyamus niger* biennial may be obtained by treating the seed with concd. H_2SO_4 . Expts. to det. the constancy of this plant have led to the discovery of 2 specimens of known biennial origin which will complete their cycle of growth in 1 season. Moisture, ash, and alkaloidal detns. were made. W. G. GAESSLER.

A comparison of the results secured by the use of the guinea pig and cat methods for the assay of tincture of aconite. CHARLES C. HASKELL AND H. B. THOMAS. *Am. J. Pharm.* 88, 3-7(1916).—The authors conclude that the cat method of Hatcher can be used with good results in the attempt to ascertain the strength of samples of tinctures of aconite; that female cats are more resistant and show greater individual variations to the toxic action of aconite than do male cats; that absorption of aconite apparently occurs readily from the subcutaneous tissues of guinea pigs. A short bibliography is appended. W. G. GAESSLER.

The standardization of drugs by the use of plants. W. M. SAYLOR. *Am. J. Pharm.* 88, 8-12(1916).—Seeds of *Lupinus albus* were soaked in H_2O for 24 hrs., then placed upon sphagnum in a dark place, at a temp. of 18-20°, and allowed to germinate. When the radicles reached a length of 25-40 mm. they were marked, 20 mm. from tips. The seedlings were suspended so that just the growing tip reached below the surface of the soln. Every plant radicle was measured at the end of 24 and 48 hrs., resp., and the amt. of growth recorded. Solns. of strychnine sulfate and strychnine nitrate were used in the following strengths: $1/10$, $1/20$, $1/15$, $1/12$, $1/10$, $1/8$ grain, and then increasing by fifths on up to 2 grains, in 50 cc. of distd. H_2O . With both salts the $1/8$ grain soln. killed the plant in 24 hrs. and the radicle did not advance in length a fraction of a mm., while in the $1/15$ grain soln. there was a growth of $1/4$ -1 mm., and in the 2 grain soln. the radicle had shrunk and did not measure the original 20 mm. from the mark. More or less irregular growths were obtained in the weaker dilns.; nearer to the toxic point a gradual decline in activity and growth is noticeable. The toxic point is definite. A comparison of the strychnine tables with those for distd. H_2O showed that strychnine first stimulated the growth of the plant, but as the solns. grew stronger, the plant weakened, the ultimate result being the death of the plant, just as is the case with animals. For each toxic substance, there is a definite point in strength beyond which the seedling plant under the influence of that substance will not grow or live. Other substances were tried. Expts. using EtOH, U. S. P., in dilns. of 5, 6, 7, 8, 9 and 10%, showed that 8% was toxic in 24 hrs., i. e., the radicle had not advanced in growth. Various dilns. of tinct. of nux vomica, U. S. P., were used; 7 cc. in 50 cc. distd. H_2O killed in 24 hrs. $2\frac{1}{2}$ cc. of fl. ext. of digitalis, U. S. P. VIII (Wyeth), in 50 cc. H_2O , were toxic in 24 hrs. Eight cc. of tincture of digitalis made from this fl. ext. dild. with 50 cc. distd. H_2O were toxic. Six cc. of tinct. digitalis, U. S. P., freed from fat (Wyeth) were toxic. Seven cc. tinc. digitalis (Lilly) (physiologically tested) were toxic. In the case of physiologically tested fl. ext. of ergot, 5 cc. in 50 cc. distd. H_2O were toxic in 24 hrs. Squibb's fl. ext. of ergot (about 6 months old) corresponded to a 95% diln. of the preceding substance. Another fl. ext. of ergot of unknown make,

but known to be a low-priced prepn., was tried; it was about 77% in strength when compared with the physiologically tested prepn. used as a standard. W. G. GAESSLER.

Colloid chemistry and perfume manufacture. P. ROHLAND. *Deut. Parfumerie Ztg.* 1, 116(1915); *Chem. Zentr.* 1915, II, 504.—Some observations on the absorption of odors, dyes, etc., by talc. E. H.

Saffron. KRIZAN. *Boll. chim. farm.* 53, 10(1914).—Examn. of numerous samples of pure saffron established the presence of H_2BO_3 as a normal constituent.

H. S. PAINE.

Chineonal. ANON. *Boll. chim. farm.* 53, 70(1914).—This prepn. is the diethyl-barbiturate of quinine and contains 63.78% of the latter; it occurs as colorless crystals of intensely bitter taste which m. at 132° and are slightly sol. in H_2O and more readily sol. in alc. and $CHCl_3$. Chineonal is recommended as an antipyretic and sedative.

H. S. PAINE.

Ferissol. ANON. *Boll. chim. farm.* 53, 70(1914).—This prepn. is obtained from cinnamic acid and guaiacol powder; it is readily sol. in H_2O . Ferissol may be taken internally in amts. of 0.9–1.0 g. once or twice per day; 0.9–2.7 cc. of a 10% soln. may be used daily for injections.

H. S. PAINE.

Dymal. ANON. *Boll. chim. farm.* 53, 103(1914).—This prepn. is a mixt. of the salicylates of Di, La and Ce; it is an inodorous, pale rose powder which is insol. in H_2O ; it is prescribed in the form of a powder or pomatum and is recommended principally for the treatment of secondary burns and as an antiseptic and exsiccative.

H. S. PAINE.

Eumenol. ANON. *Boll. chim. farm.* 53, 138(1914).—This paper includes a discussion of the history and pharmacological action of eumenol (fl. ext. of the root of a Chinese plant which is variously termed Tang-kui, Tang-kwa, Shan-ki and Won-wu and which is probably a species of *Levisticum* (Umbelliferae). Eumenol is one of the oldest remedies in Chinese materia medica and has been used as an emmenagog; it is non-toxic and free from abortive effects.

H. S. PAINE.

Eucodine. RIEDGL. Berlin. *Boll. chim. farm.* 53, 302(1914).—This prepn. is the bromoethylate of codeine. It possesses the same general properties as codeine, but is less toxic and may be administered in larger doses and with greater frequency.

H. S. PAINE.

Collyrium rubrum. BIRKHAUSER. *Corr.-bl. f. Schweiz. Aerzte* 1914, 863; *Schweis. Apoth. Ztg.* 53, 651(1915).—For a cooling collyrium in chronic conjunctivitis, mix: $ZnSO_4$ 0.04, catechu 0.1, borax 0.04, Bi subnitrate about 0.02 in suspension, H_2O 100.0. To each 50 cc. of the soln. add 1 drop of 3% menthol- $EtOH$. The soln. should be clear.

S. WALDBOTT.

Alival. FARBERKE. Höchst a/M. *Schweis. Apoth. Ztg.* 53, 599, 612–3(1915).—Alival, $CH_3ICH(OH)CH_2OH$, has 63% I; it forms colorless, silky crystals, m. $48-49^\circ$, sol. in H_2O , $EtOH$, Et_2O , less sol. in cold C_6H_6 , $CHCl_3$. Tests for identity and purity, and assay method are given.

S. WALDBOTT.

Theacylon. E. MERCK. Darmstadt. *Schweis. Apoth. Ztg.* 53, 613(1915).—It is a chem. combination of theobromine and $o-AcOC_6H_4CO_2H$, a white, cryst., tasteless powder, insol. in H_2O , $EtOH$, Et_2O , dil. acids, sol. in $CHCl_3$ and dil. alk. It is used as a diuretic in doses of 0.5 g. 3–8 times per day.

S. WALDBOTT.

Atoxicocain. *Schweis. Apoth. Ztg.* 53, 613(1915).—A chem. prepn. identical with novocain which is difficult to obtain in Switzerland.

S. WALDBOTT.

Citobarium. E. MERCK. Darmstadt. *Schweis. Apoth. Ztg.* 53, 629(1915).—This is a form of BaSO_4 producing a milky suspension with water (150–200 g. in 500 cc.), permanent for hrs. It is used in X-ray expts. S. WALDBOTT.

Ampoules. ERNST RICHTER. Frankfurt a/M. *Schweis. Apoth. Ztg.* 53, 633–6(1915).—The testing for solubility in H_2O , the rinsing and the filling are described; the latter is done by the vacuum method under a glass globe of sufficient thickness. Cf. C. A. 10, 87. S. WALDBOTT.

Determination of water in mineral greases (CAMPO) 7. Estimating antimony in stibnite (LEHMANN) 7. Determination of alkaloids (BEAL) 7.

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

Progress in the principal fields of the inorganic heavy chemical industry. V. HÖBLING. *Chem. Ind.* 38, 340–60, 388–410(1915); cf. C. A. 9, 514, 1976.—A review. F. W. SMITHER.

Recovery of ammonia from waste liquors. E. L. KNOEDLER. *J. Ind. Eng. Chem.* 7, 1061–4(1915).—Waste liquors containing 1% NH_3 from the Welsbach plant, are treated in a continuous still whose operation is largely automatic, and 3000 lbs. of 26% NH_4OH are recovered daily at a cost of \$6.71. H. L. OLIN.

Lime recovery from spent causticizing mud. JAMES H. PAYNE. *J. Ind. Eng. Chem.* 7, 1056–9(1915).—Lime recovery from spent mud is carried on successfully at nearly all the NH_3 -soda works as well as at many beet-sugar plants in the West and proves economical even when lime may be obtained from other sources at \$2.00–\$2.50 per ton. At a typical plant the mud from the causticizing tanks, after the third washing, is sent by centrifugal pump to an agitated storage tank and thence to a rotary vacuum filter. From this the mud, having a solid-liquid ratio of 100 to 45, drops directly into a gas-fired rotary kiln 7 by 120 ft. and is finished in 1.5 to 2 hrs. In using the reclaimed lime 10% must be discarded each day and replaced by new lime to prevent cumulative contamination. Fuel consumption per ton of lime is about 675 lbs. of coal for producers or 9500 cu. ft. of natural gas. H. L. OLIN.

Experiments on the separation of vanadium from crude sodium uranate. H. H. BARKER AND H. SCHLUNDT. *Met. Chem. Eng.* 14, 18–23(1916).—The expts. resulted in at least 4 successful methods: (1) By the action of HCl gas the V is completely removed, leaving a residue of $\text{Na}_2\text{U}_2\text{O}_7$, NaCl , UO_2Cl_2 and other impurities. The U may be removed from this residue by (a) boiling with an excess of NH_4Cl or (b) by dissolving in dil. mineral acid and pptg. with NH_4OH . 59–64% of U_2O_5 is recovered. (2) By mixing uranate with twice its weight of NH_4Cl and enough H_2O to make a thick paste and heating in a porcelain crucible the % of V can be reduced from 8.5 to 0.5%. The % of U recovered may be regulated by the heat treatment, the highest % recovery being obtained where the temp. was not raised any higher than necessary to volatilize the NH_4Cl and V compds. Substitution of NH_4NO_3 for $\frac{1}{4}$ of the NH_4Cl results in as large a removal of V, but also in a lower % recovery of U. (3) V can be completely pptd. by dissolving crude uranate in the least possible amt. of dil. HNO_3 , HCl or H_2SO_4 and boiling the soln. Approx. 13% of the U is pptd. with the V. Recovery of U_2O_5 in the HNO_3 and HCl treatments was 58–79%. Some U is lost in the dil. H_2SO_4 treatment of the residue for the removal of $\text{Na}_2\text{U}_2\text{O}_7$, but may

be recovered by pptn. with NH_4OH . Of the above methods only the NH_4Cl treatment accomplishes the removal of V and the conversion of U_3O_8 in one step. The % recovery of U in all methods is approx. the same. (4) Probably Cl gas may also be used to remove V from carnotite ores quant. by proper regulation of temp.

E. W. BOUGHTON.

Possible sources of potash in America. FRANK K. CAMERON. *J. Frank. Inst.* 180, 641-51(1915); cf. *C. A.* 9, 2293.—Possibilities of potash production from feldspars, from deposits in desert basins such as Searles Lake, from Utah alunite and from the Pacific kelps, are considered. The conclusion is reached that the U. S. has supplies of potash materials more than sufficient to supply domestic needs, that the technology of the subject has been developed sufficiently to prove that the industry can be established successfully so far as physical factors are concerned, but that its commercial success is still in doubt.

H. L. OLIN.

The production, manufacture and use of compounds of barium. WARREN E. EMBLEY and S. ECCLES YOUNG. *Trans. Am. Ceram. Soc.* 17, 240-8(1915).—An excellent general summary.

C. H. KERR.

Graphite. A. LANG. *Oesterr. Chem. Zig.* 18, 101-3(1915).—A discussion of artificial and natural graphite and methods of analytical detn.

A. LÆDERER.

Universities and the industries. RICHARD C. MACLAURIN. *J. Ind. Eng. Chem.* 8, 59-61(1916).—An address.

E. J. C.

The universities and the industries. HENRY P. TALBOT. *J. Ind. Eng. Chem.* 8, 61-3(1916).—An address.

E. J. C.

The university and industry. WM. H. WALKER. *J. Ind. Eng. Chem.* 8, 63-5(1916).—An address.

E. J. C.

The university and business. ARTHUR D. LITTLE. *J. Ind. Eng. Chem.* 8, 65-6(1916).—An address.

E. J. C.

Composition for printing forms. A. RËNNER. Ger., 285,534, Aug. 9, 1913. The mass is suitable for stereotyping and may be worked with the etching needle. It consists of a mixt., to be stirred up with H_2O , of alabaster gypsum 2, whiting 2, Zn white 1, cement 1, flour 1, and glue 1 part. The mass is either formed as a thick plate, or poured out as a layer upon a base. The base is flexible if cylindrical stereotypes are to be made.

Refrigeration. G. SCARAMUZZA and E. PEZZI. Ger., 284,906, Nov. 24, 1910. A readily volatile liquid is employed as the refrigerant, and a difficultly volatile, non-freezing liquid, not dissolving the refrigerant, is employed as the conducting medium, both liquids circulating in a closed circuit. The liquids are brought into heat exchange by admixt. in the evaporator, whereby the volatile refrigerant is sepd. from the conducting liquid by volatilization.

Crimped reflectors. M. WISKOTT. Ger., 285,381, Apr. 24, 1914. Addition to 284,611 (*C. A.* 10, 102).

19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

Identification of trivalent manganese in glass. S. R. SCHOLLS. Univ. Pittsburgh. *J. Ind. Eng. Chem.* 7, 1037(1915).— MnO_2 added to decolorize glass has been assumed to exist in glass as Mn_2O_3 . To show this a low melting glass (sand 100, soda

ash 50, red lead 60 and MnO_2 10) was made. It showed deep violet color. Powdering this glass and treating with HF gave a pink soln. which could be decolorized by $(\text{COOH})_2$ and other reducing agents. A similar pink soln. was also obtained by treatment with 30% H_2SO_4 . To obtain a pink soln. more readily a still more sol. glass was made (sand 100, K_2CO_3 100 and MnO_2 20). Digesting this glass with 30% H_2SO_4 gave a very strong pink soln. Absence of permanganates was shown by failure to get a colored soln. by digesting with H_2O alone. The color also was less violet in tint than permanganate. $\text{Mn}_2(\text{SO}_4)_3$ was prepd. by heating MnO_2 to give brown Mn_2O_3 and treating this with H_2SO_4 . This gave a pink soln. like that from the above glasses. Diln. with H_2O gave in both cases a flocculent brown ppt. and their action toward $(\text{COOH})_2$ was the same. These facts seem to indicate the presence of trivalent Mn in the glass.

C. H. KERR.

Variation in soda, lime and magnesia content of a glass of the type RO_3SiO_2 . C. C. RAND. U. S. Bureau of Standards, Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 236-9(1915).—The triaxial area $\text{CaO} \cdot 3\text{SiO}_2$ - $\text{Na}_2\text{O} \cdot 3\text{SiO}_2$ - $\text{MgO} \cdot 3\text{SiO}_2$ was covered with the exception of that part above 0.66 equiv. $\text{Na}_2\text{O} \cdot 3\text{SiO}_2$ which was omitted as giving unstable sol. glasses. With less than 0.15 equivs. $\text{Na}_2\text{O} \cdot 3\text{SiO}_2$ the glasses were too viscous to pour. Increase in MgO at the expense of CaO greatly decreased devitrification.

C. H. KERR.

The manufacture of optical glass. C. C. RAND. *Patt. Gaz.* 40, 1236(1915).—The requirements of optical glass are very stringent. A block 12 in. thick must show no color, but light transmission must not be destroyed to any extent. It must be freed from physical strain by annealing. Above 470 – 500° most glasses are sufficiently fluid to permit easy removal of strains. Below 350 – 370° they are too viscous to assume strains. Chem. inhomogeneity, causing striae, is most difficult to overcome. For special lenses a glass of definite index of refraction and definite dispersion is required. At the Bureau of Standards, 25–30 lb. batches are produced without color or strains, and it is hoped that a mechanical stirrer will remove striae.

R. K. HURSH.

The technical control of a window-glass tank furnace. C. J. BROCKBANK. Exolon Co. *Trans. Am. Ceram. Soc.* 17, 222–35(1915).—Tanks must be sharply constricted in width toward the working end. High crowns (over 6–8 ft. above the metal) give poor efficiency. Thin flux blocks are preferable because they allow radiation and consequent lower temp. of the inner side where the glass is in contact with the block. SiO_2 content of window glass should not fall below 70% and the high limit is 74–75%. Fe_2O_3 in the sand should be not over 0.30%. Al_2O_3 in the sand is desirable. CaO should be not over 13.0 and preferably not over 12.5%, as high CaO causes hardness and brittleness and promotes devitrification. High CaO glasses, however, are more brilliant and color-permanent. Since CaO plays an important part in the reduction of Na_2SO_4 a decrease in limestone must always be compensated for by increase in coal. Conditions alter this ratio but approx. $\frac{1}{4}$ lb. of coal must be added for each 3 lb. limestone removed and *vice versa*. The % Na_2O should not fall below 12 unless CaO is below 12 and SiO_2 above 72. Fifteen % Na_2O has been used but 14% should be considered the max. An excess of Na_2SO_4 dissolved in the glass is apt to be thrown out of soln. as sulfate stones. The loss of alkali during melting is usually 0.5 to 1.5%. When analysis shows more than 1% free Na_2SO_4 in the glass, stones may be expected.

C. H. KERR.

Glass manufacture. PAUL SCHNURPFEL. *Glashütte* 44, Nos. 44–52(1914); 45, Nos. 1–32(1915), 31 figs.—S. gives especial attention to ovens and leers.

J. B. PATCH.

The plan and management of a modern enameling factory. WILH. LINKER. *Glashütte* 44, Nos. 14-52(1914); 45, Nos. 1-36(1915). J. B. PATCH.

Note on thermoelectric phenomena observed in some silicates. A. V. BLEININGER. U. S. Bureau of Standards, Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 218-21 (1915).—Silicates of the formula $RO \cdot 2SiO_2$ are prepared with Mn, Zn, Cu and Fe and formed into small blocks with one smoothly ground surface and with a Pt wire embedded in each. Placing the ground surfaces in contact and heating to temps. of 850-1350° showed potential differences as follows: (a) $ZnO \cdot 2SiO_2 + MnO \cdot 2SiO_2$ from 0.05 millivolt at 900° to 0.65 at 1350°; (b) $ZnO \cdot 2SiO_2 + CuO \cdot 2SiO_2$ from 0.05 at 850° to 1.65 at 1350°; (c) $ZnO \cdot 2SiO_2 + FeO \cdot 2SiO_2$ from 0.02 at 850° to 0.70 at 1200°; (d) Georgia kaolin + $FeO \cdot 2SiO_2$ from 0.05 at 850° to 1.40 at 1200°; (e) Ga. kaolin + $ZnO \cdot 2SiO_2$ from 0.02 at 900° to 1.70 at 1250°; (f) Ga. kaolin + $MnO \cdot 2SiO_2$ from 0.05 at 950° to 3.60 at 1300°. Polarization also was noted increasing with potential difference. This furnishes additional evidence towards the assumption that silicates at higher temps. are partially ionized. C. H. KERR.

Our industry and the foreign trade. CULLEN W. PARMELEE. *Trans. Am. Ceram. Soc.* 17, 55-65(1915).—Presidential address before Am. Ceramic Soc. C. H. K.

Antimony compounds as opacifiers in enamels. HOMER F. STALEY. Iowa State College. *Trans. Am. Ceram. Soc.* 17, 173-89(1915).—Gloss: Sb_2O_3 enamels of good gloss can be made from 3 types of formulas: (1) high B_2O_3 , no PbO; (2) medium B_2O_3 , no PbO; (3) low B_2O_3 with PbO. Color: Sb_2O_3 enamels contain 3 color components; (1) a tan, probably due to S and fading as the smelting continues; (2) a yellow, due to PbO and persistent; (3) a blue, due to a combination of Sb_2O_3 , B_2O_3 , CaO and F, which grows more intense as smelting continues. Opaque whites are produced by controlling the heat treatment and compn. so that the tan and yellow are neutralized by blue. The dark specks in Sb_2O_3 enamels are due to contamination with organic or metallic dirt after the enamel is smelted. The remedy is extreme cleanliness. C. H. KERR.

The relative action of acids on enamel. EMERSON P. POSTER. *Trans. Am. Ceram. Soc.* 17, 137-49(1915).—Tests were made by placing 2 g. of enameled frit (ground in a lab. pebble mill and sieved through 50-mesh) in 100 cc. of the required acid and after standing 24 hrs. the undissolved frit was recovered on a weighed Gooch crucible with asbestos filler and the loss thus detd. That size of grain is of the utmost importance is shown by the following data on the same frit: 50-100 mesh, 0.0522 g. loss; 100-200 mesh, 0.0926 g. loss; through 200-mesh, 0.239 g. loss. Discussion: Shaw pointed out that if clay and other materials such as opacifiers and tempering agents are added to the frit the acid resistance of the frit may not be a fair indication of the soly. of the enamel as used. However, this method of testing shows some decided advantages, especially in factory experimentation. C. H. KERR.

The role of chlorides in the volatilization of ferric iron. GEO. A. BOLE AND R. M. HOWE. Alfred, N. Y. *Trans. Am. Ceram. Soc.* 17, 125-9(1915).—A batch of tin enamel of the following formula was made: 0.2 K_2O , 0.3 CaO, 0.5 PbO, 0.25 Al_2O_3 , 0.08 Fe_2O_3 , 2.8 SiO_2 , 0.15 SnO_2 . To each of several 50 g. portions a known wt. of chlorides of Na, K, Li, Ba, Mg, Pb, Sn and Ag was added in aq. soln. The mix was fused in a muffle kiln at cone 04, the burn lasting 16 hrs. and fusing temp. being held 5 hrs. Analyses were then made (methods are given) and the efficiency factors (% Fe volatilized divided by the % Cl introduced as chloride) were found to be: BaCl₂ 00.00, NaCl 3.76, KCl 3.90, MgCl₂ 4.80, LiCl 4.68, PbCl₂ 14.62, AgCl 14.00, SnCl₂ 18.47. The lower the m. p. of the chloride the greater was its efficiency as a volatilizer of Fe

SnCl_2 being the most active. Other advantages of SnCl_2 are: (1) more complete decompn. at lower temps. than NaCl , thus eliminating trouble from sol. salt in the frit and from decompn. of NaCl during the glaze burn; and (2) freedom from volatilization such as NaCl shows in the salt-glazing process, thus making calcn. of the exact formula possible. SnCl_2 , therefore, is a very valuable ingredient of white enamels.

C. H. KERR.

An unusual case of pinholing of glazes. H. J. KNOLLMAN. *Trans. Am. Ceram. Soc.* 17, 165-72(1915).—The appearance of pinholes is due to too great viscosity of the glaze. While there is undoubtedly more than one cause of pinholing, the sulfuring during water smoking is the main one, since it is possible to use a harder, more viscous glaze when the water smoking is reduced, while a softer and more fluid glaze is necessary when the amt. of moisture is large.

C. H. KERR.

Chrome-tin red glazes between cones 2 and 8. B. S. RADCLIFFE AND C. L. WALDUCK. Univ. Ill. *Trans. Am. Ceram. Soc.* 17, 278-89(1915).—The stain used in all tests was 1 SnO_2 , 1 SiO_2 , 0.075 PbCrO_4 , 2.25 CaO (cf. C. A. 3, 2742) and enough was added to each glaze to introduce 0.118 equiv. SnO_2 . Many trials with wide ranges of compn. were made. The Al_2O_3 to SiO_2 ratio is very important, giving the best red at 1:7. With Al_2O_3 : SiO_2 ratio const. increase in B_2O_3 changed the color from raspberry-red to cherry-red. When PbO replaced CaO the change was from raspberry-red to lilac. Evidently the RO content of the glaze has a decided influence on the color.

C. H. KERR.

White terra-cotta glazes at cones 6 and 7. ERCELL C. HILL. New York. *Trans. Am. Ceram. Soc.* 17, 381-409(1915).—*Gloss:* CaO is essential in this type of glaze, the amt. required to produce max. gloss depending upon the proportions of clay and flint. Excess CaO decreases gloss. If ZnO or small amts. of BaO be then substituted, gloss is again increased. With high CaO increase in ZnO up to 0.30 equivs. decreased gloss in these series. Half of the CaO may be replaced by ZnO . BaO increased gloss if CaO and ZnO were deficient, but decreased gloss when CaO and ZnO were present in sufficient or excess amts. When SnO_2 replaced CaO or ZnO gloss was decreased, but when it replaced BaO there was no change. The lowest clay contents gave the most fusible glazes and the best gloss. The best Al_2O_3 - SiO_2 ratio for gloss was 1:8 to 1:10, the lower feldspar glaze requiring the higher ratio. *Whiteness and opacity:* SnO_2 increased whiteness and ZnO was helpful but to less extent. Replacing CaO by BaO had no effect. Increase in Al_2O_3 decreased whiteness. *Pink coloration:* With SnO_2 pink coloration was common, evidently due to some Ca-Sn combination, low in Sn and high in Ca. Tendency toward pink may be overcome by substituting K_2O , Na_2O or ZnO for CaO . More pink colors were found at lower temps. *Blistering* was due to volatilization of ZnO or some Zn compd. in the glaze.

C. H. KERR.

The use of deflocculating agents in the washing of clays and the effect of the process upon the color. G. H. BROWN AND W. L. HOWAT. Pittsburgh, Pa. *Trans. Am. Ceram. Soc.* 17, 81-90(1915).—Using Am. kaolins even after sieving through 200-mesh gave black specks and body color inferior to European products. Increasing the degree of dispersion by adding alkali in the washing process greatly improved the color of Georgia kaolin and to a less extent the color of N. Carolina and Florida kaolins. The amts. of NaOH giving best results were, resp., 0.17, 0.19 and 0.14%. This use of the alkali decreased drying shrinkage considerably (especially with Ga. kaolin) and increased burning shrinkage at cone 10 noticeably, except in the case of the body made from Ga. clay (clay 50, flint 30, feldspar 20). The burning shrinkage of Ga. clay alone, however, showed increase due to the use of the deflocculent.

C. H. KERR.

Tests of Iowa fire clays. M. F. BEECHER. *Trans. Am. Ceram. Soc.* 17, 102-24 (1915).—Twenty-three representative fire clays of possible com. importance were examd. Fusion points were mostly between cones 18 and 27, total range being cones $4\frac{1}{2}$ and 30. Warpage was detd. on slabs $\frac{1}{2}$ in. $\times$ 1 in. $\times$ 9 in. On the basis of fusing point and warpage, 10 clays were selected for further study and burning shrinkage, porosity and sp. gr. were detd. at cone 04 to 10 and load tests were made. All data are tabulated. Results show that for tests of fire clays in general, the load test, warpage, fusion point and porosity give all the necessary information. C. H. KERR.

Laboratory methods for the physical testing of fire clays. C. H. KERR, R. J. MONTGOMERY AND C. E. FULTON. *Trans. Am. Ceram. Soc.* 17, 91-101 (1915).—Details of testing methods are given for the examn. of raw clays: (a) description, (b) sieve test, (c) sp. gr., (d) plasticity, (e) drying shrinkage, (f) modulus of rupture; and for burnt clays: (g) burning shrinkage, (h) modulus of rupture, (i) apparent porosity, (j) apparent sp. gr., (k) true sp. gr., (l) open and closed pores (all tests g, h, i, j, k, l, at various temps.), (m) fusion point. C. H. KERR.

The effect of saturated sodium sulfate solution upon the structure of clay burned to different temperatures. W. L. HOWAT. Bur. Standards, Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 249-55 (1915).—As an accelerated test of the resistance to disintegration by the weathering effects of freezing and thawing the Brard test is used. Test pieces were immersed in saturated Na_2SO_4 soln. at room temp. for 24 hrs. and then dried at 110° . This was repeated 4 times. Room temp. (and not above 33°) was used because at 33° the $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O}$ becomes anhydrous. This crystn. test disrupts burnt clay wares quickly and gives sharp and decisive results; possibly it is too severe. Perhaps a modification using lower concn. (say 10%) would be better. No direct comparison with freezing and thawing has been made. Three clays were tested after burning to 900-1200°. The temp. of burn that produced successful resistance to 4 tests as above were: (a) surface clay, 1050° ; (b) shale, 1050° ; (c) No. 2 fire clay, 1100° . C. H. KERR.

The effect of grog in a fire clay body. C. E. FULTON AND R. J. MONTGOMERY. Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 410-21 (1915).—Using St. Louis fire clay raw and burned (grog) trials were made with 0, 25, 50 and 75% grog. Increasing the grog caused: (1) decrease in H_2O required for plastic mass; (2) decrease in linear shrinkage; (3) decrease in strength of raw body; (4) decrease in burning shrinkage and also a decrease in the tendency to overfire at cones 15 and 20; (5) decrease in strength of burned ware; (6) increase in sp. gr. of burned ware; (7) increase in porosity of burned ware. Using 50% raw St. Louis fire clay and 50% burnt sieved through Tyler Standard Screens of 6-, 14-, 35-, 100- and 200-mesh showed that increasing the fineness of the grog (1) increased the H_2O required for plastic mass; (2) increased drying shrinkage; (3) increased strength of raw mass; (4) increased burning shrinkage except at cone 20 with 100- and 200-mesh grog where overfiring more than counteracted increased burning shrinkage; (5) increased strength of the burned body (up to cones 15 and 20 where overfiring decreased the strength); (6) affected the sp. gr. of the burned mass very little; (7) increased porosity up to cone 5, at cone 10 showed very little effect and at cones 15 and 20 decreased the porosity except with the 100- and 200-mesh grog where overfiring again caused increase. C. H. KERR.

Influence of varying water content in a fire-clay mixture. R. J. MONTGOMERY AND C. E. FULTON. Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 437-50 (1915).—Using St. Louis fire clay alone and with 50% burnt clay of the same kind, mixtures were made with 19.1, 21.5, 24.5 and 27.0% H_2O for the raw clay, and 14.1, 16.5, 19.0 and 21.5%

H₂O for the 1/2 grog mixtures. Trials were burned to cones 010-20. The results showed that variation in H₂O content had considerable effect on the drying shrinkage but comparatively little effect on the physical properties of the burned mass. *Discussion.* Purdy held that the amt. of H₂O used is much more important than here indicated.

C. H. KERR.

Feldspar possibilities in Georgia. S. L. GALPIN. Iowa State College. *Trans. Am. Ceram. Soc.* 17, 373-80(1915).—The materials are very promising but transportation costs are high.

C. H. KERR.

Development of shivering in a fire-clay body. R. H. MINTON. *Trans. Am. Ceram. Soc.* 17, 310-3(1915).—Expts. showed that adding SiO₂ quickly caused shivering. In many cases shivering has been attributed to sol. salts in the grog used when it was due to silicious material brought in.

C. H. KERR.

Magnesite bricks. ANON. *Brit. Clayworker* 24, 161(1915).—Grecian and Austrian magnesite are best. The rock is calcined to about 1780°, sorted, ground, mixed with light, burnt magnesite and water and pressed in semi-dry form. English bricks are fired to cone 17-18; best Austrian and German 50° higher; best Grecian to cone 35.

C. H. KERR.

The use of barium fluoride for the prevention of drier scum on bricks. HOMER F. STALEY. Iowa State College. *Trans. Am. Ceram. Soc.* 17, 200-4(1915).—BaF₂ is recommended in place of other Ba compds. The advantages are: (1) lower cost, (2) greater soly. than CaCO₃, (3) smaller amts. required, (4) absence of harmful effects on color, (5) absence of scum due to excess, and (6) promotion of vitrification.

C. H. KERR.

Results of compression tests on porcelain base. J. W. WARD. *Trans. Am. Ceram. Soc.* 17, 432-7(1915).—Factory expts. showed that it is possible to get high crushing strength in a com. porcelain body but it is very essential in assembling the parts to avoid breaks or air spaces in the joints.

C. H. KERR.

The viscosity of porcelain bodies. A. V. BLEININGER AND C. S. KINNISON. Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 130-6(1915); cf. *C. A.* 8, 804, 3225.—With high feldspar bodies (30-65%) the effect of higher feldspar content was greatly to increase viscosity, especially in low clay bodies. A slight decrease in viscosity is noted in the 40% clay series when all of the flint is replaced by feldspar. With 45% clay, feldspar contents of 35 and 40% are most effective in decreasing the viscosity. Higher % again increases it. A still higher clay content causes the softening effect of the feldspar to diminish decidedly. Flint in such high feldspar bodies is not an important factor in governing viscosity. The greatest rigidity is evidently due to the high clay content. High clay bodies having feldspar as the only other constituent showed very great viscosity. The function of viscosity is not a continuous one but changes in irregular stages. The most useful data are obtainable at 1300-1345°. C. H. K.

Dental porcelains. ARTHUR S. WATTS. Ohio State Univ. *Trans. Am. Ceram. Soc.* 17, 190-9(1915).—A porcelain body claimed to be successful showed a compn. equiv. to: K₂O 0.74, Na₂O 0.26, Al₂O₃ 1.14, SiO₂ 7.830, TiO₂ 0.002; this may be expressed in mineral compn. as feldspar 81, clay substance 4, flint 15%. Another com. dental porcelain is said to contain 80% feldspar and 20% quartz fused at cone 9, finely ground and mixed with 5% bone ash. Inlay porcelains are of various types ranging from the above to easily fusible enamels. These porcelains are supplied to dentists in powdered form to be mixed with H₂O and burned. One such powder showed a compn. equiv. to: K₂O 0.70, Na₂O 0.18, CaO 0.12, Al₂O₃ 0.700, Fe₂O₃ 0.014, SiO₂ 6.840.

TiO_2 0.014; this corresponds to the following mineral compn.: feldspar 89.50, Na_2CO_3 4.00, CaCO_3 2.70, flint 3.80%. A softer porcelain contained: K_2O 0.638, Na_2O 0.141, CaO 0.221, Al_2O_3 0.565, Fe_2O_3 0.090, SiO_2 5.900, B_2O_3 0.023, TiO_2 0.011; this may be expressed in mineral compn. as feldspar 61.06, K_2CO_3 1.98, Na_2CO_3 1.98, CaCO_3 4.21, borax 0.83, flint 29.07%. A com. "silicate cement" used for inlay work showed analysis of the powder as follows: ignition loss 2.00, SiO_2 37.00, Al_2O_3 32.20, CaO 7.50, Na_2O 10.10, P_2O_5 1.90, F 9.30, and of the liquid-solid content 41.50% (consisting of Na_2O 6.00, P_2O_5 35.50). The powder is isotropic and uniform in n_D , showing that it had been fused. Manufacturing methods of the Dentists' Supply Co., York, Pa., are given. Pure K feldspar is crushed to $1/4$ -in., hand-sorted and ground in drag mills. It is then mixed with quartz and kaolin. Since the % clay is low, starch and gum arabic or gum tragacanth are added. Coloring material is added to give the desired shade.

C. H. KERR.

The Bureau of Standards contrast method for measuring transparency. IRWIN G. PRINER. U. S. Bureau of Standards, Washington. *Trans. Am. Ceram. Soc.* 17, 150-64(1915).—If a black and a white figure placed side by side be covered by a translucent medium the contrast in color is reduced; this is used as a basis of measuring transparency. The standard white is a MgO surface (a deposit of smoke from burning Mg ribbon). The black is an acetylene smoke surface in the bottom of a black lined cavity viewed through a hole in one side. The brightness ratio is measured by the Martens (or Beckstein) photometer. An interesting discussion is given of its application to pottery.

C. H. KERR.

The value of specific gravity of raw materials. D. E. HUMPHREY. *Trans. Am. Ceram. Soc.* 17, 215-7(1915).—Sp. gr. is used in various calcns. involving wts. per cu. ft.

C. H. KERR.

Importance of the sagger-making department. GEO. SIMCOE. *Trans. Am. Ceram. Soc.* 17, 256-73.—S. wrote to most of the N. J. producers and tabulates data received, concluding that: (1) certain clays have properties other than ability to stand high temps. that make them very valuable for saggars; (2) SiO_2 , whether added in coarse grains as grog, or fine as sand or sandy clays, is a detriment rather than a help in sagger bodies; (3) materials other than those normally used in sagger bodies may be added with great benefit.

C. H. KERR.

Seger cones. ANON. *Brit. Clayworker* 24, 168(1915).—Analyses and compn. of German seger cones are given together with analyses of the raw materials used.

C. H. KERR.

Notes on the manufacture of plaster molds. GEORGE A. WILLIAMS. *Trans. Am. Ceram. Soc.* 17, 323-9(1915).—The effect of varying the amt. of mixing H_2O and the influence of retarders and accelerators on porosity and strength were studied. Temp. curves during setting were taken and transverse tests made. Hardness was measured by the time required for a jet of water to wear a hole through a slab $13/16$ in. thick. The most favorable amt. of H_2O for pottery plaster (showing max. porosity and nearly max. strength) was 1 qt. to $2\frac{3}{4}$ lbs. plaster. By the use of accelerator or retarders strength is increased at the expense of porosity or vice versa.

C. H. K.

The present status of the producer-gas-fired continuous kiln in America. R. H. McELROY. *Trans. Am. Ceram. Soc.* 17, 274-7(1915); cf. C. A. 8, 2611.

C. H. KERR.

Experiences in mending kiln furniture. SAMUEL RUSOFF. *Trans. Am. Ceram. Soc.* 17, 290-3(1915).—Na silicate or plastic clay alone are not successful. Slip clay

lacks initial bond but is good when heated. The best compn. is waste mix (or fine grog 40-60 mesh) 55, slip clay 5, fire clay or ball clay 20, Na silicate (J brand 42% H_2O) 20. The silicate is dild. to 38° Bé. before use. The clay wares are cemented together, dried and then heated to 500° F.

C. H. KERR.

Notes on casting. A. V. BLEININGER AND M. R. HORNING. U. S. Bureau of Standards, Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 330-54(1915).—For flowage measurements on casting slip the efflux viscosimeter is satisfactory. For reducing viscosity Na silicate is more effective than Na_2CO_3 . Because of comparative coarseness N. Carolina kaolin is more greatly influenced. Georgia kaolin shows far greater initial viscosity than that from N. Car. and is very sensitive to Na_2CO_3 additions. It shows a well-defined minimum in viscosity which turns rapidly toward a maximum. This min. viscosity range is greater when Na silicate is used. Tenn. ball clay No. 3 has no decided min. viscosity point, probably due to the comparatively large amt. of pseudo-emulsoïd or lyophile substance produced. A large vol. of air seems to be absorbed in slips; the removal increases viscosity. Vigorous stirring is necessary and vacuum might be beneficial. A body containing N. Car. kaolin, Florida kaolin and Tennessee ball clay proved to respond well to the addition of Na_2CO_3 but showed a turn towards greater viscosity (recoagulation) for additions greater than 0.06%. A com. slip, fairly high in English ball clay, showed rapid drop in viscosity, but required a much higher % of the reagent mixt. than the single clay bodies. The viscosity seemed to remain const. at the min. value. It is possible that this condition is due to the presence of org. colloids which exercise a protective influence. Interaction occurs between different clays with respect to viscosity changes, independent of the alk. additions, and irregular in nature. Some clays may have a detrimental effect upon the others in making up a casting body. The ball clay content in a casting slip should be reduced to the min. Absorption of the alk. reagents is important. NaOH is absorbed to a far greater extent than Na_2CO_3 and probably combines chemically with the clay. The tensile strength of cast bodies containing alk. additions may be greater than that of the same materials cast without these reagents. Single clay body-slips, used in the state of max. deflocculation do not seem to be weaker than when the suspensions are only carried to a point just under min. viscosity. The general formula: $\eta_1 = \eta (1 + kf)$, where f = ratio of vol. of dispersed particles to total vol. of system and in which k is detd. for each of a series of concns. might prove useful for interpolation purposes, provided the alkali addition is kept const. Casting bodies with low concn. of alkali are more apt to change their viscosity with time than those containing large additions.

C. H. KERR.

Time-temperature curves during salting of some oil-fired sewer-pipe kilns. F. H. RIDDLE AND A. L. GLADDING. *Trans. Am. Ceram. Soc.* 17, 314-22(1915).—Sufficient heat to volatilize the NaCl and proper draft are the 2 essentials. Reducing conditions have as much effect as the salt, or even more, in causing fall in temp. The reducing condition is caused by lowering the damper so as to cut off the air supply.

C. H. KERR.

Production and use of barium compounds (EMLBY) 18. Formation of some basic silicates (CAMPBELL) 20.

Imitation stained glass. W. GROSSHEIM. *Ger.*, 285,126, Aug. 3, 1913. Addition to 272,458 (C. A. 8, 2813).

Handling bottles during manufacture. A. GUTMANN AKT.-GES. FÜR MASCHINENBAU. *Ger.*, 285,300, Dec. 14, 1913.

Stoneware. SPECIALFABRIK FÜR GESUNDHEITSTECHNISCHE EINRICHTUNGEN E. KATZENBERGER. Ger., 285,483, Dec. 23, 1913. The ware is provided with hollow double walls, and these are filled with cement or beton, and the strength is increased further by Fe inserts. These metal inserts can be made to serve in fastening the articles to the wall.

Finishing tiles. AKT.-GES. NORDDEUTSCHE STEINGUTFABRIK. Ger., 285,255.

Glazed clay plates by wet pressing. G. KOCH. Ger., 285,341, Nov. 8, 1913.

Brick presses. T. GROTH AKT.-GES. Ger., 285,339, July 10, 1914.

Control of automatic brick cutting presses. C. KELLER & Co. Ger., 284,307, Aug. 27, 1913. Addition to 281,126.

Regulation for worm presses for clay. A. LUTZE. Ger., 284,596, Sept. 10, 1913.

Handling fresh clay goods. W. BRUDERER. Ger., 285,450, May 10, 1914.

Mica stone. C. INGVALDSEN. Ger., 285,482, Oct. 8, 1913. Mica may be formed readily into block, plates and the like of any form and size by mixing finely divided mica with only so much clay or other addition of similar properties that a coherent formless mass is just obtained. This mass is formed as desired, and burned. The burning is effected at a temp. which results only in a sintering of the mica-clay mixt. The product possesses practically the same properties as the natural mica. In order to secure still greater resistance to higher temps., a mixt. of equal parts of mica and pulverized quartz is employed instead of the mica alone, and a small amt. of clay is added. This mixt. is shaped and burned until the mica melts. A homogeneous mass of great refractory properties is obtained which is also elec. insulating. A stone prepd. in such manner is recommended for use in elec. melting furnaces, carbide furnaces, and the like.

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

The formation of some basic silicates. E. D. CAMPBELL. *Trans. Am. Ceram. Soc.* 17, 66-80(1915); cf. *C. A.* 7, 3400; 9, 703.—In Portland cement, alite (chiefly $3\text{CaO} \cdot \text{SiO}_2$) is the chief constituent, the second in importance being celite, the imbedding magma. Flat disks of clinker made from Lehigh Valley mixt. were burned to $1525\text{--}1550^\circ$. Pure MgO slabs were prepared and placing one above and another below the clinker disks; these trials were burned at various temps. from 1475 to 1575° , the temp. in each case being held within 5° for $2\frac{1}{2}$ to 13 hrs. After such burns the MgO disks were discolored and nearly satd. with the fluid constituent of the clinker. Analysis and calcn. of the mol. ratios showed that: (1) although the proportion of Fe_2O_3 to Al_2O_3 is a little higher in celite than in alite, the difference is not great, and the assumption that Fe_2O_3 is molecularly equiv. to Al_2O_3 , so far as the formation of celite goes, seems justifiable, although the hydraulic properties of the aluminates and ferrites differ; (2) with a given basicity of the entire mass the proportion of SiO_2 to $\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$ in the celite increases with temp.; (3) with a given temp., the proportion of the SiO_2 to the $\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$ in the celite decreases as the basicity of the entire mass increases. From these facts the following hypothesis was derived: (1) Celite consists essentially of a Ca aluminate, fusible a little above 1400° and capable of dissolving when liquid, $\text{CaO} \cdot 2\text{SiO}_2$ and CaO . The CaO is more readily sol. and the solubilities of $\text{CaO} \cdot 2\text{SiO}_2$ and CaO follow laws similar to those which govern the soly. of salts in

liquid soln. (2) The alite consists essentially of either α or β CaSi_2O_6 holding in solid soln. CaO with some Ca aluminate and ferrite. The concn. of the CaO held in solid soln. is dependent upon the basicity of the mass as a whole, and upon the temp., but the limit of soly. apparently is reached when the proportions required to form the usually accepted $3\text{CaO} \cdot \text{SiO}_2$ have been reached. It may be very fruitful to ceramic investigations to conceive the process as consisting of a series of solns. followed by recrystn. from a fusible solvent, until chem. equil. is reached if sufficient time is allowed.

C. H. KERR.

Tests on the inflammability of untreated wood and of wood treated with fire-retarding compounds. R. E. PRINCE. U. S. Forest Products Lab. *Proc. National Fire Protection Assoc.* 1915, 106-49.—An extensive series of tests on the inflammability of wood, on the methods of rendering it fire-retardant by the use of fire-retarding paints and on the injection of chemicals is being made. Small blocks of 11 species of wood were tested untreated. Western red cedar shingles and cypress siding were tested untreated, after painting with various paints and after treatment with the following chemicals: NH_4 -phosphate, -sulfate, -chloride and -alum, $\text{Al}_2(\text{SO}_4)_3$, ZnCl_2 borax and Zn borate. Oxalic acid, Na_2CO_3 and NaHCO_3 were also used on small blocks of noble fir. An app. was developed for testing inflammability. From the data obtained to date it appears that: (1) There was very little variation in the inflammability of the various untreated woods when tested at high temps. (2) NH_4 salts, borax and Zn borate gave better results than the other chemicals. (3) None of the injected chemicals prevented glowing or charring of the wood when it was continuously heated. (4) Wooden shingles may be made fire-retardant by injecting certain chemicals. Painting after treatment is necessary to prevent leaching if sol. salts are used. (5) The pptn. of insol. metallic borates in shingles appears to be the most practical method studied. (6) All the paints tested increased the fire resistance of shingles to some extent. The most effective paint tested, which was suitable for outside use, was one containing Zn borate pigment. (7) Shingle stains did not greatly increase the inflammability of shingles. (8) Paints for interior use were in general more effective than paints for outside use. Detailed descriptions of app. methods of testing and results are given. The work is being continued.

GEO. M. HUNT.

Saving creosote oil in the treatment of piling. C. H. TRESDALE. U. S. Forest Products Lab. *Wood Preserving* 2, 63(1915).—The small end of piling absorbs more oil per cu. ft. than the rest, although it is driven into the mud and needs no protection. The large end is cut off after driving and also needs no protection. Expts. show the possibility of retarding penetration in these portions and thus saving preservative, by leaving the inner bark on them when the rest of the pile is peeled, or by applying special paints. The length which can safely be left untreated must depend on the conditions under which the piling is to be used. Further expts. are desirable.

GEO. M. HUNT.

The preservative treatment of farm timbers. GEO. M. HUNT. U. S. Forest Products Lab. *Wood Preserving* 2, 67-8(1915); cf. *C. A.* 9, 1987.—Coal-tar creosote is generally used for farm timbers. Tar, crude oil, paint, linseed oil, and whitewash cannot be depended upon to prevent decay. Open tank treatment is the most effective and most expensive method suitable for farm use. Dipping and brush treatment may also be used.

GEO. M. HUNT.

Oxychloride cement. L. PINK. *Ger.*, 285,369, Dec. 19, 1913. The object of the process is to prep. the initial material for the manuf. of sorel cement in the form of a dry, slightly hygroscopic powder, ready to mix. This is accomplished by the dry

mixing of MgO and SrCl_2 , with or without anhydrous MgSO_4 . In the latter case, the liquid MgCl_2 forms only upon mixing the powder. The dry powder is mixed with H_2O *in situ* to a slurry which hardens later. The pulverulent mixt. may be transported readily in sacks, and may be stored, if due precautions be taken, without alteration. The MgSO_4 is best used in the form of the monohydrate. In combination with filling material, the mixt. serves for the manuf. of continuous floor surfaces, and without filling it serves other purposes. The SrCl_2 has the advantage over CaCl_2 and MgCl_2 of less fluidity, and over BaCl_2 of being non-poisonous.

Artificial stone. C. H. SCHOL. Ger., 285,316, Dec. 25, 1912. A porous stone is made from blast furnace slag. Cf. C. A. 9, 1837.

Artificial stone. C. SCHNEIDER. Ger., 285,602, May 11, 1913. A rough stone is made from cement and comminuted combustible matter. The outer layer, alone, of the shaped mass contains the combustible matter, so that upon burning, the combustible matter is completely burned before sintering can take place.

Roofing paper. SCHATZ & HÜBNER. Ger., 284,886, Oct. 23, 1913. Coarse paper is satd. with a mixt. of coke-oven tar, Mexican asphalt, charcoal pitch, and brown-coal tar oil. E. g., the coke oven-tar is heated to about 120° , and for every 100 parts are added about 7 parts charcoal pitch, 5 of brown-coal tar oil, and 25 of Mexican asphalt, the mass is stirred thoroughly, and the paper is satd. with the product in the usual manner. The resulting material is smooth and lustrous and stronger than the products obtained by other processes.

21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

Final report of the joint committee on coal analysis of the American Society for Testing Materials and the American Chemical Society. W. A. NOYES, *et al.* *Proc. Am. Soc. Testing Materials* 15, Pt. I, 454-5 (1915).—Investigations have been carried out by sub-committees on (1) prepn. of sample, (2) moisture, (3) deterioration, (4) volatile matter, (5) fixed C and ash, (6) S, (7) P, (8) ultimate analysis, (9) calorimetric detn. See following abstract.

H. L. OLIN.

Report of Committee E-4 on methods of laboratory sampling and analysis of coal. S. W. PARR, *et al.* *Proc. Am. Soc. Testing Materials* 15, Pt. I, 453, and *Year Book* 1915, 596-624.—The committee proposes numerous modifications of the official methods (*J. Am. Chem. Soc.* 21, 1116 (1899)). Dry the lab. sample, if wet, at room temp. or in a special oven (cf. Stanton and Fieldner, *Tech. Paper* No. 8, Bur. Mines) $10-15^\circ$ above room temp., crush to 20-mesh and take a 60 g. moisture sample (a), riffle the remainder to 120 g., crush to 60-mesh, riffle to a final 60 g. sample (b), and transfer it to a 4 oz. rubber-stoppered bottle. Det. moisture on both a and b, after heating the capsules and cooling over H_2SO_4 by heating for 1 hr. in an oven with toluene bath, through which passes a current of air dried with concd. H_2SO_4 . Det. volatile matter by heating a 1 g. sample in a Pt crucible fitted with a capsule cover, in an electrically heated furnace (cf. Fieldner, *Tech. Paper* No. 76, Bur. Mines, p. 21) at $950^\circ (\pm 20^\circ)$ for 7 min. For fixed C and ash, place the porcelain capsules containing the dry sample in a cold muffle furnace, heat gradually to redness, and finish at $700-750^\circ$. Cool in air if the coal is free from CO_3 .—Det. S by the Eschka method. To det. P add 10 cc. HNO_3 and 3-5 cc. HF to the ash from a 5 g. sample, evap. the liquid and fuse the residue with 3 g. Na_2CO_3 . Acidify the filtrates from the leachings with HNO_3 , add molybdate soln. and det. PO_4 — as usual. Directions for detg. calorific values,

involving the refinements common to all accurate work of the kind, are given in detail. The total rise of temp. R due to combustion is $t_c = r_2(c - b) - (t_a = r_1(b - a))$ where r_1 is rate of rise per min. for 5 min. before firing, r_2 rate of cooling of final 5 min. after firing, a the time of last temp. reading before firing, b the time when the rise in temp. has reached 0.6 of the total, c the time of thermometer reading taken when temp. change has become uniform 5 min. after firing, and t_a and t_c temps. at times a and c . The radiation factor $r_2(c - b)$ is added if the temp. is falling at time c , subtracted, if rising; $r_1(b - a)$ is added if temp. is rising at time a , subtracted if falling.

H. L. OLIN.

A critical review of the method employed for determining heats of combustion. STANLEY ROBSON. *J. Gas Lighting* 132, 431-2, 478-9, 532-4, 583-5, 635(1915).

E. H.

Reaction between gas and pole in the electrical ignition of gaseous mixtures. W. M. THORNTON. *Proc. Roy. Soc. London (A)* 92, 9-22(1915); cf. *C. A.* 8, 3498.—Mixts. of C_2H_4 or CO with air have been ignited by break sparks in mixts. in which the % has been varied at atm. pressure, and by long and short jump-sparks in a const. mixt. and varied gas pressure. The limits of inflammability for C_2H_4 are 3.1 and 10.7% in air, of CO 14 and 71%. Electrodes of Pt, Ni, Cu, Al, Fe and C were used. The metal of the sparking points has a great influence upon ignition, at pressures up to an atm., whether the sparks are disruptive or formed by sepn. of the electrodes. The order of difficulty of ignition by continuous-current break-sparks is that of the density of the poles; that by jump or long disruptive discharge sparks varies with the tenacity of the material of the poles; that by alternating or condenser discharge sparks is proportional to the rates of heating of the points of contact. With C poles condenser discharge in coal gas has the most effect upon the H; longer disruptive discharge upon the CH_4 .

E. B. MILLARD.

Coal storage for gas works. A. WEIGEL. *J. Gasbel.* 58, 375-6(1915).—The advantages of closed silos are (1) no deterioration of the coal from weathering, (2) low operating costs for handling coal to and from storage, (3) less space required, (4) more opportunities for the elimination of hand labor. W. describes the silo for the gas plant at Posen where space was limited. The plant consists of horizontal chamber ovens, and the silo is built over the ovens and forms the roof of the oven building. Foundations were expensive but saving of space more than offsets this. The coal goes from cars or barges through rolls and then directly to the silo. The floor of the silo has provisions for insulation and ventilation to prevent overheating the lower layers of coal. A drawing of the plant showing the coal handling system is included.

W. L. BADGER.

Colliery power and by-products from unsalable fuel. M. H. MILLS. *Gas World* 63, No. 1628; *Coking By-Products Section* 19-20(1915).—A discussion of the use of rough slack coal as employed in a Mond producer to generate gas which is utilized in two 200 h. p. engines at a cost of 0.3 d. per unit including depreciation of plant. About 62 cu. ft. of gas are obtained from each lb. of fuel and about 80 lbs. of $(NH_4)_2SO_4$ and 4 gals. of tar from each ton. M. also discusses the use of "butts" or interstratified coal and shale picked from the colliery screenings as used in Kerpely producers. Av. results and description of operation are given. M. L. TROWBRIDGE.

Recent advances in generator gas technic. GWOSDZ. *Feuerungstechnik* 4, 4 (1915).—A review of recent improvements in generator construction, particularly for increasing the yield and recovery of the by-products.

H. R. GUNDLACH.

Comparison of yield and costs of different methods of operating vertical retorts. W. SCHWEIZER. *Düsseldorf. J. Gasbel.* 58, 438-9(1915).—The plant consists of 7

Dessau settings of 10 retorts each, and horizontal chamber ovens. The problem was to produce 2,850,000 cu. ft. of gas daily, with a heating value of 595 B. t. u. per cu. ft. (at 0° and 760 mm., dry gas) and to use as few of the chamber ovens as possible. Plan (a) was to charge the vertical retorts every 12 hrs., use steam in them, and add as much water-gas as possible without going below the required heating value. Plan (b) was to charge the retorts every 10 hrs. and operate them without steam. It was found that (b) gave nearly the same amt. of gas from the vertical retorts as (a), but of enough higher heating value that 190,000 cu. ft. more water-gas per day could be added. The result was about 7% more gas of the same quality by method (b). Comparisons show that (b) costs 24 cents more per 1000 cu. m. than (a). W. L. BADGER.

Blue water-gas and deep-fuel combustion. A. G. GLASGOW. *Am. Gas Light J.* 104, 23, 26-7(1916); see *C. A.* 10, 112. E. H.

Heating experiments with gas coke and metallurgical coke. H. MARKGRAF. *J. Gasbel.* 58, 408-9(1915).—A criticism of the results and conclusions of Otto (*C. A.* 9, 2144) and a reply to M. by Otto. W. L. BADGER.

Gas lighting and hygiene (GRUBER) 14.

22. PETROLEUM, ASPHALT, AND WOOD PRODUCTS.

F. M. ROGERS.

The cracking and distillation of petroleum under pressure. B. T. BROOKS. *J. Frank. Inst.* 180, 653-72(1915).—A review and discussion of patented processes together with expts. on them. A sample of the liquid product (obtained by compressing 1000 cu. ft. of the gas) used for the manuf. of Pintsch gas and obtained by cracking petroleum at high temps. (900°) showed: d. 0.830, distg. below 115°, 88%, treated with cold concd. H_2SO_4 , loss = 48%. The principal constituent of the remainder was C_4H_4 . Expts. on Texas solar oil (d. 0.8862) within the temp. range 430° to 600° yielded 3 to 20% of gasoline boiling below 150°; the product was highly unsatd., the loss on treating with 0.2 vol. of concd. H_2SO_4 averaged about 28%. Contact substances appeared to be without effect, except in the case of Ni, when the amt. of gas produced was greater and the gasoline fraction of the resulting product showed a much greater loss to the H_2SO_4 than when other contact substances were employed. B. has found $HCHO$ and $HCOOH$ among the products of the auto-oxidation of cracked oils, indicating the presence of the group = CH_2 . Ordinary desulfurization methods leave traces of S that soon render the catalysts (Ni and Pd) inactive. In view of the recently proposed method of Bergius, of hydrogenating without a metallic catalyst, an expt. was made in which a sample of cracked gasoline (I no. 55.0) was maintained at 196° for 30 hrs. under a H pressure of 3000 lbs. per sq. in. The I no. after the expt. was 52.9, due to polymerization since a similar reduction occurred in an atm. of N. Cracked oils, desulfurized and otherwise purified by metallic Na, held their H_2O -white color and were decidedly better, even in odor, than good com. "primary" gasoline, after the 2 samples had been exposed side by side to light and air for 6 months. The same marked difference was noted in the case of a sample of "primary" gasoline from Oklahoma crude, part of which was treated with Na and the second part "refined" by H_2SO_4 in the usual manner. S compds., perhaps in the sulfite condition, appear to catalyze the auto-oxidation of such refined oils. Results with the steam-Fe method indicate that hydrogenation of olefins under these conditions is inappreciable. In

order to compare the results obtainable by heating under pressure and subsequently distg. at atm. pressure, Oklahoma reduced oil, containing no constituents boiling below 275° , was heated for 2 hrs. under a pressure of 180 lbs. per sq. in., the pressure being that developed by its own vapors and decompn. products. Subsequent distn. at atm. pressure yielded 5% gasoline. In another expt. in the same app., with the same quantity of reduced oil, for 2 hrs. at 180 lbs., 30% of gasoline was obtained by distg. the gasoline as fast as formed. Continually increasing yields of gasoline up to about 250 lbs. per sq. in. were obtained; with further increase of pressure the yield diminished, the relative amt. of coke and gas formed rapidly increasing. The marked influence of pressure upon the percentage of olefins in the gasoline produced is shown graphically. This decrease in the percentage of olefins in the resulting gasoline is due to their polymerization, not to hydrogenation. Analysis of the gases evolved during distn. of Oklahoma reduced oil at 110 lbs. press. shows the percentage of H to be extremely small. Higher temps. are required to "crack" paraffin than a mixt. of the cyclic hydrocarbons or naphthenes. Paraffin is more stable toward Al_2Cl_3 than naphthenes of about the same range of b. p. Cracking apparently occurs chiefly at the heated surfaces, so that too rapid distn. must be prevented; slow and less intense firing of the still greatly diminishes the percentage of olefins in the gasoline produced, although the yield of gasoline is much increased. The amt. of gas evolved and coke deposited increases very rapidly as the working pressure is increased beyond 100 lbs., varying with app. and distn. rates. If the heating surfaces are vertical, the amt. of coke deposited is not more than 0.2 as much as is obtained under the same conditions but with the heating surfaces horizontal. The claims of Burton to the effect that condensing the vapors under 75 lbs. pressure yields gasoline of satd. character, whereas releasing the vapors close to the still and condensing them at atm. pressure yields gasoline of too unsatd. character for industrial use, could not be confirmed. By distg. Oklahoma reduced oil under 80 lbs., practically identical products were obtained by both methods. Examn. of the gasoline made from Oklahoma reduced oil, 30° B $\acute{e}$., by distg. under 100 lbs., shows that in addition to approx. 8% of C_6H_6 , toluene, and *m*-xylene, the material appears to consist chiefly of normal paraffin hydrocarbons. B. believes that the occurrence of C_6H_6 , toluene, and xylene in the gasoline made by cracking heavy oils under the conditions described is to be explained by the splitting off or "cracking" of high-boiling complex hydrocarbons, containing the phenyl radical. Exptl. results on the Oklahoma reduced oil and on synthetic phenylparaffin are given in detail to support this view. In the course of the work on the distn. of heavy petroleum oils, B. operated up to working pressures of 450 lbs. per sq. in. Tables, curves, and details are given.

F. W. SMITH.

Chemical-technical investigation of the Matitza asphalt. C. NICOLESCO-OTTIN. *Ann. sci. Univ. Jassy* 9, 138-68(1915); *Chem. Zentr.* 1915, II, 504.—The asphalt is dark colored, dull, compact, and has a peculiar odor. The mass is brittle, and has an oily feel; the fracture shows traces of cryst. structure. The material is apparently bituminous; it softens on warming. The $CHCl_3$ ext. averaged 29.91%. Fractional extrn. with alc., then ether, and finally $CHCl_3$ gave (same sequence): 6.5%, 10.3%, 12.3% (=29.2% sol. bitumen). Petroleum ether at 150° extd. 28.35%. Results are shown in tables:

Bitumen.	% C.	% H.	% S.	% N.	% O.	I no.	Sapon. no.
Extd. with alc.....	82.75	10.66	0.57	0.94	5.08	19.15	85.17
Extd. with ether.....	82.52	10.57	0.82	0.88	5.21	17.28	59.03
Extd. with $CHCl_3$	79.85	10.34	0.93	0.86	8.02	25.03	107.60
$CHCl_3$ ext.....	81.12	10.45	0.79	0.88	6.76	19.62	86.36

Bitumen.	Acidity.			D.	Softening point.	Drop point.
	Ether.	CHCl ₃ .	Total.			
Extd. with alc.....	13.03	1.03	14.06	1.0100	30-35°	42-45°
Extd. with ether.....	21.57	4.35	25.92	1.0715	89-92	110-115
Extd. with CHCl ₃	17.44	3.10	20.57	1.1520	155	170-180
CHCl ₃ ext.....	17.41	3.60	21.01	1.0851	78-81	97-99

The C and H content is dependent upon the solubility; the readily sol. portions contained the greatest amts. of C and H. The S and O content increased with diminished solubility. The product is characterized by its low S content. The I no. indicates that the content of unsatd. hydrocarbons must be low. The const. indicate a first class bitumen.

F. W. SMITHER.

Determination of water in mineral greases (CAMPO) 7.

23. CELLULOSE AND PAPER.

A. D. LITTLE.

Advances in paper testing in the years 1913-1914. W. HERZBERG. *Papier Ztg.* 40, 1708-10, 1728-9, 1744-6, 1765-6(1915).—A review. V. NUNEZ.

Paper testing. PAUL WAGNER. *Wochenbl. Papierfabr.* 46, 235-8, 425-8, 621-3, 659-60(1915).—A review of thesis work done at the Kgl. sächs. tech. Hochschule, Dresden. The following subjects are dealt with: influence of animal sizing on the strength of paper; viscose sizing; influence of high temps. on sizing; influence of high temps. on strength of various grades of paper; influence on paper of disinfection by steam, hot dry air, and hot moist air; discoloration of paper with age; influence of aging on strength of papers containing chem. wood pulp as compared to all-rag papers; influence of moisture content of papers on their strength; influence of compn., sizing and ash content on strength of papers made in the same manner; influence of width and breadth of strip, machine direction, and rapidity of applying stress on the results of paper strength testing.

V. NUNEZ.

Testing pulps for moisture. D. V. MCSWENEY. *Paper* 17, No. 11, 16-8(1915).—Well considered suggestions for testing pulp for shipment. V. NUNEZ.

Determination of permeability of paper to air. W. HERZBERG. *Papier-Ztg.* 40, 1656(1915).—An app. for detg. the porosity of paper is described in which air is drawn through a given area of paper by means of a suction pump connected with a pressure regulator. Pressure is measured by water manometers and vol. of air by a gasometer. The app. makes possible the use of const. pressures and use of air of any desired temp. and humidity. At 65% humidity and a pressure of 10 cm. water, blotting paper transmitted 64.3 l. air in 5 min., print-paper 2.9 l., pergamin 0.1 l. and parchment 0.1 l.

V. NUNEZ.

Paper fiber analysis. MAX CLINE. *Paper* 17, No. 3, 19-21(1915); *Chem. Eng.* 22, 164-6(1915).—Microscopic estn. of the ground-wood pulp content of paper, while rapid and convenient, is even approx. accurate only in skilled hands and under carefully controlled conditions. Much greater accuracy is obtained by chem. methods, e. g., phloroglucinol absorption or detn. of cellulose content.

V. NUNEZ.

Beating test for paper-making fibers. E. SUTERMEISTER. *Paper* 17, No. 9, 11-8(1915).—Treatment of pulp for 1 hr. in a small ball mill is a test of great practical value for detg. the strength of sheet to be expected on beating and to detect differences in strength

and quality of the pulp under test. The fiber so treated is made up into sheets on hand molds and their strength detd. by the Ashcroft tester which is more suitable than the Mullen tester for this purpose. The temp. at which the beating is conducted affects the results to some extent, high temps. producing weaker sheets. Atm. humidity has some effect on the results obtained by the Ashcroft tester, the max. strength figures for the fibers tested being obtained between 30% and 50% relative humidity. Of major importance is the moisture control of the pulps taken for test. Wet pulp, i. e., lap pulp which has never been dried, gives the strongest sheets both before and after beating; air-dried pulp gives weaker sheets; and steam-dried pulp still weaker. This loss in strength is progressive as the pulp loses moisture but is most marked when the moisture content becomes less than 10%. For reliable results from this beating test therefore it appears necessary to bring the pulps to a const. moisture content before testing. Soaking in water for an extended period was of some benefit in restoring strength to air-dried pulp and bleaching effected complete restoration of the Ashcroft strength. The strength of the sheets increases with time of beating at least up to 8 hrs. (time limit of tests) and shrinkage on drying also increases. No const. relation appears between percent. shrinkage and strength of sheet. The ball-mill test is applicable to sulfite and sulfate pulps, but ground-wood and soda-poplar pulps yield rather indefinite results.

V. NUNEZ.

Chemical analysis of wood-pulps. BJARNE JOHNSEN. *Pulp Paper Mag. Can.* 13, 600(1915).—Brief review of J.'s researches in the chemistry of cellulose, dealing particularly with estn. of lignin by splitting off the methoxyl group by means of concd. HI, of furfural-yielding constituents by heating with HCl, and of cellulose. In detn. of cellulose hydrolysis of the pentosans is accomplished by König and by Tollens by use of mineral acid. J. finds that these attack the cellulose and advocates use of AcOH for hydrolysis followed by oxidation with NaNO_2 and H_2SO_4 . This modification is, however, not applicable to wood.

V. NUNEZ.

Calculation of the volume and strength of paper. E. H. HJÆRNE. *Papier-Fabr.* 13, 709-13(1915).

V. NUNEZ.

How to photograph the papermaking fibers. H. A. BROMLEY. *Paper Maker and British Trade J.* 50, 491-5(1915).

V. NUNEZ.

Improved titration method for the analysis of sulfite cooking acids. R. DIECKMANN. *Wochenbl. Papierfabr.* 46, 1764(1915).—The method of Sander (*C. A.* 8, 2132) and that of Feld (*C. A.* 7, 2732) rest on the oxidation of the SO_2 to SO_3 by I, setting free I corresponding to the free SO_2 by addition of KI and KIO_3 , and titration by $\text{Na}_2\text{S}_2\text{O}_4$. D. finds the use of KI unnecessary, 5 cc. of 3% KIO_3 soln. only being required for each cc. of cooking acid taken for analysis.

V. NUNEZ.

Specific gravity of wood and pulp. ERICH RICHTER. *Wochenbl. Papierfabr.* 46, 1529-33(1915).—Balsam wood (*Abies fraseri*) of 12.5 to 21.5 cm. diam. gave the following av. values: (a) moisture 49.4%, (b) dimensional shrinkage on drying 8.2%, (c) d. wet 0.688, (d) d. dry 0.373. Spruce (*Picea nigra*) gave (a) 29.4%, (b) 10.0%, (c) 0.583, (d) 0.436. Sp. gr. in EtOH of various sulfite pulps was detd. by pycnometer methods. D. varied from 1.408 to 1.634 and was in general highest in those pulps of high ash and lignin content although no definite relation existed in this regard. D. of pure cellulose by the same method was 1.583 and of black spruce, white spruce and balsam (heart-wood), 1.512, 1.517 and 1.402, resp., showing that the d. of the non-cellulosic constituents of wood must be considerably less than that of the cellulose. Variation in d. from heart to outside of sticks of wood was slight but noteworthy.

V. NUNEZ.

Manufacture of filter paper in France. M. DURIEUX. *Ann. fals.* Aug., 1915; *Schweiz. Apoth. Ztg.* 53, 614-5 (1915).—The old hand or vat process still in use at Ambert, and the modern machine process are described. "Ashless" 9 cm. filter papers leaving 0.000125 and 0.00015 g. of ash are at present obtained, also hardened papers retaining cold-pptd. BaSO₄. S. WALDBOTT.

Removal of rosin from chemical wood-pulp. A. D. G. KUHN. *Papier-Fabr.* 13, 725-30, 744-6 (1915).—Well cooked sulfite pulp made from properly prepd. wood will contain about 44% of the rosin originally present in the wood. Washing the pulp with hot water will largely remove this rosin. The main conditions for effective washing are (1) the entire bottom and preferably also part of the sides of the blow pit to consist of drain plates, and (2) large inlets and outlets for wash water. V. NUNEZ.

Neutralization and fermentation of sulfite waste liquor. ERIK OERMAN. *Papier-Fabr.* 13, 534-8, 553-5 (1915).—General. V. NUNEZ.

Length of fiber of the southern pine. C. BEADLE AND H. P. STEVENS. *Chem. News* 112, 225-6 (1915).—Samples of pulp made from *Pinus palustris* from Florida were found to have an av. fiber length of 5.278 mm. This is exceptional even for long-leaf pine. V. NUNEZ.

Yield of paper on green stem of banana. C. BEADLE AND H. P. STEVENS. *Chem. News* 112, 235 (1915).—The fact that about 132 tons of green banana stem are required, to make 1 ton of paper, would make necessary some mechanical sepn. of fiber on the field if this fiber were to be exploited commercially. V. NUNEZ.

Choice of paper for half-tone engravings. H. P. CARRUTH. *Paper* 17, No. 5 11 (1915).—Discussion of the relation of the kind and finish of the paper and the kind of ink, to the half-tone printing properties, illustrated by excellent photomicrographs. V. NUNEZ.

White wood-pulp board. E. KIRCHNER. *Wochenbl. Papierfabr.* 46, 1492-4 (1915).—Calendering decreased the av. bulk of pulp board from three mills 28%, and increased the breaking length 16.7% and the stretch 14.1%. The length and appearance of the fibers and the slowness of the stock of these boards considered in relation to their respective strengths confirms K. in his belief that most mills grind wood unnecessarily fine for this class of product. V. NUNEZ.

Way to overcome aniline color shortage. A. KOMP. *Paper Trade J.* 61, No. 16, 10-2 (1915).—Enumeration of vegetable and mineral colors used before the introduction of aniline dyes. V. NUNEZ.

Highly polished celluloid surfaces. KRAEMER & VAN ELSBERG. *Ger.*, 285,349, Oct. 31, 1912. The celluloid is polished by pressing against highly polished metal surfaces.

24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

Action of alkalis on trinitrotoluene. M. COPISAROW. *Chem. News* 112, 283-4 (1915).—From the results obtained by many investigators using trinitrobenzene, *p*-nitrotoluene and its numerous *o*-substitution products, including trinitrotoluene, the following conclusions are reached: (1) The reactive sensitiveness of nitro groups towards alkalis increases with their accumulation in the mol. (2) The sensitiveness and number of chem. changes is greatly augmented by the presence of an alkyl radical

in the *p*-position, facilitating probably the formation of nitric acids ($R.NO(OH)_2$). (3) The reactivity of the mol. is very much increased by the introduction of electro-negative groups in the *o*-position to the alkyl radical. Alkalies produce addition, substitution and condensation compds. Alkalies and alk. compds. produce red colorations in α -trinitrotoluene. C. found that when 5 cc. of a satd. soln. of KOH in MeOH (about 33% KOH) cooled in solid CO_2 -ether mixt. are added to 0.166 g. of pure 2,4,6-trinitrotoluene dissolved in 1 cc. of pyridine and 5 cc. MeOH, the latter soln. being kept in solid CO_2 -ether mixt., the color change took place at a temp. as low as -65° . The products of reaction of alkalies with trinitrotoluene are highly explosive. Dupré found the addition of a little KOH caused trinitrotoluene to explode when heated to 160° .
CHARLES E. MUNROE.

Hazards in handling gasoline. GEORGE A. BURRELL. *Bur. Mines, Tech. Paper* 127, 11 pp. (1915).—At ordinary temps. air will hold 5% vapor of cleaner's naphtha, 11% 64° Bé. gasoline, 15% 69° Bé. gasoline, and 28% 73° Bé. gasoline. Because gasoline vapor is 3 times heavier than air the atm. of a confined space has the largest proportion of gasoline vapor at the bottom. The limits of explosibility for gasoline vapor-air mixts. are 1.4 to 6% of the former, although dangerous flashes may be produced in mixts. containing less and more than these percentages of gasoline vapor. One gallon of gasoline can, under ideal conditions, form an explosive mixt. with 2100 cu. ft. of air. Burning liquids are extinguished by forming a blanket of gas or solid material over them to cut off the supply of air, or by diluting them with water. As gasoline is not miscible with water the latter serves but to scatter the burning gasoline; therefore blankets of sawdust or frothy mixts. are used. In some large plants gasoline is stored under pressure of N or CO_2 gas. In others the tanks are kept so filled by aid of water that there is no space for a vapor-air mixt. to form. B. claims that the mixt. may be ignited by sparks.
CHARLES E. MUNROE.

The safe transportation of explosives and other dangerous articles. JAMES L. TAYLOR. *Met. Chem. Eng.* 14, 46 (1916).—A synopsis of an illustrated lecture delivered before the First National Exposition of Chemical Industries describing the development of the Bureau of Explosives of the American Railway Association and the enactment of its regulations into the organic law of the United States. C. E. M.

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Raphael Meldola. A. G. GREEN. *J. Soc. Dyers Colourists* 31, 260-2 (1915).—An obituary.
E. J. C.

The future prospects of the British dye industry. F. M. PERKIN. *J. Soc. Dyers Colourists* 31, 234-41 (1915).
E. J. C.

Coal-tar color industry in the United States of America. K. PIETRUSKY. *Chem. Ind.* 38, 383-5 (1915); cf. *C. A.* 10, 296.—A discussion.
F. W. SMITHER.

Indigo and hydron blue in apparatus-dyeing. ERNST JENTSCH. Copenhagen. *Färber-Ztg.* 26, 202-3 (1915).—A suitable light blue (pearl-blue) which can be obtained on hanks of yarn in a Zn dust-lime vat only with two passages can be produced in a Thiess app. on cops and similar forms with one passage. The stock-soln. (for 1500-1600 lbs. of cops) is made from $2-2\frac{1}{2}$ kg. of indigo MLB powder, $6-7\frac{1}{2}$ l. 40° Bé. NaOH soln., $2\frac{1}{2}$ kg. of hyposulfite, and H_2O to make a vol. of 50 l. Into

the vat of the app. are placed $2\frac{1}{2}$ l. of 50% Turkey red oil, $\frac{3}{4}$ l. 40° B $\acute{e}$. NaOH soln. and 1 kg. of hyposulfite and sufficient H_2O to give a vol. of 1000 l. After circulating for 5 min., 6 l. of the stock-soln. is added through a sieve. Smaller quantities are added for subsequent parts of the lot. The liquor is circulated for $\frac{1}{2}$ to $\frac{3}{4}$ hr. Hydron blues G and R can be used also, and for some shades $1\frac{1}{2}$ – $1\frac{3}{4}$ kg. of hydron blue R can be used in place of 4 kg. of indigo. This effects economy. The dyeings are satisfactory, and less supervision of the process is necessary. Hydron blue G is suitable for a light pearl-blue, the bath being nearly exhausted. Without Turkey red oil, the dye is not distributed well in the bath, and the deposit is largely superficial. A concd. stock soln. cannot, however, be prepd. An abundance of NaOH must be used in order to utilize the dye thoroughly. The baths may be used subsequently for lighter shades.

W. F. FARAGHER.

The action of assistants in monochrome dyeing. A. GROSS. *Färber-Ztg.* 26, 185–6(1915).—Rapid dyeing methods for wool have become necessary and for this reason the use of the monochrome process has been favored. In $2\text{--}2\frac{1}{4}$ hrs. a lot of field-gray can be turned out which is entirely satisfactory in regard to fastness. It was formerly impossible, however, to guarantee an exact match in shade for different lots, as matching is more difficult with this process than with the after-shaded acid-process. It is known also that different qualities of wool when dyed together in a lot always differ in shade. This was of less importance for the user than having fugitive dyeings. By regulating conditions, satisfactory matches can now be obtained without shading. The use of assistants is important. Glauber's salt and $MgSO_4$ are essential with some dyes and in no case are they detrimental. They act also as good bath-purifiers. When replacing one of these by the other in producing light shades, they should be used in quantities proportional to the molar wts., in order that the concns. of SO_4^{--} may be equal, and the shade obtained be thereby maintained.

W. F. FARAGHER.

Rapid dyeing methods. G. TAGLIANI. *Färber-Ztg.* 26, 225–8(1915).—Piece dyeing of cotton goods is generally done by one of two methods: jig-dyeing for fabrics which require handling in open width and under tension, and reel-vat-dyeing for fabrics which can be handled as hanks. Other processes are being used, as, e. g., the continuous vat and so-called foulards. The latter are, however, less frequently used. Until recently, foulard-dyeing had found practical use only when bright and medium shades were desired and when no great demands on levelness, penetration and fastness were made. The process is, however, cheaper than the other methods. It allows all of the after-treatments, and insures good production. The method is essentially one of short immersion of the fabrics, followed by squeezing and drying in warm air. For dark shades, the proper amt. of dye soln. must be left in the fabrics, and the soln. must be taken up quickly and evenly. For this reason, the baths consist of a concd. dye soln. nearly free from salts and contain some dextrin and sol. oil. A short exposure to the air should be given before the piece passes onto the copper drying drum. By supplementing with a small steaming app., washing app., and chroming or acid vats, vat dyes may be used.

W. F. FARAGHER.

Replacing Turkey red oils from castor oil by sulfonated products from the free acids of this oil and from oleic acid. FRANZ ERBAN. *Färber-Ztg.* 26, 186–91 (1915).—The castor oil fatty acids were prepd. by sapon. with NaOH and subsequent treatment with H_2SO_4 . In heating the fatty acids to sep. them from the acid liquor and to dry them (100°) some polymerization is effected as is shown by the acid number (169 instead of 188). The mixt. contained 82.3% free mixed fatty acids, 15.3%

diricinoleic acid, 1.8% unsaponified oil and 0.6% water and impurities. H_2SO_4 (66° Bé.) was used in 3 proportions, namely, 15, 25 and 35% of the wt. of the fatty acid. Partial neutralization was obtained by the use of NaOH solns. The resulting products were in all cases inferior in stability and emulsifying power to the corresponding products made from neutral oil. In the case of the products with the higher percentages of combined S, the low percentage oils could be had only in the form of rather unstable emulsions. The products from com. oleic acid (red oil) were still less satisfactory. For some purposes, however, the stability and emulsifying power of these products are sufficient to justify their use. Directions in full are given for prepg. the various products and for using them in the production of various dyeings.

W. F. FARAGHER.

Progress in the preparation and use of oxidizing agents. FRANZ ERBAN. Vienna. *Färber-Ztg.* 26, 228-32, 242-7(1915).—A review of the literature since 1912.

W. F. FARAGHER.

American cotton industry as seen by the industrial chemist. F. DANNERTH. Newark. *J. Ind. Eng. Chem.* 8, 75-8(1916).—In this address a strong plea is made for more chemical control and research work in all lines of the cotton industry.

L. W. RIGGS.

The Cross-Bevan jute-reaction and its use on raw cotton. R. HALLER. Traun. *Färber-Ztg.* 26, 157-9, 173-6(1915).—Upon mixing equal vols. of 0.1 N FeCl_3 and 0.1 N $\text{K}_3\text{Fe}(\text{CN})_6$ solns., a clear, brown soln. is obtained. This reagent is, however, not stable, and there soon appears on the surface a blue opalescent skin and simultaneously the soln. deposits a dark green ppt., which according to Messner (*Z. anorg. Chem.* 9, 126(1895)) consists of Prussian green, $\text{Fe}_3(\text{CN})_{24}$. In the freshly prepd. soln., jute soon acquires a dark blue color, with no trace of green, showing that the deposit on the jute is not Prussian green. C. and B. proved it to be Prussian blue. Since reduction of ferricyanide does not occur on standing, jute must contain some reducing substance. Pure cellulose and lignocellulose do not react, while certain varieties of raw cotton give a positive reaction. C. and B. showed that the addition of an oxidizing agent to the reagent does not prevent the reaction. Raw khaki-cotton (*Gossypium hirsutum* var. *religiosa* Watt) soon becomes blue-black, and *Gossypium nanking* var. *Himalayana* Watt (gray in color) acquires a slightly less intense color, which has a decidedly green cast. The whitest, purest of raw cotton, *Gossypium barbadense* Tiun (sea island) is colored a bright yellowish green. In the case of *religiosa* Watt the ppt. is Prussian blue. The fibers are colored homogeneously, as is shown by the microscope. Treatment with Schweizer's reagent reveals that only the outer cuticular layers contain ppt. By isolating the two brownish yellow natural coloring matters of cotton and cotton-wax, H. showed that each is able to ppt. Prussian blue from the reagent. The dyes which were recovered were altered, showing that the originals had undergone chem. change. C. and B. attributed the reaction to aldehydes. Hydrocellulose and oxycellulose give negative reactions although they are reducing agents and it follows that certain groups are essential. The freshly prepd. soln. shows sub-microns in dark-field illumination. These are very numerous and have a peach-blossom color. The separate solns. are optically empty. Soon larger aggregates without motion are observed, although macroscopically the soln. has not changed. Presumably this disperse substance is a ferric ferricyanide. If the brown soln. is placed in Schleicher-Schüll dialyzing thimbles, large quantities of $\text{K}_3\text{Fe}(\text{CN})_6$ pass through at first, together with HCl. The membrane soon becomes blue and a small blue ppt. is formed on the inside of the thimble. If the dialysis is continued until no more ferri-

cyanide passes through, and the contents of the thimble are filtered, a pale green filtrate is obtained which contains ferricyanide (shown by FeSO_4), but which gives no test for FeCl_3 . No FeCl_3 was found in the outer liquid at any time. Also no $\text{Fe}(\text{OH})_3$ can be present in colloidal soln., as even traces of ferricyanide ppt. this colloid. The filtrate, in dark-field illumination, shows large numbers of silvery mobile particles which are highly disperse. Even strong NaCl soln. does not flocculate this colloidal soln., which thus has an emulsoid character. Similar colloidal solns. are obtained by adding $\text{Na}_2\text{S}_2\text{O}_4$ in quantities insufficient for complete reduction of the reagent. A dark blue soln. results, which contains, presumably, colloidal Turnbull's blue and Prussian blue. Electrolytes do not flocculate this soln. (cf. Eibner and Gerstacker, *C. A.* 7, 2313). The pale green filtrate from the dialyzed jute reagent has a greenish luster—almost a fluorescence. Disperse blue substances usually appear violet-copper-red. The filtrate does not color jute, but does so weakly if a little FeCl_3 is added. The latter is apparently necessary for the reaction, as addition of HCl is without effect. By dialyzing a soln. of FeCl_3 in the presence of aniline, a colloidal soln. of $\text{Fe}(\text{OH})_3$ is obtained. When the aniline is added, its odor disappears, and a brown soln. similar in appearance to the jute reagent is formed. CaCO_3 and BaCO_3 do not behave similarly, as they adsorb $\text{Fe}(\text{OH})_3$. Addition of $\text{Fe}(\text{CN})_6^{3-}$ to the aniline-containing soln. gives a ppt. of Prussian blue. Other amines and phenols act similarly. However, amines and phenols which contain a nitro group do not give the reaction. H. concludes that the substances in jute and raw cotton contain NH_2 and OH groups. Treating jute with NaNO_2 to eliminate NH_2 groups, he finds that it still reacts, and concludes that OH groups are present. When jute is added to the reagent, the latter is imbibed freely. The reduction of the ferricyanide by the incrusting substances of the jute follows and the ppt. is formed in the fibers. This agrees with an observation made by Schwalbe ("*Zellulose*," p. 375, footnote) that only a weak color results when the jute is first immersed in the FeCl_3 and then in the $\text{K}_3\text{Fe}(\text{CN})_6$, since the color should be more intense when the two solns. are imbibed together. Simultaneously the ferric ferricyanide is adsorbed and the reduction follows. The mechanism of the process is therefore that of substantive dyeing.

W. F. FARAGHER.

Determination of the breaking strength of yarns and fabrics made from animal fibers. ERNST KRAUS. *Färber-Ztg.* 26, 232-3(1915).—The ordinary dynamometric tests giving breaking strength and elongation do not suffice to enable one to judge of the value of wool and silk materials. The considerable elasticity of these fibers is one of their most important properties. Within the elastic limit, the elongation is temporary and only when the elastic limit is passed, does the elongation become permanent. The simple detns. of max. elongation and breaking strength do not characterize wool. App. showing the elongation as a function of the applied load, in the form of a curve, are essential, as two samples may show the same max. elongation and breaking strength, and still be unequally valuable. Such an app. is that of Hartig. A 50 cm. test piece is used, and the app. is constructed for max. loads of 10, 20, 30, 40 and 50 kg. The cost is 850 M.

W. F. FARAGHER.

Water proofing military fabrics. H. POMERANZ. *Färber-Ztg.* 26, 171-3(1915).—Although the military authorities specify the nature of the dyes and the methods of dyeing, until recently they have not issued directions for the no less important matter of waterproofing and for the detn. of the degree of waterproofing obtained and the safety of the process for the fabrics. The recent requirement that the fabric shall withstand for 24 hrs. the action of a water column covering 50 sq. cm. and having a height of 75 mm. without allowing a drop of water to pass, is unsatisfactory. This degree of waterproofing can be reached by almost any of the processes in use. It is

important to det. how the fabric behaves after it has undergone the above test. If it begins to allow water to pass after 24 hrs., it frequently happens that the property of waterproofing is lost. Such waterproofing is illusory, and the fabrics will surely fail in field-use. Substances which render fabrics waterproof are not always insol. in water. Some swell in water and nearly all undergo some change. The desirable property therefore tends to disappear as the fabrics are continually subjected in service to the action of water. The above test should therefore be repeated several times. No material should be used which can weaken the fibers, and none the presence of which is unpleasant or unhygienic. The military department now forbids the presence of free acid and of alum or $\text{Al}_2(\text{SO}_4)_3$. The tests given are the action on litmus paper and the use of BaCl_2 . On the other hand, they recommend Al acetate and Al formate, fats, paraffin, etc. It is questionable whether the Al acetate mentioned is suitable, since on heating it passes into sol. basic compds. The mixed sulfate-acetate which is used sometimes as a mordant, should be preferable, since on heating it forms difficulty sol. colloidal $\text{Al}(\text{OH})_3$, free from acid. The product must be made sufficiently basic to insure the deposition of colloidal $\text{Al}(\text{OH})_3$ at 60–65°. There have recently been put on the market soaps which may be added to solns. containing Al^{+++} without the formation of a ppt. of Al soap. The soap removes the acidity of the soln., thus satisfying the requirements of the authorities. No sol. compds. of Ca should be present in the soln.

W. F. FARAGHER.

Waterproofing military fabrics. Reply to H. Pomeranz. C. BOCHTER. *Färber-Ztg.* 26, 214–6(1915).—Polemical (cf. preceding abstract). Repeating the water column test does not insure that a fabric which passes the test will preserve its waterproof character for a long time under service conditions. It is natural, however, that a fabric which withstands the test several times will be superior in use to one which fails on the second trial. B. proposes that the test-piece be crumpled while moist before drying after each test or that it be laid in small folds and allowed to dry thus. The tests are then to be repeated after intervals of 24 hrs. Usually a single repetition is sufficient, although if there is doubt, further tests should be made. Both Al acetate and Al formate are preferable to the mixed Al acetate-sulfate proposed by P. Waterproofing does not depend upon the deposition of a colloidal, acid-free $\text{Al}(\text{OH})_3$ by heating to 60–65°. The object of the heating is to fix the basic Al compds. upon the fabrics, so that they may be subsequently converted into Al soaps. For complete decompn. of the Al compds., thorough drying must follow the immersion in the boiling soap soln. The conversion of the Al compds. into $\text{Al}(\text{OH})_3$ would therefore be undesirable, as no Al soap could be produced. Moreover, the $\text{Al}(\text{OH})_3$ becomes hard and horn-like in time, and is then incapable of forming a continuous, elastic coating. Since the military fabrics are mostly dyed with S dyes, the use of H_2SO_4 even in the form of its salts is to be avoided. $\text{Al}(\text{OH})_3$ deposited on the fibers would be less readily attacked than the fibers. It is well known that it is difficult to wash out impurities in the presence of colloids and water-repellant substances, and it is therefore wise, when such substances are present, to avoid the use of H_2SO_4 . A satisfactory process devised by B. is as follows: Impregnate the fabrics in a double padding-machine with 4–6° Bé. Al acetate and then dry carefully in a hot-flue or dry-room at 45°. On a similar machine, treat the dried fabric in the following soln.: 25 g. grained soap, 5 g. rosin and 2 g. soda per l., or 15 g. dry, pure Na stearate, 5 g. rosin, and 2 g. soda per l. The addition of paraffin or stearin increases the effect. The bath should be as hot as possible. A second passage through the Al acetate after drying the Al soap is advisable. The fabrics should now be dried at a high temp. The frequently used process which is the reverse of B.'s gives inferior results and should be abandoned.

W. F. FARAGHER.

Waterproofing military fabrics. Remarks on Bochter's criticism. H. POMERANZ. *Färber-Ztg.* 26, 247-8(1915).—Polemical (cf. preceding abstracts). W. F. F.

Way to overcome aniline color shortage (KOMP) 23.

Printing in fast colors. BADISCHE. Ger., 284,855, Sept. 25, 1912. Addition to 281,859 (C. A. 9, 2154). Instead of fixing by steaming, as in the parent specification, fixing can be accomplished by treating the print with alk. agents. The resulting prints are similar in shades and properties to those obtained by the principal process. E. g., a print is made with a color containing 200 g. of a soln. prepd. from 20 g. Na hexahydroxyanthraquinonedisulfonate and 40 g. of fluorochrome, together with 40 g. HCOOH, 500 g. HOAc-starch-tragacanth thickening, and 260 g. H₂O. After drying, the print is treated for 1-2 mins. with a 3% soda soln., rinsed, and finished in the usual manner. Blue-green shades, very fast to washing and light, are obtained. The fixation can be effected also with NH₃ in soln. or as vapor.

Treating wool-scouring liquors. W. G. ABBOTT. Brit., 18,736, Aug. 17, 1914. Wool-scouring and like liquors are treated to sep. grease, etc., by heating under pressure until light greases rise to the surface, heavy greases settle to the bottom, and the intermediate liquor is clear. The liquor is heated in a closed vessel by a steam coil to about 165° until a sample of the liquor in a test glass suitably connected to the vessel, becomes clear by settlement of the grease on standing. The liquor is allowed to cool. The light grease, the clear liquor, and the heavy grease are removed sep.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

An electrically conducting paint. M. JAMES. *Elec. World* 67, 51(1916).—Two methods may be used: (1) treatment of a freshly bronze-painted surface with concd. HCl; (2) application of a paint that has been made to conduct by mixing with HCl. Exposure to HCl fumes also gives a like result. Although the entire film becomes conducting, the cond. varies greatly from point to point. The second method is carried out as follows: Bronze powder is mixed with amyl acetate soln., concd. HCl added and the whole stirred till pasty. The HCl is then washed out with H₂O, the paste decanted and mixed with Me alc. until suspension is obtained. The alc. is then poured off and more amyl acetate soln. added to get a good paint. The paint should be applied fresh. A soln. containing 2 parts amyl acetate to one of acetone and 5% celluloid yielded a paint of good covering quality and a surface resistance of 0.1 ohm per sq. cm. for 0.05 mm. thickness. The resistivity increases with time. A film on glass kept in the dark increased 50% in 4 mos. and in sunlight 200%. The presence of varnishes, shellacs or gums leads to the corrosion the metallic particles and should be avoided. W. E. RUDER.

Determination of the covering power of paints. H. K. VAN VLOTEN. *Chem. Weekblad* 12, 1077-8(1915).—On the rough side of a glass plate ground on one side, measuring 25 cm. by as many times 15 cm. as there are paints to be examd. at one time, is pasted a paper sheet with equally distant rectangular openings 20 × 10 cm. Small quantities of the different paints are mixed with a previously detd. percentage

of unboiled linseed oil. The glass plate is placed with the paper side down on the balance and equal quantities of the different paints weighed out on the uncovered sections. The paint is then spread out so that equal surfaces are covered with equal amounts of paint. The glass plate is placed in an inclined position, so that part of the paint flows down towards the lower edge but remains on the original surface. The wedge-shaped layer of paint is allowed to dry. A black strip on the opposite side of the glass shows the relative transparency of the different paints. J. V. F.

Polymerization of Chinese wood oil. C. L. SCHUMANN. *J. Ind. Eng. Chem.* 8, 5-15 (1916).—From his expts. S. concludes that the polymerization of Chinese wood oil is analogous to that of linseed oil, and takes place through the dissolution of one unsatd. linkage in each elaeomargaric chain, forming a triglyceride composed of dimolecular fatty acids. The formation of the gel is due to an insol. colloidal mass containing mol. complexes. The polymerization is "mesomorphic." The intermediate product is sol. in ordinary org. solvents, except very light petroleum ether, as well as in unchanged wood oil and rosin. The % of polymerized triglyceride in gels of the same apparent consistency is not necessarily the same. Elaeomargaric acid will cryst. from a dil. EtOH soln. at a temp. of 0°, while the acids from the polymerized triglyceride remain sol. If Chinese wood oil is rapidly heated to 350° it will polymerize, but the decompn. products will prevent the formation of the gel. Chinese wood oil polymerizes more rapidly than linseed oil; CaO, PbO and oxidation products act as catalysts accelerating the polymerization. The course of polymerization can be followed by the I value. Dissolving the gel in rosin or continually heating it above 250° constitutes a reformation of the sol. intermediate product. The darkening of rosin-Chinese wood oil mixts. is due to oxidation and may be avoided by the exclusion of air during heating. The pure polymerized product of Chinese wood oil dries very slowly.

E. W. BOUGHTON.

Boiled oil. W. FAHRION. *Chem. Rev. Fett-Harz-Ind.* 22, 110-2 (1915).—A semi-popular article which defines the meaning of "boiled oil" (linseed oil which has up to 2% metallic oxides incorporated for the purpose of increasing its drying speed), linoleate, resinate, oxide-driers, etc., and which repeats P. Muhle's proposition of distinguishing 5 classes of boiled oils: (1) Plain boiled oil (Firniss), drying oils which have their driers dissolved below 150°, (2) boiled oil (gekochter Firnis), temp. at least 200°, (3) blown oil (geblasenes Öl), (4) blown and boiled oil (geblasenes und gekochtes Öl) (5) siccativated oil, containing at most 5% drier and prepd. cold. P. E.

A modern jappanning plant (TURNBULL) 4.

Anti-fouling paint. B. MALENKOVIC. *Ger.*, 285,261, Dec. 23, 1913. The products contain ethers or esters of the naphthols or their homologs or derivs., especially the hydroxy and amino derivs. of these compds., not, however, nitro derivs. The aromatic ethers and esters have been found to exert a repelling action on the lower animals merely by the odor which is commonly present. Further action is, in sequence, exciting, stupefying, paralyzing, and finally lethal. These ethers and esters act more quickly in proportion to their volatility. Too great volatility, nevertheless, is detrimental to their practical use. Less volatile and more active are the ethers and esters of naphthalene and its homologs and of naphthols and their homologs, *e. g.*, naphthyl methyl ether, naphthyl isoamyl ether, naphthyl acetate, naphthyl ether, dinaphthylene oxide. All these substances may be converted into powerful poisons for lower plants

if salt-forming groups are introduced into the atomic complex, whereby H_2O likewise results. The salt-forming groups specified are OH , NH_2 , and NH . The group SO_3H is not suitable, since it neutralizes the action, also the group $COOH$ is not well suited, since it has a weakening effect. For ships' bottoms these substances are simply added to the pigment, but for painting wood, they are dissolved in oils or converted into salts and dissolved in H_2O . Sprays for plants are prepd. in the latter manner.

Oil and paint films. OEL & FARBFILM AKT.-GES. Brit., 18,889, Aug. 20, 1914. Oil and oil paint films are prepd. in the form of webs of any desired size by impregnating a strong, slightly glued paper with an alk. soln. such as water-glass soln. on one side, the other side being, if desired, varnished, and then spreading the oil or paint on the side that has been impregnated with water-glass. The alkali saponifies the oil so that, on drying, the film may be stripped off, and is sufficiently adhesive on its saponified side to adhere to any desired surface without additional adhesive. The films may be attached to fabrics, paper, wood, Fe, etc., to give a washable or water-proof surface for bags, packing material, wall coverings, clothing, etc. Cf. C. A. 9, 2319.

27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

Annual review on fats, oils and waxes for 1914. W. HERBIG. Chemitz. *Chem. Rev. Fett-Harz-Ind.* 22, 17-9, 28-30, 38-40, 47-9, 57-60, 67-9, 80-1, 90-2, 99-101, 108-10(1915).—A comprehensive and critical annual review. P. ESCHER.

Manufacture of lanolin. B. LACH. *Seifensieder-Ztg.* 42, 929-31, 950-1(1915).—The amt. of wool fat in wool varies from 6 to 35%. It is recovered by extn. with a solvent or by washing with alkali carbonates and acidifying the soln., or the wash waters may be treated by alk. earth salts. In both cases the waters are filtered and the cake dried in the 1st case and acidified in the 2nd to decompose the soaps. If lanolin is to be made, the fatty acids are removed by pptn. with $Mg(OH)_2$ and the unsaponifiable matter extd. with CS_2 , benzine or trichloroethylene. The best solvent is acetone. In order to remove all saponifiable matter the above handling is repeated. The crude wool fat obtained from the wash waters is often distd., yielding, after pressing, wool fat, olein and stearin. The crude lanolin is purified by bleaching with fuller's earth.

E. SCHERUBEL.

Fish oil industry in Hokkaido. SEIICHI UENO. *J. Chem. Ind. Japan* 18, 798-808(1915).—Hokkaido is known as a famous fishery in Japan. The oils produced are classified by U. as follows: body oils: herring (*Clupea pallasii* C. & V.), sardine (*Sardinella melanosticta* T. & S.), flat fish (*Pleuronectidae*), kinkin oil (*Helicobnus marmoratus* C. & V.), sculpin oil (*Myoxocephalus*), menukedai oil (*Sebastolobus macrochir* Günther), kuromenuke oil (*Sebastes glaucus* Hilgendorf), suginouwo oil and sand eel oil. Liver oils: cod liver (*Pollachius brandti* Hilg.), sting ray oil (*Dasyatis akajei* M. & H.), ray oil (*Raja kenoei* M. & H.), suketo, tara oil (*Pollachius chalcogramma* Pall), shark oils (*Selachoidae*), calamary and cuttle fish and globe fish oil. Blubber oils: whale oils. Liquid waxes: sperm oils. Herring and liver oils are prepd. on a large scale. The body oils are inferior in quality and are used in the hardened oil industry. E. S.

Hardening of oils. SEIICHI UENO. *J. Chem. Ind. Japan* 8, 545-65(1915).—Discussion of the following subjects: Hydrogenation of sardine oil on a semi-industrial

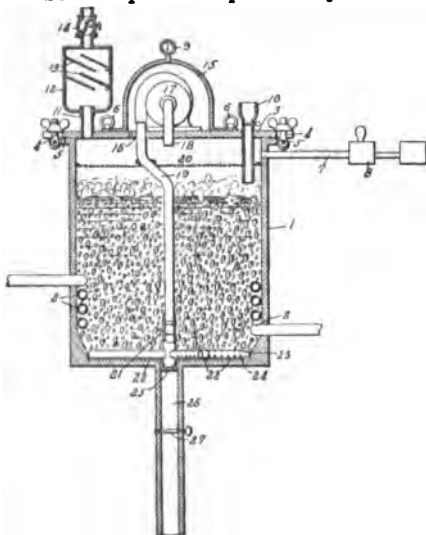
scale. Examn. of the intermediate products of hydrogenation. Durability of the activity of Ni and revivification of spent catalyzer. Hydrogenation at low temps. Relation of the catalytic activity of Ni-kieselguhr catalyzer to the proportions of the Ni and its carrier. E. SCHERUBEL.

Fatty oil from rose seed (hagebutten). ARTHUR MEYER. *Apoth.-Ztg.* 30, 595 (1915).—Grape seed is also mentioned as a possible source of fatty oil. W. O. E.

Conservation of hot transformer oils through absence of air. P. M. GREMPER. *Seifensieder-Ztg.* 42, 936(1915).—It was found that when these oils are kept from contact with air they do not decompose. E. SCHERUBEL.

Modern toilet-soap manufacture. B. ZIENLE. *Seifensieder-Ztg.* 42, 949-50 (1915).—Discussion of necessary equipment. E. SCHERUBEL.

Soft soap from liquid linoxyn. H. GRIFF. *Seifensieder-Ztg.* 42, 929(1915).—A satisfactory Na and K soap was made from liquid linoxyn either half boiled or cold made. E. SCHERUBEL.



Replacing Turkey red oils from castor oil (ERBAN) 25. Relative digestibility and utilization of lard and hydrogenated vegetable oil (SMITH) 11E. Sulfonated oils (BUMCKE) 29.

Hydrogenation of oils. K. P. McELROY. U. S., 1,157,993, Oct. 26. Hydrogenation of oils such as cottonseed oil is effected by maintaining a body of mixed oil and catalyst in the chamber 1 heated by a steam coil 2 and circulating H from the upper to the lower part of the chamber by the blower 17 and pipes 18 and 19. The catalyst is used on a light carrier such

as petroleum coke so that it is readily kept in suspension in the oil. 7 is a H supply pipe. 14 is a vent for waste gas and 12 an entrainment chamber for sepg. liquid.

28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

A review of the progress of the sugar industry in 1914. V. VILLAVECCHIA AND G. ROSSI. *Ann. chim. applicata* 4, 270-84(1915). E. H.

Molasses formation from the standpoint of the phase rule. T. VAN DEN LINDEN. *Arch. Suikerind.* 23, 1033-50, 1389-1418(1915).—The system sugar-H₂O-non-sugar is discussed as though the non-sugars could be represented by a single component. Molasses is defined as a mixt. which is satd. not only with respect to sucrose but also with respect to at least one more substance. Ideal diagrams for this ternary

system are given and the influence of various factors on molasses formation is discussed in the light of these diagrams. On the assumption that no compds. are formed, the conclusions are: (1) For every mixt. of a given purity there is a definite Brix below which true molasses cannot be obtained after cooling and centrifuging. (2) If cooked to too high a Brix it may be dild. to the proper Brix without greatly changing the purity of the molasses. There are 2 possible cases depending on the position of the sugar-non-sugar eutectic line; (a) the purity decreases with the H_2O content, (b) it increases with increasing H_2O . (3) If dild. below the proper Brix, the purity will rise rapidly. (4) The lower the purity of a pan, the lower the Brix to which it should be boiled. (5) A pan of low purity may be dild. further than one of high purity if both were boiled to the same Brix. (6) The higher the Brix to which a pan is boiled, the higher should be the temp. of centrifuging. If (2a) holds, this is disadvantageous; if (2b), the reverse. (7) If (2a) holds, adding H_2O and cooling may sep. out sucrose and evapg. H_2O will have no effect; if (2b) holds, adding H_2O has no effect and evapg. H_2O seps. out sucrose. (8) If the non-sugars are largely inorg. the purity will be high (beet molasses). (9) If the non-sugar is chiefly invert the purity will be lower (cane molasses). (10) If the ratio glucose: ash is high the purity of the molasses will be low and *vice versa*. (11) Adding glucose to thick juice should lower the purity of the molasses [but see Claassen, *C. A.* 9, 975.—ABSTR.]. (12) Any substance of low m. p. which does not introduce other complications will have the same effect as glucose. On reviewing the same ground but with the assumption that compounds might be formed, there are no important changes in these conclusions. If molasses is considered, not as a eutectic but an exactly satd. soln. of sucrose, whether stable or metastable, it is necessary to det. the surface representing satd. sucrose solns. in the system sucrose-glucose-salt- H_2O . This can only be done very incompletely from data now available; and the most satisfactory progress is made from this point on by Geertig's molasses theory.

W. L. BADGER.

Molasses from the standpoint of the phase rule. A. SCHWEIZER. *Arch. Suiker-ind.* 23, 1054-6(1915); cf. preceding abstract.—Comment on van den Linden's article, and suggestions as to investigations which should be taken up to throw light on obscure points in the equil. diagrams.

W. L. BADGER.

Report on saccharine products. F. L. SHANNON. *J. Assoc. Official Agr. Chemists* 1, 472-80(1915).—This work consists of a study of the methods for the detection of artificial invert sugar in honey. Nine of the best tests were used and it was found that artificial invert sugar can readily be detected when it is present in amts. of 20% or over. When the amt. is only 5% some difficulty is experienced. The nature of the adulterant has something to do with the possibility of its detection as a 5% Herzfeld sirup was readily detected in a sample while the presence of 5% commercial invert sugar in a sample was considered doubtful. This is explained by the fact that the Herzfeld sirup was made by heating while the commercial invert sugar was no doubt made in the cold. Further work is recommended with Feder's aniline-HCl test and with the Fiehe test by allowing the color to develop 24 hrs., noting the color immediately after the addition of the reagent in the Hartman modification and changing the word "vigorously" to "gently" in the Bryan modification of this test.

A. GROSS.

The double polarization process applied to cane products and the variation of the constant to be applied. H. PELLER. *Intern. Sugar J.* 17, 558-60(1915); cf. *C. A.* 9, 3374.—P. does not believe that the double polarization process is inapplicable to cane juice which has been treated by lime at the b. p. and stated by Walker (*C. A.* 10, 127) to be due to the decompn. products of glucose, causing too low results. He expects

to show by previous experience and a series of expts. that the double polarization method is not at fault. Walker suggests that the const. be changed from 142.66 to 142.92. From the analysis of the pure sugars prep'd. by Walker, P. finds that the polarization should have been higher and concludes that the saccharimeter used by W. must have corresponded to 99.90 at the 100 point. The question of the correctness of a const. is a matter of individual treatment, variations in instruments and methods causing the usual differences suggested.

A. GROSS.

Contribution to the examination of cane sugar. T. v. FELLEBERG. *Mitt. Lebens. Hyg.* 6, 197-8(1915).—For the detn. of invert sugar in the presence of sucrose, dissolve 20 g. of the sugar in cold, recently boiled H_2O and dil. to 200 cc. Place 50 cc. in a porcelain dish and heat to boiling; add 50 cc. of Fehling soln., treated in the same way, to the sugar soln. which is covered and kept boiling for 2 min. Make a blank with 5 g. pure sucrose. The difference between the value for the blank and that for the sample is the invert sugar, termed by F. "organic impurities." The sample of sugar examined had a faint odor and taste of caramel with H_2O insol. of 0.11%, ash 0.02%, and invert sugar (organic impurities) 0.11%.

A. GROSS.

The determination of reducing sugar in the presence of sucrose. H. PELLER. *Ann. chim. anal.* 20, 169-75(1915); cf. *C. A.* 8, 1681, 2633; 9, 1699, 2463.—Saillard is wrong in saying that, while sucrose does not reduce Fehling soln., it influences the results. Sucrose reduces Fehling soln.; the reduction is greater the longer the boiling, the greater the amt. of sucrose, or the greater the alkalinity of the soln. Sucrose does not reduce Violette's soln. 10 g. sucrose boiled 10 min. by the new procedure of P. (*C. A.* 8, 1217) gave no reduction. Longer boiling gives reduction. The ordinary purification of sucrose does not free it from reducing sugars. Beet sugar, prep'd. by an alk. process and centrifuged, contains 0.03% ash, 0.04-0.05% org. matter, 0.06-0.08% H_2O , and gives no reaction for invert sugar, when tested by a process which will show the presence of 0.01%.

P. M. GIBSY.

The influence of the methods of juice purification on the production of molasses. J. S. DEHAAN. *Arch. Suikerind.* 23, 878-88(1915).—Results for 1914 from 9 carbonation factories (a) and 22 defecation-sulfitation factories (b) were recalcd. to give parts molasses of 87.4° Brix and 37.8 purity per 100 parts non-sugars in the raw juice. This gives for (a), max., 168; min., 110; av., 134; for (b), max., 181; min., 155; av., 166. The figure 168 for (a) comes from a plant which has always had a high figure for the amt. of molasses formed, perhaps from especially high alkali salts in its juices. Omitting this the max. for (a) is 142 and the av. 128.5. Calcns. are given which show that for conditions in Java the carbonation process results in a yield of 2.53% more marketable sugar. For 100 parts of non-sugar in the raw juice, the carbonation factories sent 73 parts, the defecation factories 90 parts, into the molasses. Non-sugars are obtained by calcn. from Brix and purity. A sample of raw juice was purified by different methods, and the change in sulfate ash detd. to check the removal of inorg. non-sugars. The raw juice had an ash of 1.66%. Defecated with 0.8% of 15° Bé. milk of lime, the ash increased 2.4%; double carbonation by the usual method, 10% of 20° Bé. milk of lime, a decrease of 26.3% ash; single carbonation, same liming, decrease of 25.8%; double carbonation, deHaan's method, 6% of 20° Bé. milk of lime, decrease of 24.6%; single carbonation, deHaan's method, decrease of 31.0%.

W. L. BADGER.

A study in the chemical control of cane sugar factories. NOEL DEER. *Intern. Sugar J.* 17, 514-6(1915); cf. *C. A.* 9, 3374.—D. strongly inclines towards the use of gravity purities. Abs. purities demand too much time and refractive detns. are not of sufficient delicacy for control work. The question of polarizations as opposed to sugar

% as a basis is discussed. As deductions drawn from a polarization basis are deceptive, a routine is given for the laboratory control of sirup, raw sugar, molasses and raw juice. The actual effect of clarification is shown to be 0.63 unit when sugar % is substituted for polarization which indicated a rise of 1.33 units. In estg. the economic limits of maceration an essential point is the purity, as upon this depends the proportion of sugar which can be extd. Last mill juices when valued on their gravity purity detd. at high dilns. show too low a value. If, however, the calcn. be based on a comparison of the mixed juices obtained under 2 systems of milling, the error due to decrease in gravity purity with diln. will tend to disappear. A. G.

The latest prescribed rules for chemical control in the cane sugar factories in Java. IV. H. C. PRINSEN-GEERLIGS. *Louisiana Planter* 55, 364-5 (1915).—Continuation of previous articles (cf. C. A. 9, 2990). Methods are given for the sampling and analysis of sirup, massecuites, green molasses, final molasses, and first and second sugars (molasses sugar). A. GROSS.

The Naudet diffusion process at the Toledo (Ohio) sugar factory. A. MUSY. *Sugar* 17, No. 12, 26-7 (1915).—Results indicate a higher yield of sugar than that shown by the original analysis of the beets. This is explained by M. on the ground that the beet contains a certain quantity of unfinished immature sugar, which, owing to the high temp., 100° or over, used in the diffusors, matures instantly, while in the old process where much lower temps. are used, this instantaneous maturing is not possible, but there is a destruction of sugar, due to the action of bacteria. A. G.

Juice-heaters. E. W. KERR. *Louisiana Bull.* 149; *Intern. Sugar J.* 17, 517-21 (1915).—A discussion of the factors affecting heat transmission with 2 tables of results of tests on juice-heaters relative to heat transmission, steam consumption and heat efficiency. A. GROSS.

The manufacture of sugar in Porto Rico. J. F. CLARENC. *Intern. Sugar J.* 17, 560-5 (1915).—An editorial summary of a report in *Bull.* No. 4, Part II, Dept. of Agr. Mauritius, containing production statistics, a description of the processes in 2 of the best factories and comparative control reports of 11 factories for 1914-15. A. GROSS.

The manufacture of sugar in Cuba. J. F. CLARENC. *Intern. Sugar J.* 17, 523-8 (1915).—An editorial summary of the report in *Bull.* 4, Part II, Dept. of Agr. Mauritius by C. on the sugar factories in Cuba. A. GROSS.

Sugar factory work in Natal. WM. CLACHER. *Intern. Sugar J.* 17, 504-8 (1915).—A description of the processes used for producing raw and refined sugar. A. GROSS.

Loss in tonnage of sugar beets by drying. H. B. SHAW. *Sugar* 17, No. 11, 55-8 (1915).—Beets were exposed under varying conditions to det. what losses might occur if storage was necessary. These expts. were conducted with a view to det. a system of payment for the beets. The av. daily shrinkage during 5 days in large uncovered piles was 2.92%, in covered piles the loss was reduced 0.9% per day. When the beets were thrown into small piles or were left scattered along the rows from which they were pulled, the shrinkage increased greatly, reaching 4.7% in 24 hrs. in a Utah expt. and an av. of 6.48% per day for 4 days in a Kans. expt. A. GROSS.

Charcoal prepared from molasses as a substitute for blood charcoal. H. FRIEDRICH. *Oesterr. Chem. Ztg.* 18, 137-8 (1915).—Blood charcoal is high in N and therefore valuable. Since it is required for fighting cholera and dysentery a cheaper substitute, such as molasses charcoal, is desirable. The latter is a bulky, tasteless and

odorless black powder and fulfills all of the requirements of a good blood-charcoal. Several comparative analyses are given. ARTHUR LEDERER.

Apparatus for the culture of yeast used for the determination of various sugars by fermentation (TRAMBICKS) 1. Oxidizing power of soils (GERRETSEN) 15.

Extracting sugar. W. A. RAMSAY. Brit., 18,515, Aug. 10, 1914. Bagasse, as it issues from the mill and while it is still under compression and shut off from the air, as by passage through a restricted chamber, is macerated in H_2O supplied under pressure.

29. LEATHER AND GLUE.

LLOYD BALDERSTON.

The Levi-Orthmann method of tannin estimation. R. LAUFFMANN. *Ledertechn. Rundschau* 7, 297-9(1915).—The method is described (cf. C. A. 7, 3249). L. finds that it sometimes gives higher results than the shake method with hide powder, and sometimes lower for the same kind of material. With sulfite-cellulose ext. the L.-O. method gives no ppt., but because of the absorption of I by the ext., the titration with $Na_2S_2O_3$ gives an apparent "tannin" content. L. B.

Note on the determination of tannin. D. B. DORR. *J. Soc. Chem. Ind.* 34, 1124-5 (1915).—The official (hide powder) method of the I. A. L. T. C. for detg. tannin has the objection that results produced by different analysts are not concordant. Tannin may be detd. by pptn. of the tannic acid by a metallic oxide. D. has had experience using a hot soln. of cupric acetate, which is added in excess to the warm infusion and the mixt. heated to boiling, the ppt. being collected on a filter and washed with hot water. After drying it is ignited, treated with HNO_3 , dried and again ignited. The wt. of CuO is multiplied by 1.305 to obtain the equiv. of tannin. Practically constant results are easily obtained, but they are 1% to 2% lower than the corresponding hide powder figures. Limited investigations seem to indicate that varying factors should be used for the different kinds of tannin, 1.45 for gallotannic acid (which would make the results more nearly correspond to those by the hide powder method), and 1.305 for the tannin in tea. The absorption by hide should be used as a check on the percentage indicated by the metallic oxide, while the latter is the more exact method on which to base analytical data. J. S. ROGERS.

Gravimetric method for the estimation of tannin. A. GAWALOWSKI. *Ledertechn. Rundschau* 7, 337-8(1915); see C. A. 9, 3378. L. B.

Color tests with skivers. OSCAR RIETHOF. *J. Am. Leather Chem. Assoc.* 11, 2-15(1916).—R. uses cow grain splits, the tanning soln. containing 80% as much tannin as the dry wt. of the skin. The residue of the soln. made up for analysis (0.4% tannin) is preferably employed. Tabulated results show the effect of variation in time, etc., on the proportion of tannin absorbed by the skivers. L. B.

Fermentations in tanning liquors. HUGO KÜHL. *Ledertechn. Rundschau* 7, 273-4(1915).—The well-known fermentations are described. Tanning material was extd. with water to which had been added a pure culture of an organism producing lactic acid, grown in a mixt. of 4 parts whey to 1 part water. The liquor so produced

was concd. and contained a higher amt. of tannin than an ext. made from a liquor obtained by leaching with water. L. recommends leaching with water which has been sterilized by heat, and introducing pure cultures of lactic organisms. L. B.

Depeptization during leather formation. W. MOELLER. *Collegium* 1915, 353-66. L. B.

Oak leaves and pine cones as tanning materials. C. SCHIFFKORN. *Collegium* 1915, 145-6. L. B.

A new method of chrome-tanning light skins. ANON. *Shoe Leather Rep.* 120, No. 10, 61(1915).—Butyric acid is used for deliming and bating when firm leather is wanted, and NH_4 butyrate for soft light leathers. Skins pickled in butyric acid may be chrome-tanned without the addition of HCl . Light skins are suitably delimited with NH_4 butyrate and then pickled with butyric acid. The process is described in detail. The leather is well tanned and has a soft grain and agreeable feel. Light skins may be drenched with NH_4 butyrate and pickled with formic acid and salt. Skins immersed in a weak bath of HCHO and drained will keep 2 weeks or more without pickling. Skins tanned with a weak soln. of HCHO resemble alum-tanned stock.

J. S. ROGERS.

Effluents of potassium salts factories and the leather industry. W. MOELLER. *Collegium* 1915, 373-82, 417-26.—Discussion of alleged ill effects on leather due to use of water from streams into which waste flows from factories producing K salts. L. B.

Sulfonated oils. G. BUMCKE. *J. Am. Leather Chem. Assoc.* 10, 559-69(1915).—B. objects to the assumption that total fatty matter is the difference between 100% and the sum of moisture, ash and unsaponifiable, because NH_3 and its salts will be lost from the ash, and if glycerol is present (as it usually is) it will be included in fatty matter; also sulfates of heavy metals in the ash are liable to partial reduction. For H_2O detn. B. recommends 100 cc. xylene instead of 50. Readings of water vol. after standing 12 hrs. should be made at about 21° . *Total fatty matter*: dissolve 4 g. oil in 20 cc. H_2O adding a little NH_3 and 30 cc. HCl dild. 1:5. Boil with glass beads under reflux condenser until oil and water become clear (about 15 min.). Cool and transfer to a separatory funnel with the aid of H_2O and Et_2O , shake and let settle. Draw off the water through a filter, wash the ether layer with H_2O until free from mineral acid, keeping the filtrate and wash water for detn. of SO_3 by pptn. with BaCl_2 . If petroleum ether is used instead of Et_2O the unoxidized fatty acids are sepd. from the oxidized; the latter being insol. in petroleum ether are left sticking to the flask, funnel and filter and may be dissolved off with hot alc. The solns. are transferred to tared dishes, the solvent evapd. and the fat weighed. SO_3 in salts is detd. by washing 10 g. of oil with Et_2O and NaCl soln., sepg. the aq. soln. and pptg. with BaCl_2 . SO_3 in sulfo-fatty acids is found by subtracting SO_3 in salts from total SO_3 . This wt. is multiplied by 4.725 for Turkey red oil or by 4.75 for other sulfonated oils to find the amt. of sulfo-fatty acids. The factor 4.75 is nearly correct for any oils whose liquid fatty acid is mainly oleic, but not for those which, like fish oils, contain considerable amts. of other liquid fatty acids. Unsaponifiable matter is detd. by the Spitz and Hönig method. The ash test is of little value, as oils neutralized with NH_3 show low ash, while those neutralized with fixed alkalis give high ash. Methods for Na_2O , NH_3 and NaCl are given. *Neutral oil*: 10 g. oil (20-30 g. Turkey red oil) are dissolved in 50 cc. H_2O in a 500 cc. separatory funnel, 20 cc. concd. NH_4OH soln. and 30 cc. glycerol are added, and when the oil is dissolved, 150 cc. Et_2O and 15 cc. alc. added and the funnel shaken vigorously. Sepn. will be complete on standing 2 to 3 hrs. A 2nd and 3rd extn. with 100 cc. Et_2O

each require 20 to 30 min. The combined exts. are washed with 20 cc. H_2O , then 20 cc. HCl dild. 1:10, and again twice with 10 to 20 cc. H_2O . The small amt. of fatty acid in the ether ext. is found by titration (mol. wt. 282) and deducted from the wt. found for the ether ext. The term "sulfonation value" has been employed to mean % of the total fatty matter which is not neutral oil. This is misleading, because the residue of fatty matter after subtracting neutral oil consists of (1) sulfo-fatty acids, which are the real products of sulfonation, (2) oxidized fatty acids, largely an indirect product of sulfonation, and (3) fatty acids which were partly present in the original oil, and were partly formed by the action of the acid.

L. B.

Chemical Abstracts

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CHEMICAL ABSTRACTS

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No. 5

I. APPARATUS.

J. C. JONES.

Platinum boats for carbon determination by direct combustion method. H. F. SIEVER. New Bedford, Mass. *Met. Chem. Eng.* 13, 525(1915).—While the initial cost of Pt boats is much greater than for other materials the life is so much greater in this method, that they are quite economical. S. has a Pt boat which has been used for some 25,000 combustions with a loss of weight of but 0.5 g. Care should be taken that the reaction does not take place at too high a temp., nor with too rapid a flow of O. The best results are obtained when the drillings just fuse together but do not lose their identity. Silica sand should be used freely in the boat. It is necessary to have a steel form on which to hammer the boat into shape occasionally. F. A. HARVEY.

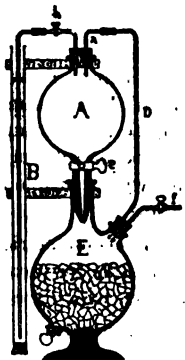
A check valve for suction flasks. G. P. WALTON. *J. Ind. Eng. Chem.* 8, 57 (1916).—The valve is designed automatically to empty the flask as soon as the Gooch crucible is removed and so is useful only where the filtrate may be rejected. A short piece of $\frac{1}{4}$ in. glass tube is inserted in a hole in the flask near the bottom. A piece of heavy rubber tubing is then slipped over the tube and forced tightly into the hole. The end of the rubber should project about $\frac{1}{16}$ in. beyond the end of the glass tube. A piece of capillary tube with a $\frac{3}{8}$ in. bulb blown on 1 end and sealed at the other is then inserted stem first into the 2 tubes. Finally a piece of $\frac{1}{2}$ in. glass tube is forced over both tubes and bulb. An indentation in the side of the latter tube limits the motion of the bulb. As soon as the suction is put on the flask the bulb is drawn up against the rubber tube thus closing the valve. When the suction is broken by removing the gooch the pressure of the filtrate opens the valve and the filtrate is discharged.

F. A. HARVEY.

Gas generator. I. BERTIAUX. *Ann. chim. anal.* 20, 239-40 (1915).—This app. is provided with a manometer B, which also serves as a safety tube. The reacting material is placed in E, and the reagent to be added in A. The stopcocks are kept closed, except when the gas is being used. The spent liquor is withdrawn at g. Other forms of app. on the same principle are shown.

P. M. GIESY.

The use of cobalt nitrate for marking porcelain. S. B. KUZMIAK. *J. Ind. Eng. Chem.* 8, 89(1916).—It is claimed that the mark will be permanent and will stand a high temp. of ignition. The porcelain is gently heated with a low flame, then marked, using the sharp end of a burned taper or pen, then ignited with a strong flame for about 3 min.; a black mark is left. F. A. HARVEY.



Distilling apparatus. M. M. BROWN. Macon, Miss. *Dental Summary* 36, 50(1916).—A drawing and description of "an inexpensive and efficient distg. app." for the prepn. of small quantities of distd. H_2O . JOSEPH S. HERBURN.

Demonstration air thermometer, and a few physical and chemical thermal experiments. W. RORH. Greifswald. *Z. physik. chem. Unterricht* 28, 317-20(1915).—To the top of the cylindrical bulb is fused a narrow tube which is bent twice at right

angles, and on the long, vertical arm 2 safety bulbs are blown at some distance apart. A scale is attached between the bulbs, and the lower end of the tube dips into a colored soln. A 3-way cock is in the horizontal part of the tube for partly exhausting the app. and raising the soln. in front of the scale. Two knobs are fused near the top of the bulb and 1 at the bottom for winding wires in elec. expts. Several expts. are described.

J. H. MOORE.

Guarding against danger of burning and explosion in chemical processes with combustible fluids. H. HÜNEKE. *Chem. App.* 2, 281-4(1915).—Descriptions, with 6 cuts, of methods of reducing danger by surrounding and filling the app. with inert gas, and of the Martini-Hüneke app. for washing with benzine, which is claimed to reduce the benzine consumption to about 8% of the wt. of the goods cleaned.

J. H. MOORE.

Electrical pyrometry. ROBT. W. PAUL. *Trans. Eng. Ceram. Soc.* 14, 1-26 (1914-15).—A general article, describing especially the latest improvements in various types of pyrometers.

C. H. KERR.

Lubricating-oil testing machine. W. B. SLAUGHTER, JR. *Am. Machinist* 44, 71-2(1916).—S. describes a machine used at the Los Angeles testing laboratory. It consists of a motor-driven shaft, upon which rides an accurately machined bearing. Loads giving bearing pressures equiv. to those attained in practice are applied to the bearing to which measured quantities of lubricant are fed to the journal and distributed by a scoring in the surface of the gearing. The peculiar value of the machine lies in the method of applying the load, reading of the torque developed, and absence of calcs. in detg. the coeff. of friction. Temp. changes are read by a standard thermometer and provision made for the retention of the oil used. Parts are illustrated. Coeff. of friction is obtained directly from a chart, knowing the load applied and the deflection of torque-reading springs. $M = 4fPr/\pi$ plotted in rectangular coördinates. M = moment of friction in inch lbs., f = coeff. of friction, P = load on bearing in lbs., and r = radius of journal in inches. Abscissas are graduated in terms of micrometer readings and ordinates in terms of the coefficient of friction. A curve is shown.

W. H. BOYNTON.

Apparatus for evaporating aqueous extracts (ALDRICH) 11B.

Electric resistance thermometers. CAMBRIDGE SCIENTIFIC INSTRUMENT CO. and W. H. APTHORPE. *Brit.*, 20,248, Sept. 26, 1914. An elec. resistance thermometer is made by winding a doubled metal wire in a double screw-thread cut on the outside of a rod or tube of porcelain, steatite, glass, etc., then coating the surface of the rod or tube with a fusible material, and finally heating the whole to fuse the material on to the surface.

Thermoelectric battery. H. HAUSRATH. *Brit.*, 20,009, Sept. 21, 1914. A thermopile for measuring radiation or elec. energy is composed of stacks of thin plates, between which are clamped the outer ends of the elements.

Evaporators. FAWCETT, PRESTON & CO. and A. M. LANG. *Brit.*, 19,568, Sept. 9, 1914. App. for evapg. liquids comprizes a number of sep. superposed vessels each containing a set of inclined heating tubes and communicating with a common sepg. chamber receiving the vapor and liquid issuing from the tubes. The unevapd. liquid is returned by a pipe partly to the same vessel and partly to the vessel next below. The vapor is compressed by a steam jet compressor into the heating space around the tubes in the superposed vessels, the steam passing from vessel to vessel through pipes. Excess steam escapes to a feed-heater. The sepg. chamber is preferably

arranged to one side of the superposed vessels. The vapors escaping from the upper ends of the tubes flow past a baffle into a chamber while the liquid is received on a tray fitted with a weir over which a portion flows to pass by a pipe to the vessel next below. The pipe withdrawing liquid for recirculation in the same vessel is connected with the tray on the other side of the weir.

Evaporating and concentrating liquids. FAWCETT, PRESTON & Co. and A. M. LANG. Brit., 19,567, Sept. 9, 1914. In an evaporator having a heating chamber containing tubes extending between upper and lower downwardly inclined tube-plates, the tubes are inclined so as to enter the tube-plates at right-angles, and the lower tube-plate is formed in two or more stepped parts. By forming the lower tube-plate of the heating chamber in steps the lower ends of the inner set of tubes come close to the bottom of the evaporator, thus improving the circulation at that part. Steam may be introduced into a jacket formed by an annular concave plate secured to the bottom of the evaporator.

Filtering liquids. T. K. IRWIN. Brit., 19,901, Sept. 17, 1914. Each stage of a multi-stage app. for the filtration and aeration of sewage or other liquid comprises a fine bed of sand, etc., adapted to serve as a filter, a coarse bed of clinker, coke, etc., adapted to serve as a surface-contact bed, and a lower chamber into which air or gas is introduced at each stage from a supply pipe. The liquid to be filtered enters through a conduit while the filtrate passes through another conduit, the sludge, etc., passing through a perforated partition and being drawn off.

Cooling towers. W. W. WHITE. Brit., 19,646, Sept. 10, 1914. The liquid drops from troughs on to saucer-shaped plates and thence flows in thin streams along shallow gutters, which may be formed by the surfaces of laths or planks, arranged in a zigzag manner in parallel vertical sets, the direction of inclination being reversed from set to set so that transverse air passages are formed, free of falling H_2O . The lower ends of the planks are supported in members and are notched so as to direct the H_2O on to the plank below.

Cooling apparatus for steam jets on hollow grates. S. POMERANZ. Ger., 285,435, Mar. 11, 1913.

Revoluble tube furnace. FELLNER & ZIEGLER. Ger., 285,419, Nov. 29, 1913. The construction has in view the prevention of deposits.

Continuously operating heating vessel. STREBELWERK, G. M. B. H. Ger., 285,201, Feb. 5, 1914. Provision is made for the reflux of tar from the smoke channels.

Apparatus for cleaning boilers. H. BASCHI. Ger., 285,287, Sept. 17, 1914.

Surface-apparatus for heating and cooling fluids. A. J. E. MUTERS. Brit., 20,017, Sept. 21, 1914. The app. comprises a number of hollow elements mounted on a central shaft and so arranged one above the other as to leave spaces between the elements, the elements being in communication with one another through passages in the shaft and the spaces between the elements being in communication with one another through other passages. The spaces between the elements are placed in communication with one another at their outer ends by parts projecting from the elements.

Vessels for use in analysis. H. ZELLNER. Brit., 19,914, Sept. 18, 1914. Vessels for use in measuring in analytical operations are formed as an open miniature balance pan, tube, flask, or boat made of foil of Sn or Cu or an alloy or amalgam of these metals. The substance to be tested is measured out in the vessel, and then both vessel and substance are introduced into a flask, etc.; when the vessels are formed of amalgams, they serve to supply the contact substances necessary in certain operations. In preparing the amalgams, Cu and Hg are first amalgamated in the usual manner, and then

this amalgam is poured in the molten condition on to molten Sn. To prevent the alloy from becoming brittle, a small quantity of Pb may be added.

Acetylene generator. F. H. MCGURK. U. S., 1,163,887. Dec. 28.

2. GENERAL AND PHYSICAL CHEMISTRY.

W. D. HARKINS and E. B. MILLARD.

Some scientific advances during 1915. H. R. HOSMER. *Gen. Elec. Rev.* 19, 92-3(1916).—H. briefly reviews the work of T. W. Richards, Langmuir, Kalmus, Rittman, *et al.* C. G. F.

History of the development of hydrometry. EDMUND O. VON LIEPMANN. *Chem. Ztg.* 39, 983-6(1915); cf. Schelenz, *C. A.* 10, 299.—A brief bibliography is given.

J. H. MOORE.

Work of the Physikalisch-Technische Reichsanstalt in 1914. *Z. Elektrochem.* 21, 501-11(1915); cf. *C. A.* 9, 3148-51. Radiation measurements: improvements in the methods. WARNBURG AND MÜLLER.—The investigations of vacuum radiation were continued, and the following improvements proposed: (1) To det. constancy of temp. of the vacuum radiator and of other cases in which the thermoelectric method is not applicable, a special form of bolometer (Haltebolometer or Mittelblockbolometer) is used. The instrument is set in a larger water bath so that the furnace radiation must penetrate a greater H₂O layer, the bath being kept at const. temp. by an elec. thermostat. (2) The formula previously reported (*C. A.* 7, 3700) for calcg. spectral intensity measurements with the mirror spectrometer was based on expts. with freshly silvered mirrors; this is not exactly correct as the reflectivity diminishes with the age of the mirrors. In a new series of expts. on the reflectivity of the mirrors, the wave lengths were measured by the method of Hagen and Rubens. Determinations of the constant c . WARNBURG AND MÜLLER. Applying the above improvements to the methods previously used (*C. A.* 7, 3700), new detns. of c were made with: (1) the vacuum-carbon radiator between the m. p. of Au and 1400°, and the m. p. of Au and 1700°; (2) the Lummer-Kurlbaum open radiator between m. p. of Au and 1400°; (3) the L.-K. model with linear dimensions of double size, but with relatively smaller opening of the inner screen, between same temp. limits. The new expts. show a better agreement among themselves than the old and give a smaller value to c , to be published later. All expts. were made with the new quartz prisms. Recent expts. of Paschen show deviations from the Carvallo dispersion formula in the 5th decimal place of the refraction exponent sufficient to make changes of almost 1% in the value of c . Temperature determinations according to the Wien displacement law and the Stefan-Boltzmann law. WARNBURG AND MÜLLER. Using the large L.-K. model, detns. were made at the same temp. according to the Wien law and according to the Stefan-Boltzmann law; the diam. of the furnace opening was increased from 5 to 10 mm. and the bolometer was placed in the center of a reflecting Ni hemisphere. Under these conditions the temp. detns. by both methods based on the Carvallo dispersion curve were almost in complete agreement. Light unit. WARNBURG AND MÜLLER. A rational light unit can be obtained only through vacuum radiation, holding the radiator at a temp. of about 3000°. Expts. have been initiated with the vacuum-C radiator, holding the temp. const. with the improved bolometer. For reproducing the temp. the method of Lummer and Kurlbaum was used in which a definite reduction of the total radiation is effected by absorption. For this a 2 cm. thick layer of a 10% K₂Cr₂O₇ soln. between quartz plates was used. The light radiation could be reproduced up to 0.4%. Further work is in progress. Energy law of photochemical process. WAR-

BURG. See *C. A.* 9, 883, 2348, 3149. Absorption of ultraviolet radiation. WARBURG. See *C. A.* 8, 613; 9, 2480, 2836. Measurement of ϵ/μ . GEHRCKE AND JANICKI. Further work is reported on the cathode dusting method. Metal plates of Pt, Au, Cu, and Zn were subjected to the rays of a Hg quartz lamp *in vacuo* and studied to det. the reproducibility of the potential charges of the plates. The charges were reproduced only when the plates were thoroughly "cleansed" by previous cathode dusting. The potential charge depends mainly upon the gas in which the dusting has been effected and only slightly upon the metal. After dusting in H the highest potential was found, viz., 2.44 v. for Pt, Au, Cu; 2.62 v. for Zn. Dusting in H_2O vapor gave lower and less const. values of 1.8 to 2.3 v.; in He the lowest value (1.8 v.) was obtained. These potentials were reproducible and stable for hrs., as long as the vacuum was held const. by liquid air. It was immaterial whether liquid air or liquid H, with or without coconut charcoal, was used in producing the vacuum. No reproducible potentials could be obtained with Al. Light emission of metal vapors. in the glow discharge. JANICKI AND SRELLIGER. In the emission spectra of Cd, Zn, Mg, Pb, Al, Sn, Ag and Si there is a parallelism on the one hand between sparks and negative glow, on the other between arcs and positive columns; Te shows no such analogy. Expts. with Zn and Cd in externally heated Geissler tubes with inner electrodes confirmed the results with these 2 metals. Testing of radioactive preparations. GEIGER, BOTHE AND JANICKI. The total content of 395 strongly radioactive preps. examd. corresponded to about 8230 mg. Ra element (including 49 meso-Th preps. with a Ra equiv. of 1181 mg.); 102 preps. at time of examn. were not yet in radioactive equil.; 13 feebly radioactive preps. tested contained amts. of Ra of the order of magnitude of 10^{-8} to 10^{-4} mg. Ra element per g. of substance. Apparatus for testing feebly radioactive preparations. BOTHE. See *C. A.* 9, 3026. Theory of the normal elements. VON STEINWEHR. Kohnstamm and Cohen (*Wied. Ann.* 65, 344(1899)) and Holsboer (*Z. physik. Chem.* 39, 691(1902)) have reported a transformation point at 15° for $3CdSO_4 \cdot 8H_2O$; the work and conclusions of these authors are critically discussed, calcns. from their data giving a much lower temp. than 15° . New measurements were made of the differential heats of diln. of $CdSO_4$ solns. and the temp. coefficients of this heat tone calcd. From these data and older values the theoretical heat of soln. and its temp. coeff. were computed; from these 2 magnitudes the temp. of the change of sign of the theoretical heat of soln. and the minimum soly. agree to $+3^\circ$ with the soly. expts. of Mylius and Funk (*Ber.* 30, 825(1897)). In the calcn. of the chem. energy the new values for the e. m. f. of the elements were used (electrochem. equiv. of 96494 (instead of 96540), elec. equiv. of heat = 0.2389). The results (47252 cal. calorimetrically and 47427 cal. electrically) show better agreement than earlier values. Calorimetric detns. of the temp. coeff. of the chem. energy of the elements gave +19.45 cal./degree; electrical detns. using the temp. formula of Jaeger and Wachsmuth for the Weston element gave +17.44 cal./deg. The Wolff formula gave +21.10 cal./deg. This shows that Cohen's criticism (*C. A.* 5, 1014) of the Jaeger temp. formula is not tenable. Cf. *C. A.* 8, 3146; 9, 3149. Mercurous sulfate. v. STEINWEHR. Hg_2SO_4 is prepd. in large amts. for normal elements by E. de Haën, Hannover, under the supervision of the Reichsanstalt. The salt is kept under a satd. soln. of $CdSO_4$ (cf. Warburg, *C. A.* 9, 1007). Silver voltameter. JAEGER AND V. STEINWEHR. A note describing briefly the different forms of Ag voltameter and calling attention to the work set forth in other publications (cf. Rosa, *et al.*, *C. A.* 8, 3154). Mercury resistance thermometer: change of resistance of Hg between 0 and 100° . JAEGER AND V. STEINWEHR. See *C. A.* 8, 2297; 9, 749. Theory of mercury rectifiers. JAEGER. The oscillographic curve for electrolytic and Hg rectifiers has been investigated with a view to detg. the "minimum potential" which must be overcome. Cur-

rent and voltage curves of Hg rectifiers in different combinations with ohm resistance, capacities and inductances are calcd. and explained with figures. Cf. Schulze, *C. A.* 9, 24, 414, 1007. Weak-current laboratory. See normal elements, *C. A.* 9, 3150. Electrical measuring technics laboratory. FUSZNER. A description of a new lab. and its equipment. Comparison of platinum and helium thermometers below -193° . HENNING. The work previously reported (cf. *C. A.* 7, 2892) has been continued. Different resistance thermometers were compared with a He gas thermometer in baths of liquid air and liquid H, which boiled under normal or reduced pressure. For the intervals 80° and 62.5° , and 20.3° and 16.4° abs. temp. the resistance ratio (Pt thermometer No. 30) $R = r/r_0$ as a function of the abs. temp. T may be calcd. by the empirical equation $\log (R - 0.0038) = -1.71496 + 0.76176 \log T - (34.985/T)$ with an accuracy of about 0.02° . This formula has not been tested for the interval between $T = 62.5$ and 20.3° . With Pt wires of same m. p. as No. 30, the equation holds with approx. the same consts. (cf. Henning, *C. A.* 9, 3148). The quadratic reduction formula for R of different thermometers held above -193° (at b. p. of O and at b. p. of CO_2) regardless of the variety of Pt; at lower temps. it does not suffice for all the varieties of Pt, e. g., 2 varieties of Heraeus very pure Pt at the b. p. of H gave R at $T = 20.3^{\circ}$, 0.0060 and 0.0082. Boiling point of hydrogen. HENNING. The normal b. p. of H was detd. by immersing a He thermometer directly in the boiling liquid. The results were the same whether the liquid was stirred or not. Measurements agreeing within the limits of observation (0.02°) with 2 different fillings of the gas thermometer (initial pressure $p_0 = 740$ mm.) gave the normal b. p. $t = -252.79^{\circ}$; reduction to 760 mm. being calcd. by the coeff. of Onnes, $dt/dp = 0.005^{\circ}$ per mm. Applying the correction calcd. by Berthelot's method ($+0.004^{\circ}$) for the thermodynamic scale the normal b. p. on this scale $t = -252.79^{\circ}$. This result is not final as the thermal coeff. of expansion of the gas thermometer vessel (Jena glass 59^{III}) was based on a value which by extrapolation gave an equation holding only to -193° . Onnes and Keesom in 1913 reported the normal b. p. of H on the thermodynamic scale = -252.76° . Comparison of different gas thermometers. HENNING. Const. of Pt resistance thermometers. The results together with previous measurements at 445° in which A thermometers were investigated, are reported in a table, the He, N, or A thermometers giving higher readings than the H. The results were calcd. by the formula $t_0 - t = p_0 (T_c^3 - p_c) + 517 \times 10^{-9} [t(t - 100) (t + 273)]$, which according to the Berthelot equation of state, gives the temp. difference $t_0 - t$ of the thermodynamic scale (t_0) against the scale of a gas thermometer of const. vol. (t) at the initial pressure p_0 . T_c and p_c are the abs. critical temp. and press. of the gases. The results show that the B. equation does not present with sufficient accuracy the deviations of the different gas thermometers within the observed temp. range. Measurements with platinum thermometers in Leiden and Teddington. H. SCHULTZ. Three Pt thermometers of the Reichsanstalt were taken to Onnes' laboratory at Leiden and to the Natl. Physical Lab. at Teddington. In Leiden the resistance thermometer No. 35 (Pt exceptionally pure; 20.3° and 14.7° abs. The temp. was detd. from the vapor pressure of H, which, according to the measurements of Onnes and Keesom, is a function of the temp. measured on the thermodynamic scale. Measurements with the same instrument at the Reichsanstalt gave $R = 0.00000$ at $T = 20.38^{\circ}$ (He scale); by interpolation of the Leiden observations this value of R corresponds to 20.33° (0.05° higher). Aside from expd. differences this difference is explained by the difference of the temp. scale of the Leiden lab. and in the Reichsanstalt, O. and K. using a value for normal b. p. of H 0.03° higher. Barker in the Natl. Physical Lab. has tested Pt thermometers Nos. 10 and 13 at the b. p. of

S. The measurements were made with 2 b. p. app., one of Fe, the other of glass. The Reichsanstalt measurements were made in a glass boiling-tube, the av. results of a series of concordant measurements being reported. The results of the 2 institutions show good agreement. **Specific heats of gases at low temperatures.** H₂USZ. The sp. heat of A at a pressure of 1 atm.: at $+20^{\circ} = 0.1263$ g. Cal. $_{15}$ /g. degree, at $-180^{\circ} = 0.1317$ g. Cal. $_{15}$ /g. degree. From Berthelot's equation for the ratio of the sp. heats in ideal gases, α at $20^{\circ} = 1.651$. The deviation of this value from that (1.667) for monoatomic gases by the kinetic gas theory is of the same significance as was observed with He (cf. C. A. 9, 3148). **Equation of state of gases.** HOLBORN AND H. SCHULTZE. Cf. C. A. 10, 416. The $p\bar{v}$ value for pure He was detd. at 0° , 50° , and 100° for pressures of 19 and 38 m. of Hg. Within these limits the isothermals are rectilinear; the values of Onnes at 0° and 100° within this pressure range show deviations up to 0.1% from the rectilinear. Expts. were interrupted by the war. In order to check the pressure measurements within an accuracy of 0.03%, the pressure balance, which had been compared with a Hg manometer at 16 atm., was tested for higher pressures. For this purpose 2 similar balances, standardized as above, were compared with one another at pressures up to 200 atm., showing a variation with the pressure and necessitating a direct comparison with the Hg manometer which is outlined. **Specific heats of gases at high pressure.** HOLBORN AND JAKOB. Expts. on the av. sp. heat of air between 20° and 100° were extended to 300 atms., but the outbreak of the war has interrupted the work. **Liquefaction of hydrogen and helium.** MEISSNER. Improvements in the plant for the liquefaction of gases have reduced the amt. of liquid air used for precooling in the liquefaction of H from 2.5 to 1.75 l. per hr. During the yr. 33 l. of liquid H were produced. According to Onnes the production of a few hundred cc. of liquid He requires 25 l. of liquid H, the production of which requires about 75 l. of liquid air. An investigation is in progress looking to a simpler and more economical process. Expts. without definite results have been made on the liquefaction of H without precooling with liquid air, based on the use of the external performance of the compressed H. In the liquefaction of He the precooling with liquid H cools the He to a little below the inversion point for the Joule-Thomson effect, so that the latter is very small; an improvement appears possible by the use of the external performance of the compressed He, e. g., on a turbine as suggested by Rayleigh. **The testing of laboratory and other thermometers** (normal, meteorological, calorimeter, etc.) is reported, number of tests made and accuracy required being given. Seven per cent. of thermometers tested were rejected. **Comparison of mercury with platinum thermometers between 0° and 100° .** HOLBORN AND SCHEEL. A series of Hg thermometers were compared among themselves and with 3 Pt resistance thermometers in the interval 0° to 100° . Two thermometers of the *verre dur* of the Internatl. Bureau, 2 inclosed scale thermometers of Jena glass 16^{III} and rod thermometers of Jena glasses 16^{III} and 59^{III} were tested. Results are reported in a table, the values agreeing for each temp. (20° , 40° , 50° , 75°) within the limits of error of about 0.005 $^{\circ}$ for the 3 scales (internatl. H scale, testing lab. scale and the scale used in the radiation measurements above). **Comparison of mercury and platinum thermometers between 100° and 300° .** HOFFMANN AND MEISSNER. See C. A. 9, 2331. **New thermometer glasses.** SCHEEL, GRÜTZMACHER AND MOELLER. The work is progressing, though not completed, owing to the personal supervision required in the factory and the time and care necessary in the calibration. Twelve normals of different glasses have been calibrated and compared; the softening temp. and expansion of some glasses were detd. dilatometrically; one glass is being tested for the manuf. of clinical thermometers. **Electrical and optical temperature measurements.** HOFFMANN AND A. SCHULZE. Tests reported on thermoelements, using 3 elements of Pt-(Pt-Rh) from 100° to 1100° as instruments of precision. Two elements of constantan-Cu and 1 element of constantan-Fe below 0° were tested; 8

elements of constantan-Fe and 1 of constantan-W up to 800-900° were tested, two of Ni-(Ni-Cr) up to 1100°. A study of the behavior of thermoelements of the base metals on continued heating at high temps. in the elec. furnace showed that in elements consisting of strong tubes or rods the thermal force did not change more than 5° to 10°; such constancy can be attained only when the element, before being used for temp. measurements, is heated throughout its length in order to reduce any irregularities (lack of homogeneity). Elements of constantan-Fe, constantan-steel tube, and Ni-35% Ni steel withstood a temp. of 800° for 250 to 300 hrs.; an element of Ni-66% Ni steel withstood 1000°. Elements of Ni-C for an av. of 275 hrs. at a temp. of 1200° did not change more than 10°; Ni-(Ni-Cr) (10% Cr) at 1000° for longer periods changed not over 10°. The thermo-electric behavior of W, Mo, and Ta is being studied. **Special tests.** MOELLER AND HOFFMANN. The heats of combustion of lamp filaments of W and W powder were detd. The m. p. (273°) of Bi prepd. in the lab. was detd. by sealing the metal in a glass tube; the m. p. and solidifying point were detd. with a thermoelement. **Chemical work.** Preparation of pure metals. MYLIUS. The work of the Reichsanstalt has enabled German factories to produce the following metals of great purity: Hg, Ag, Au, Pt, Cu, Sn, Zn, Cd, Pb, Bi, Sb, Fe, Ni, Co, Ir, Rh, Ru, Os. The impurity of the factory products never exceeds 1:10⁴. The prepn. of pure Pt from Na₂PtCl₄ was accomplished by Mylius and Foerster (*Ber.* 25, 665(1892)); methods of Pt analysis (cf. *C. A.* 9, 419). The Pt of commerce always contains numerous impurities in small amts., e. g., Heraeus purest Pt contains traces of Ir, Pd, Au, Cu and Fe (=1:10⁴ impurity). Readily detectable amts. of Pt, Ag, Sn and Zn are normally present in the pure electrolytic Bi, while Kahlbaum's purest Bi (in 1914) prepd. by chemical methods contained as impurities: Ag trace, Cu 0.001%, Pb and Fe traces (=1:10⁴⁻⁵). A table is given showing amts. of impurities in Bi from various sources. The sp. elec. resistance of Bi wire from Hartmann and Braun was found by Steinhaus and Werner to be 1.290 at 22°; of Bi prepd. by Lenard's process (*Ann. Physik. Chem.* 39, 642(1890)) varies from 1.088 to 1.157. Groschuff's work on a commercial Sb shows the need for improved chemical methods. For the sepn. of Sb from its solns. it is suggested that one use the H₂O-decomposable, crystd. compd. of SbCl₃ with HCl, which is pptd. by passing in HCl-gas. The impurities are concd. in the mother-liquor and then detd. Kahlbaum's "technical" Sb contains as impurities Cu, Pb, Fe, Ni, Co, Sn, and As (impurity = 1:10³); K.'s "pure" Sb is of higher purity, but the ratio of the impurities to Sb has not been established. **Nickel and cobalt.** MYLIUS AND HÖTTNER. Expts. on the purification of impure Ni and Co by the crystn. of the simple salts (nitrates, chlorides, sulfates, etc.) resulted more in the removal of impurities (Cu, Fe, Mn, Zn, etc.) than in the sepn. of Ni and Co, as the salts of the latter are very similar in soly. and readily form mixed crystals. For the complete sepn. and purification, complex compds. characteristic of 1 metal only must be used: for Ni the rose colored double nitrite Ni(NO₂)₂(NH₃)₄; for Co the purpureo salt Co(NH₃)₆(NO₂)₂. The use of these and other salts is being studied. **Platinum substitutes.** GROSCHUFF AND LENZ. Wires of Pt-Ag alloys have been tested for use in incandescent lamps. Time expts. with such wires containing 25% Pt have been conducted with reference to the required "vacuum density."

F. W. SMITHER.

The temperature scale of the Physikalisch-Technischen Reichsanstalt and the unification of temperature measurements. L. HOLBORN. *Z. Elektrochem.* 21, 559-62 (1915).—A review of the thermometry work of the Reichsanstalt. Cf. *C. A.* 9, 3148-51 and preceding abstract.

F. W. SMITHER.

Law of fall of drops of oil in air and the charge of the electron. A. SCHIDLOW AND J. MURZYNOWSKA. *Arch. sci. phys. nat.* 11, 386-99(1915).—The expts. were undertaken to remove the discrepancies between various workers on the value of the ele-

mentary charge. The principle of the method is similar to that of Millikan; a drop of oil is produced, charged by mechanical pulverization, and allowed to come between the plates of a horizontal condenser. In this paper the corrections have been calcd. and the exptl. details given. Data will be given in a future paper. E. B. M.

✓ The theory of the solubility of gases in liquids. G. JÄGER. *Sitzb. Akad. Wiss., Wien, Abt. IIa* 124, 287-304(1915).—Both from hydrostatic equations and from the kinetic theory of matter the following formula for α , the soly. of a gas in a liquid, is readily deduced: $\alpha = e^{-A/RT}$, where A is the work done by the surface forces in transforming 1 g. mol. of the gas from soln. into vapor, T is the abs. temp., and R is the gas const. An empirical formula for A has the form $A = A_0 [1 + at (1 - bt)^2]$, where A_0 , a , and b are const. Comparison with the data for aq. solns. of various gases shows that b is a const. for nearly all gases and on the av. identical with the temp. coeff. of the capillarity const. of water. The gases when arranged in order of decreasing A_0 are in the order of increasing a . G. L. WENDT.

The variation of surface tension with temperature. ALLAN FERGUSON. Univ. North Wales, Bangor. *Phil. Mag.* 31, 37-47(1916).—The validity of the equation $T = T_0 (1 - b\theta)^n$, in which T is the surface tension of any liquid against its vapor at the temperature θ , and b and n are const., has been extended to 14 org. liquids. It gives very accurate values for the critical temperature, θ_c , when $T = c$, through the equation $\theta_c = 1/b$. Values of surface tension may be calcd. from it with greater accuracy than from van der Waals' formula. From the data of Morgan and Schwartz (*C. A.* 5, 2586) the formula is shown to hold also for surface tension against air, but it is never valid for "associated" liquids. The value of n varies among liquids but is always close to 1.21. Among organic esters b diminishes, and θ_c increases, with increase of the hydrocarbon residue and is greater for an iso-compound than for the normal one. A possible relation of b with the abs. boiling point is suggested. G. L. WENDT.

The structure of silver crystals. L. VEGARD. Univ. Christiania. *Phil. Mag.* 31, 83-7(1916).—By the use of a Bragg X-ray spectrometer, cubic crystals of Ag were found to have a simple face-centered lattice structure. G. L. WENDT.

Ionization of phosphorus. JOHN LANDIN. *Svensk Kem. Tidskrift* 27, 157-9 (1915).—The literature pertaining to the ionization of yellow P is referred to and the assertion is made that amorphous P also ionizes under the same conditions. Ionization of both forms of P is very weak at room temp. but on ignition becomes very strong. Burning P in an atm. of Cl_2 causes more ionization than burning in O_2 . The highest reading of volts was in the 1st min. after the first discharge; 2 min. thereafter this had dropped in one expt. from 2.388 to 1.725 and a 2nd discharge dropped to 1.038 and finally to the control values. The measurable ionization disappeared before the P vapors had condensed in the electroscope. A. R. ROSE.

Determination of Avogadro's constant by the study of the Brownian movement of the particles of gold hydrosols. ARNE WESTGREN. Upsala. *Z. anorg. allgem. Chem.* 93, 231-66(1915); cf. *C. A.* 9, 737.—Expts. were made with Au hydrosols to det. whether or not Stokes' law is applicable to such solns., and to det. the Avogadro constant by Perrin's method. The value of N was calcd. by Einstein's formula for each of a series of hydrosols, the sedimentation equil. being detd. by a method similar to that used by Perrin. The size of the particles was detd. directly, and by application of Stokes' law; the 2 methods showed excellent agreement. In the series of hydrosols studied the vol. of the particles was varied 8-fold, and the kinetic energy of the particles remained independent of their mass. Stokes' law was found to hold valid, and the mean value found for N was $60.5 \pm 3 \times 10^{23}$. GEORGE W. MOREY.

The capacity of salts of sodium and potassium to form compounds and crystal mixtures. I. M. AMADORI. Univ. Padua. *Atti ist. Veneto sci. let. arti* 72, II, 903-31; cf. *C. A.* 8, 847.—A. has shown that corresponding Na and K salts yield mixed crystals on crystg. from their fusion mixt., indicating their complete isomorphism at high temps. The temp. of formation of the compd. approaches that of crystn. only in the case of the molybdates and tungstates. With lowering of the temp., so that other cryst. forms intervene, the mixed crystals break up, yielding a mechanical mixt. or a mixt. of the salts for the most part in the ratio of 1:1. At ordinary temp., there is practically no soln. between the salts of Na and K. The chlorides and nitrates are not miscible at this temp.; the sulfates and chromates form a compd.; other salts form cryst. hydrates (particularly the Na salts) on crystg. from aq. soln. It is noteworthy that in some cases, where the miscibility is complete at high temp., it decreases with diminution of temp., finally becoming practically *nil*. This occurs in cases even where the 2 sets of crystals have the same cryst. form, as in the case of the chlorides. This shows that the single crystal form is not sufficient to indicate isomorphism between 2 salts, since for the same forms there may be variations in the degree of miscibility. II. *Ibid* 73, II, 1679-89. Further expts. with the arsenates of Na and K show that partial solubility occurs between the meta-arsenates. Complete miscibility at solidification is shown in the case of the ortho- and pyroarsenates. In both cases, this ceases on lowering the temp. The ortho-arsenates of these metals exhibit a behavior analogous to that of the corresponding carbonates. In the case of the pyroarsenates, expts. show that there is evidently formed a mixt. of the β -forms of the 2 salts in equimol. proportions, as well as the stable compd. that is formed from the crystal mixt. of the α -forms. An analogous interpretation is likely applicable to the phenomena observed in the case of the pyrophosphates, the Na and K salts of which behave similarly to the sulfates and chromates.

L. T. FAIRHALL.

Conductivities of certain organic acids in absolute ethyl alcohol. H. H. LLOYD, JOHN B. WISEL AND HARRY C. JONES. *J. Am. Chem. Soc.* 38, 121-31(1916); also in *Publ. Carnegie Inst. Washington* No. 230(1915); cf. *C. A.* 8, 3735.—All the measurements were made in alc. containing not more than 0.04% H₂O and with a sp. cond. averaging 2×10^{-7} . The mol. conds. at 15°, 25° and 35° in approx. *N*/8, *N*/32, *N*/128 and *N*/512 solns. were detd. for the following acids: (the cond. at 25° in *N*/32 soln. is given) phenylacetic 0.01614, hydroxyisobutyric 0.01813, bromopalmitic 0.02316, malonic 0.0555, ethyl- 0.8345, diethyl- 0.08044, propyl- 0.1049, dipropyl- 0.09058, butyl- 0.0363, allyl- 0.03882, benzylmalonic 0.06189, bromo- 0.1177, dibromosuccinic 0.04816, sebacic 0.005566, dithioglycollic 0.04269, benzilic 0.07267, maleic 0.3768, fumaric 0.01291, itaconic 0.07795, mesaconic 0.01636, phenylpropilic 0.04278, aconitic 0.03403, benzoic 0.01405, *m*-chloro- 0.01610, *m*-nitro- 0.02308, 3,5-dinitrobenzoic 0.04113, picric 6.264, sulfosalicylic 30.68, *o*- 0.03400 and *p*-aminobenzoic 0.2910, *o*- 0.01637 and *p*-toluic 0.004444, cinnamic 0.004603, phthalic 0.1077, dichlorophthalic 0.06579, anisic 0.01662 (*N*/8), mandelic 0.01680, and camphoric 0.01539. In nearly all cases the conds. are several hundred times smaller than in H₂O; increase in diln. increases the cond., the increase in many cases being almost proportional to the vol. Assuming, from Goldschmidt's work (*C. A.* 9, 745), that the limiting conds. are not far from 90, the dissociation of the above acids in no case exceeds 2%, even in *N*/512 soln. The relations between structure and cond., as brought out in this work, are briefly discussed.

C. A. ROULLER.

The shape of molecules. II. TH. SVEDBERG. *Arkiv. Kem. Min. Geol.* 5, No. 11, 1-6(1914); *J. Chem. Soc.* 108, II, 628.—In former articles S. has dealt qual. (*C. A.* 7, 2504) and quant. (*C. A.* 8, 1372, 2097) with a method which may be used for

ascertaining the dis-symmetry of the molecules, and in the present paper the results of certain series of measurements are given. Using the anisotropic substance azoxy-phenetole as solvent, and measuring the elec. cond. of a dissolved electrolyte or the velocity of diffusion of a dissolved nonelectrolyte in directions parallel and at right angles to the direction of the axes of the solvent molecules, it is possible to calc. the ratio between the 2 axes of the solute molecules, assuming that these molecules consist of rotation ellipsoids; the measurements are carried out at various temps. below that of the clearing point of the solvent. Using phenol, *o*-nitrophenol, quinol, and pyrogallol as solutes, the axial ratio of the benzene mols. was found to be 1.63. With β -naphthol and sodium α -dinitronaphthol as solutes, the axial ratio for the $C_{10}H_8$ mol. was calcd. to be 2.93. If it is assumed, among other things, that the C_6H_6 and $C_{10}H_8$ mols. are ellipsoidal in form, and further that their minor axes, b and c , are of the same length in the 2 mols., it can be calcd. that the relative lengths of their major axes are 1:1.79, that is, numbers are obtained which are in qual. agreement with the ratio 1.63:2.93 of the numbers given above.

E. J. C.

A criticism on van der Waals' equation and some new equations derived therefrom. JAMES KAT. *Phil. Mag.* 31, 22-36(1916).—The factor b in van der Waals' equation is amended by the use of the term b for the vol. of N mols. filling a vol. $V + b$ at a pressure of RT/V , while β is the vol. of N_1 mols. filling the vol. V at the same temp. and pressure. Then b is a const. and β a variable which decreases as V decreases. For large values of V , N_1 is almost equal to N and β to b . In any actual gas only N_1 mols. give a pressure which would be given by N mols. of a perfect gas, and N_1/N is defined as the sp. d. This decreases with increasing compression and in the critical state is for all substances $2/3$ of the theoretical density, whence $\beta = 2b/3$, and the critical vol., $V_c = 3\beta$. The usual soln. of the equation in powers of V_c is not justified since it assumes that the pressure is the inverse value of the vol. and does not allow for the actual value of b . If $V_c = 2b$, or 3β , is used the pressure on the gas from the exterior at the critical state, $P_c = RT_c/2V_c$, or $2P_cV_c = RT_c$. The total critical pressure $\pi_c = P_c + P_{1c}$, where the latter term is the "inward pressure" due to van der Waals' factor a . P_c is shown to equal P_{1c} , whence $\pi_cV_c = RT_c$, i. e., the "gas law" holds good for the critical state. Values of P_c calcd. from the equation $2P_cV_c = RT_c$ show fair agreement with the facts for 27 gases given. If $P_c = P_{1c}$ at the critical state, surface tension and latent heat of vaporization disappear at that point.

G. L. WENDT.

The kinetic theory of gases. I. SAUL DUSHMAN. *Gen. Elec. Rev.* 18, 952-6 (1915).—The first of a series of articles in which D. elucidates the theory of gases in an elementary manner and discusses the principal conclusions that have been deduced from it, also their bearing upon different problems in physics and chemistry.

C. G. F.

The mean maximal deviation in the Brownian molecular movement and Brillouin's diffusion experiments. M. v. SMOLUCHOWSKI. *Sitzb. Akad. Wiss. Wien Abt. IIa* 124, 263-76(1915).—A probability calcn. applicable to mol. displacement in the Brownian movement. Brillouin's deductions (*C. A.* 7, 3870) are criticized on the ground that he assumes that particles striking the sticky wall of the vessel adhere without chance of return, and that there is no increase of viscosity in the liquid layer adjoining the wall. The two erroneous assumptions compensate.

G. L. W.

A study of the form of the ultramicroscopic particles in colloidal solutions of metals. R. GANS. *Publicaciones univ. nacional de la Plata, facultad de ciencias fis. mat. y astron.* 1915, No. 16, 161-79.—The measurement of the absorption curve of colloidal solns. of Au and Ag is a very sensitive method for detg. the form of the ultramicroscopic particles. The results in the case of these 2 substances showed very accurately

that their form is spherical. The supposition of Siedentopf and Zsigmondy that the particles have the form of disks or platelets is entirely untenable. D. I. MACHT.

The dissociation equilibrium $2\text{NO} + \text{Cl}_2 \rightleftharpoons 2\text{NOCl}$. A confirmation of the hypothesis of the additivity of the internal atomic heats. MAX TRAUTZ AND CLAUS F. HINCK. Heidelberg. *Z. anorg. allgem. Chem.* 93, 177-201(1915).—A discussion of the existing data on the above equil. and its bearing on the hypothesis of the additivity of the internal atomic heats (*C. A.* 8, 452). The reaction isochor is integrated both with the aid of Nernst's theorem, using existing data for specific heats, and by the aid of T.'s hypothesis of additivity of at. heats, and the theoretical values compared with the observed results of Vágó, Hinck, and Trautz. A critical discussion of the work of the above experimenters brings out the fact that over a considerable range values obtained by different observers by different methods in the temp. interval 450-600° abs. show excellent agreement with each other and are uniformly about one-half of the theoretical values calcd. on the basis of additivity. Above 600° abs. the exptl. values begin to diverge from the theoretical, probably due to a side reaction. Comparison with theoretical values calcd. on the basis of non-additivity, however, shows the observed values to be 50-160 times larger. It is concluded that the hypothesis of additivity of the at. heats is confirmed, the difference of 50% being explained by uncertainties in the constants. G. W. MOREY.

The resolving effect of nuclei on reduction in a mixture of aurichloric acid and hydrogen peroxide. ARNE WESTGREN. Upsala. *Z. anorg. allgem. Chem.* 93, 151-60(1915).—The fact that Zsigmondy's nuclei method for the estn. of the size of the particles of a dispersed phase has been found to give good results both with amicroscopic and submicroscopic colloids led to the testing of the effect on the size and concn. of the resulting colloid of varying the components. The size of the particles was detd. by application of Stokes' law, using the method previously described by W. (*C. A.* 9, 737). Variation of the amt. of H_2O_2 was without effect on the degree of dispersion of the colloid obtained, and the size of the added nuclei was also without effect. Variation in both the concn. of the added nuclei and the Au concn. of the soln. were without effect up to a certain limit, but when the soln. was too dil. spontaneous crystn. centers developed. G. W. MOREY.

Action of salts with water of hydration and without water of hydration on the velocity of saponification of esters. J. E. L. HOLMES AND HARRY C. JONES. *J. Am. Chem. Soc.* 38, 105-21(1916); also part of *Publ. Carnegie Inst. Washington* No. 230. —Previous spectro- and radiomicrometric work has shown that combined H_2O (H_2O of hydration) has a different power from free H_2O to absorb light; the present work shows that a similar chem. difference exists. The sapon. of MeOAc in 24 and 48 hrs. at 15°, 25° and 35° in 0.25, 0.5 and 1 *N* solns. of KCl , KNO_3 , NaCl , CaCl_2 , MgCl_2 , SrCl_2 , LiCl , $\text{Ca}(\text{NO}_3)_2$, NaNO_3 , NaBr , KBr , BaCl_2 , $\text{Mg}(\text{NO}_3)_2$, KI , NaI , CaBr_2 , MgSO_4 , $\text{Sr}(\text{NO}_3)_2$, LiBr , Li_2SO_4 , BaBr_2 , SrBr_2 and LiNO_3 was detd. (some expts. were also made with HCO_2Me), NH_4OH and corallin being used for the titrations. From the data, which are reproduced in tables and curves, H. and J. conclude that salts with H_2O of crystn. increase the velocity of sapon. more than salts with no H_2O of crystn.; on diln., the effect of the former salts decreases more rapidly than that of non-hydrated salts, showing that the result cannot be due to hydrolysis alone; the sapon. curves for the 2 esters are very similar; the large effect of hydrated salts is probably due, in part, to the combined H_2O being more highly ionized than free H_2O ; the amt. of sapon. seems to be due to the combined effect of both cation and anion; it is probable that anions as well as cations are somewhat hydrated; the hydration of cations is inversely proportional to their at. vols.; there seems to be a diln. of max. sapon. for each salt; hydrated salts show a large temp. coeff., probably due in part to hydrolysis, notwith-

standing the decompn. of hydrates with rise in temp.; decompn. of hydrates may play an important role in the increased velocity of chem. reactions with rise in temp.

CHAS. A. ROUILLER.

Studies of the imperfect crystals formed in a colloidal medium. ALBERT AND ALEXANDER MARY. *Bull. soc. Belge geol.* 26, 69-73(1912); *Neues Jahrb. Min. Geol.* 1915, I, Ref. 307-8.—The minute, more or less spherical cryst. masses of CaCO_3 , $\text{Ca}_3(\text{PO}_4)_2$, sulfates and fluorides of alk. earths, CuCO_3 , etc., formed in solns. of colloids such as $\text{SiO}_2 + \text{H}_2\text{O}$, albumin, oleic acid, and gelatin are described. The formation of these masses is discussed from the point of view of surface tension and capillarity phenomena, and it is found that their form is what would be predicted by theory.

E. T. W.

The reciprocal salt pair $\text{KCl} + \text{NaNO}_3 \rightleftharpoons \text{NaCl} + \text{KNO}_3$ and the manufacture of conversion saltpeter. W. REINDERS. Delft. *Z. anorg. allgem. Chem.* 93, 202-12 (1915).—The above reciprocal salt pair was studied by detg. isothermal soly. curves at 5, 25, 50 and 100° . The results, which are summarized by means of tables and curves, are too voluminous to be abstracted, but the main features of the system are the following. Over the entire temp. range $\text{NaCl} + \text{KNO}_3$ is the stable salt pair. The soln. in equil. with NaCl , NaNO_3 and KNO_3 is at all temps. congruently satd., but the soln. in equil. with NaCl , KCl and KNO_3 becomes incongruently satd. between 25 and 50° . At all temps. the soly. of NaNO_3 in H_2O is raised by addition of KNO_3 , which is to be ascribed, not to the formation of a double salt, but to the fact that the end point of the curve representing the equil. $\text{NaNO}_3 + \text{KNO}_3$ is the eutectic in the binary system, which is at the relatively low temp. of 218° . Various possible procedures in the manufacture of conversion saltpeter are discussed from the standpoint of theoretical yield, and it is shown that the best conversion is obtained by using an excess of NaNO_3 , which is in harmony with present technical practice, and that contamination by NaCl may be prevented by addition of H_2O at the proper point, which would obviate the necessity of the present method of washing out the admixed NaCl .

GEORGE W. MOREY.

Studies in the molecular theory on the reversion of thermodynamically irreversible processes and on the recurrence of abnormal conditions. M. v. SMOLUCHOWSKI. *Sitzb. Akad. Wiss. Wien, Abt. IIa* 124, 339-68(1915).—Probability calcns., intended to demonstrate theoretical reversibility for all processes, in accordance with molecular kinetics. Observed irreversibility is due to the length of the period of probable reversion. In the diffusion of O and N the return of a state in which the concn. of O is 1% in excess of normal occurs for a sphere of 1 cm. radius in 10^{10} sec., and for a sphere of 1.1×10^{-8} cm. radius in 10^{-11} sec. For visible vols. such a process seems irreversible while ultramicroscopically it is reversible or "revertible," i. e., automatically reversible.

G. L. WENDT.

The reversed heat engine as a drying machine. PAUL J. FOX. *J. Ind. Eng. Chem.* 7, 1065-9(1915).—The cycle suggested is that air is expanded adiabatically in a cylinder, warmed to atm. temp. in a heater (the source of heat being the atmosphere), and then compressed adiabatically in another heater. The cycle is discussed from a purely thermodynamic standpoint. It is calcd. that if air at 60°F . is warmed to 100°F . the air need only be expanded to 11.4 lbs. abs.; and the ratio of heat added to heat equivalent of work done will be 12.3 to 1, in other words, the cycle should have a far greater efficiency than most operations of heating as now carried on. There are many processes where a positive circulation of warm air at a definite temp. would be advantageous, e. g., drying products which are sensitive to heat. The expansion in the first stage of the cycle will in most cases cause a deposition of H_2O , so that the air will be dried by the process as well. A disadvantage is that for high efficiencies

the temp. lift should be small, and in case of widely fluctuating atm. temps. the result would be fluctuations of equal magnitude in the drying chamber. Means of circumventing this are given, such as changing the valve settings or having several machines in series and operating only as many as would be needed to give the required lift.

W. L. BADGER.

Decomposition potentials of fused alkali hydroxides. B. NEUMANN AND E. BERGVE. *Z. Elektrochem.* 21, 143-52 (1915); cf. *C. A.* 9, 3032.—Attempts to measure directly the potentials of Na against NaOH and K against KOH, as well as the cell $\text{Na} \mid \text{NaOH} \mid \text{KOH} \mid \text{K}$ were not very successful on account of exptl. difficulties. The decompn. potentials have been measured by LeBlanc's method (1902) for NaOH, KOH in the presence of air, NaOH in the presence of Na_2O_2 , KOH in an atm. of N, and mixts. of NaOH and KOH in both air and N. The following values for the decompn. potential were obtained:

NaOH.		KOH.	
Temp.	Decompn. potential.	Temp.	Decompn. potential.
180	2.38	...	..
200	2.32	200	2.4
230	2.29	230	2.37
280	2.25	280	2.34
305	2.25	305	2.36
335	2.22	335	2.4
390	2.05	380	2.25
450	1.87	...	..
530	1.62	530	1.8
640	1.32	...	..

The temp. coeff. above 335° for NaOH was 2.95×10^{-3} , for peroxide-free KOH 3.05×10^{-3} . The potential difference is therefore independent of the temp. The decompn. potential of LiOH gave no values for $\text{Li} \mid \text{LiOH}$, but a value of the order of the decompn. potential for H_2O .

E. B. MILLARD.

The electric field and the parallel arrangement of atoms and the polarization of the light emitted by them. Preliminary announcement. J. STARK. *Aachen. Naturwissenschaften* 3, 419 (1915).—S. found that the lines of the 3rd secondary series in the spectrum of Li are polarized by an intense elec. field in such a way that the parallel components of the lines (*i. e.*, those vibrating parallel to the elec. field) appear decidedly sharper and brighter than the components vibrating at right angles. This new phenomenon is here recorded for the first time. Another new and interesting observation is the following: Whereas the relative brightness of the main series, as compared with the 1st and 2nd secondary series of lines, is not appreciably effected by the elec. field, the relative brightness of the 3rd secondary series is most remarkably dependent upon the intensity of the elec. field. At low field intensities the 3rd secondary series is very faint (a photographic plate exposed long enough to record these faint lines is decidedly overexposed for even the second secondary series). At high field intensities the 3rd secondary series is very much brighter than the 2nd.

C. G. F.

The Kirchhoff radiation law. G. JÄGER. *Sitzb. Akad. Wiss., Wien, Abt. IIa* 124, 305-8 (1915).—The law is derived from thermal considerations, without the use of mathematics or hypothetical black and diathermic bodies or perfect reflectors.

G. L. WENDT.

Some observations on the absorption spectra of the vapors of inorganic salts. E. J. EVANS. *Univ. Manchester. Phil. Mag.* 31, 55-62 (1916).—The vapors of

NH_4Cl , HgCl , HgCl_2 , CdCl_2 , CdBr_2 and CdI_2 do not give well-defined absorption bands in the region λ 2500– λ 6700, as do Br and I. Excepting NH_4Cl , they give a general selective absorption in the ultraviolet, which is greater for CdI_2 and CdBr_2 than for CdCl_2 . Certain lines from CdCl_2 between λ 3000 and λ 3200 are intensified by the presence of H, so that an unstable compd. of Cd and H is suspected.

G. L. WENDT.

Measurements of the wave lengths on the international system in the red and infra-red arc spectra of the elements. II. J. M. EDER. *Sitzb. Akad. Wiss., Wien, Abt. IIa* 124, 101–21(1915); cf. C. A. 10, 146.—Red and infra-red lines are recorded for Al, Pb, Gd, Au, Cu, Nd, Pr, Ag, Tl, Y, and Zn.

G. L. WENDT.

Plates sensitized for spectrum photography in the infra-red, red, yellow and green. JOSEF M. EDER. *Sitzb. Akad. Wiss., Wien, Abt. IIa* 124, 231–40(1915); see C. A. 10, 157.

G. L. WENDT.

The magneton. P. WEISS. *Engineering* 100, 345–6(1915).—Lecture. Magnetism cannot be a property of the atom, since the Heusler alloys would then be non-magnetic. If this were the case it would be impossible, too, for cuprous salts to be diamagnetic and cupric salts paramagnetic. A diagram is shown illustrating the number of magnetons in alloys of Fe-Ni, Fe-Co and Ni-Co from 0 to 100%. There were sharp breaks in the curves corresponding to the definite compds. Fe_3Co and Fe_2Ni . The detns. of the number of magnetons indicated a new form of Fe, and it appears as if the atoms of an element might have different magneton values. Electromagnets could be strengthened by fitting them with pole tips of Fe-Co alloy. Langevin's law does not hold for Fe alloys at temps. above that at which they almost lose their magnetism (Curie point). W. could offer no explanation for the fact that his magneton was 18.5×10^{-21} while the nuclear theory of Bohr and Rutherford demands 5 times that value, 92.7×10^{-21} . He also was troubled about the fractional values for the magneton. In Cu salts, e. g., the magneton number in all concns. was 9.62, and that for Mn 29.2. Other difficulties, such as the half-magneton values, could be met by multiplying through by 2, but not those for Cu and Mn.

E. B. MILLARD.

The correction for the projecting thread of a mercury thermometer in a cooler atmosphere. GOTTFRIED DIMMER. Imper. Commission of Standards, Vienna. *Sitzb. Akad. Wiss., Wien, Abt. IIa* 124, 141–6(1915).—Numerous expts. have been made both in an atm. of 20° and one of 4° which verify the Kopp formula for the correction for the projecting thread, viz., $k = n\alpha(t_1 - t_2)$, where n is the number of projecting degrees on the thermometer, α is the apparent coeff. of expansion of Hg in the glass, t_1 is the temp. read, and t_2 is the temp. of an auxiliary thermometer half-way up the exposed thread. In the absence of air currents the formula is entirely reliable up to $t_1 = 400^\circ$. Cf. C. A. 8, 3743.

G. L. WENDT.

The correction for the projecting thread of a mercury thermometer exposed to air currents. GOTTFRIED DIMMER. *Sitzb. Akad. Wiss., Wien, Abt. IIa* 124, 241–7(1915); cf. preceding abstract.—The disturbances due to air currents may be entirely obviated by using a strong, wide horizontal blast of air blowing equally on the precision thermometer and on the auxiliary one. Experiments in which $t_2 - t_1$ varied from 70° to 326° showed exact correspondence with the Kopp formula under these conditions.

G. L. WENDT.

The rare gases of fire-damp. CHARLES MOUREU AND ADOLPHE LEPAPE. *Ann. chim.* 3, 137–57(1915).—A general and historical discussion, including some analytical results, and a restatement of M.'s astrophysical theory. Cf. C. A. 6, 1120, 2720; 8, 1699, 2239, 3358.

P. M. GIESY.

† Physico-chemical studies of the roasting processes. I. The roasting process with lead; equilibrium in the system lead-sulfur-oxygen. W. REINDERS. Delft. *Z. anorg. allgem. Chem.* 93, 213-30(1915).—Practically a duplication of *C. A.* 9, 1564, with slight additions; the conclusions reached are identical. GEORGE W. MORRY.

3. RADIOACTIVITY.

WILLIAM H. ROSS.

Radium. G. W. C. KAYE AND W. T. HIGGINS. *Rept. Nat. Phys. Lab.* 1914-15, 92-3.—A report on tests made during the period, March 1914-March 1915.

W. H. ROSS.

The necessity for a unit scale of hardness in Röntgen ray technic. P. LUDWIG. Freiberg i. Sa. *Naturwissenschaften* 3, 403-7(1915).—A discussion of the 9 units in common use and the practicability of adopting the abs. wave-length scale. The election of a commission of Röntgen ray physicists is urged to choose a suitable standard scale of units.

G. L. WENDT.

The process for stabilizing the functioning of Röntgen tubes by the absorption of carbon dioxide. P. CARDANI. Univ. Parma. *Atti accad. Lincei* 24, I, 898-904 (1915).—In a preceding note (cf. *C. A.* 9, 2188) C. showed how Röntgen tubes obtained from the factories when opened and connected with a pump and a manometer evolved notable amts. of gas which diminished in amt. with time, but which was evolved in notable amts. again when the tubes were excited after a period of rest. The gas emitted was not air nor combinations of the gases of the air. The tubes were heated to 400° and an attempt was made to accelerate the emission of gas by passage of the discharge and the action of a Gaede pump. It was found that the gas in the tubes was not re-absorbed and that after a prolonged evacuation the pressure was elevated in 4 days from 0.052 to 0.226 mm. on exciting the tubes a few mins. at a time at intervals of some hrs. The appearance of the tube had undergone a marked change. At the beginning at 0.226 mm. the light invading the tube was bluish white and the cathode stream white, but the diffuse light became a magnificent sea-green and the cathode rose-red. The cathode at first emitted another gas but under the evacuation treatment it finally yielded only H as shown by its spectrum. C. made expts. to see if it was possible to construct Röntgen tubes by subjecting the Al electrodes to a long exhaustion. He thought that it would be advantageous first to sat. the electrodes with some other gas which would impede the emission of H. Among the gases easily absorbed was CO₂ which is quickly dissociated, when the tube is excited, into CO + O, of which O is first absorbed and CO more slowly. The appearance of the tube on excitation when it contained CO was the same as in the first stage described above. If then in the construction of Röntgen tubes the emission of H by the Al electrodes is eliminated by satg. the electrodes with CO, it is clear that on subjecting tubes thus treated to heating and simultaneous excitation the gas 1st evolved would be CO, then CO + H and finally H alone. This was verified and proved by the spectra. It was thus shown that by eliminating the air adhering to the surface of the electrodes the gas emitted is solely CO at first and solely H at the end. The expts. were continued in order to find conditions under which the emission of H could be prevented. After several trials (described) the tube was evacuated as much as possible and filled with CO₂ under pressure and the discharge was passed (anticathode isolated). The results indicate that the air adhering to the electrodes was released before the absorption of CO took place. Tubes prepared in this way began to develop X-rays as shown by the electrometer at 0.033 mm. and the evolution was very abundant at 0.020 so that the

needle was deviated 80 divisions in 5 secs. by the charge carried by the ions produced by the X-radiation. The expts. are being continued. E. J. WITZEMANN.

The magnetic constants of isotopic substances. STEFAN MEYER. Radium Inst., Vienna. *Sitzb. kais. Akad. Wiss., Wien, Abt. IIa* 124, 187-92(1915).—Specimens of Hönigschmid's pure Ra G salts (*C. A.* 9, 3026) when tested in the Fe-free magnetic balance gave values for the magnetic susceptibility within 1% of those for pure ordinary Pb salts. This indicates that at. magnetism is a property due to the electron rings rather than to the nucleus, assuming the Rutherford-Bohr atom. That it is usually an additive property of the atom, however, indicated that it is seated in one of the inner electron rings. G. L. WENDT.

The interchange of atoms between solid and liquid phases. G. v. HEVESY. Radium Inst., Vienna. *Sitzb. kais. Akad. Wiss., Wien, Abt. IIa* 124, 131-9(1915); see *C. A.* 9, 2485. G. L. WENDT.

The atomic volume curve and the connection between atomic volumes and radioactivity. STEFAN MEYER. Radium Inst., Vienna. *Sitzb. kais. Akad. Wiss., Wien, Abt. IIa* 124, 249-62(1915).—A new at. vol. curve is drawn, for which the at. numbers of the elements as given by Moseley (*C. A.* 8, 2307), instead of the at. wts., are divided by the densities. There are then abrupt breaks in the curve between N and O, P and S, and less marked breaks at the corresponding points of the longer periods, i. e., Ge-As, In-Sn and Tl-Pb. It is pointed out that these positions are those at which the number of rings of electrons in the atom increases by one, according to the theory of Bohr (*C. A.* 7, 3712). As long as the number of rings remains const. an increase in the number of electrons in the outermost ring, corresponding with an increase in valence, results in a decrease in the at. vol., and an increase in the latter follows a decrease in the former. The abrupt change at P may be connected with the 2 allotropic forms of P and both densities may be used; then red P has the greater at. vol. and probably is the trivalent form with 3 electronic rings, while white P has a lesser vol., is pentavalent, and has but 2 electron rings. A similar allotropy may occur with N, As, etc., but in the heavier atoms the effect is relatively smaller. That not only high at. wt. but also great at. vol. cause at. instability is shown by the radioactivity of K and Rb. That Cs is not radioactive and that the rays from Rb are weaker than the K rays results from the lesser at. vol. gradient for K-Rb-Cs as compared with that for Li-Na-K. In the radioactive disintegration series the at. vols. attain and pass a max. value but never pass a minimum. An α -ray product formed with increased at. vol. has a shorter period than its parent, but if the resulting at. vol. is less the period is greater. In the interval of increasing at. vol. the return of a disintegration series to an isotope (as U_1 to U_2) involves a shortening of the period, but after the emanations are passed and at. vols. are decreasing such a return (as Ra B to Ra D to Ra G) increases the period. Of 2 successive β -radiators the 2nd always has the lesser period. Such β -ray interruptions in a series of α -ray changes occur at U X_1 and the "B" elements, all of which are in the 4th group of the periodic table where the at. vol. is at a minimum. Branching of the disintegration series occurs only at the "C" members, which are in the 5th group and therefore correspond with P and N. It is suggested that there are present 2 allotropic modifications of the C elements, resp., tri- and penta-valent, of which the former contains one additional electronic ring, as in the case of N and P, and that the 2 modifications disintegrate in different manner, one giving a β -, the other an α -ray. G. L. WENDT.

The structure of gamma rays on the basis of the electro-magnetic theory of light. JAKOB KUNZ. Univ. Illinois. *Phys. Rev.* [2] 6, 413-8(1915).—Calcns. on the distribution of the energy radiated by an electron in collision. At low velocities the energy

radiates in an equatorial plane perpendicular to the line of motion but with increasing velocity the direction of radiation approaches the direction of motion of the electron, until, when the velocity of light is reached, the directions are identical. If the electromagnetic field is endowed not only with energy but with mass and momentum, then the electromagnetic mass of the electron, when it comes to rest, is thrown forward more and more with increasing velocity. The conception resembles then the old notion of light particles.

G. L. WENDT.

Absorption of the beta particles from some of the radioactive substances by air and carbon dioxide. ALOIS F. KOVARIK. Univ. Minnesota. *Phys. Rev.* [2] 6, 419-25(1915).—The ionization produced by β -rays in a shallow ionization chamber placed at a fixed distance from the source within a high-pressure vessel was measured at various pressures, and the coeff. of absorption thence calcd. The absorption curves in air and CO_2 are of the same shape as those in Al. The following values of the absorption per cm. for the β -rays from the following elements were obtained for air and for CO_2 , resp., at 1 atm. and 22°: Ra D, 0.097 and 0.183; Ra D (very soft), 0.64 and 1.69; Ra E, 0.0152 and 0.0297; Th B, 0.090 and 0.142; Th C + Th D, 0.0068 and 0.0129; Act B, 0.31; Act C + Act D, 0.0091 and 0.0175; U X_1 , 0.12 and 0.23; U X_2 , 0.0063 and 0.0114. To compare the relative ionizations of the soft and hard rays when both are present, ionization ratios were detd. as follows for the β -rays from the following sources: Ra D (soft) to Ra E, 2.4; Ra D (harder) to Ra E, 0.30; Act active deposit, soft to hard, 1.14; and Th active deposit, soft to hard, 2.86. These values are for air at 1 atm., and were computed by extrapolation to zero absorber.

G. L. WENDT.

Distribution of transmitted and reflected beta particles determined by the statistical method. ALOIS F. KOVARIK AND L. W. MCKEEHAN. Univ. Minnesota. *Phys. Rev.* [2] 6, 426-36(1915).—An adaptation of Geiger's counting method was used to det. the number of β -particles reflected from and transmitted through an Al plate at all angles. The data accord with Rutherford's theory of scattering by single at. encounters. The mean free path of the β -particle in Al between deflections is deduced as 0.001 cm. When the plate is thick enough to deflect practically each particle a number of times the transmitted rays emerge in accordance with a cosine law, as do light waves emitted from a heated solid.

G. L. WENDT.

An attempt to influence the rate of radioactive transformations by means of alpha rays. JEAN DANYSZ AND LOUIS WERTENSTEIN. *Compt. rend.* 161, 784-7(1915).—Although no chem. or physical agency is known which has any effect on the rate of transformation of the radioelements, it was nevertheless thought that if some agency could be made to act upon the nucleus of the atom within which, according to Rutherford's theory, is inherent the property of radioactivity of an element, an artificial alteration in the rate of transformation might be possible of attainment. Such an agency is available in the case of α -rays, for when an element is bombarded by these rays a certain small percentage of the rays undergoes total reflection in the absorbing material, which phenomenon is caused, according to theory, by these α -particles coming within the influence of the nucleus of the atom. Any change in the rate of transformation would be more marked in the case where a long-lived element changes into a short-lived one, as in the transformation of $\text{U}_1 \rightarrow \text{U X}_1$, and of Meso-Th $\rightarrow$ Meso-Th $_2$. A layer of U_2O_8 just thick enough to absorb the α -rays was accordingly exposed to the rays from 18 millicuries of Ra E, for 6 days, and the activity measured before and after exposure to the rays. A Meso-Th prepn. was likewise exposed to the rays in the same way. From the negative results obtained it is concluded with a considerable degree of certainty that even those α -particles which come under the influence of the nucleus of the atom do not have any effect in changing its rate of transformation.

W. H. ROSS.

Work of the Physikalisch-Technische Reichsanstalt in 1914 2.

Extracting vanadium, uranium and radium from ores. R. B. MOORE. U. S., 1,165,692, Dec. 28. (Dedicated for free use by the public.) Ores containing V, U and Ra are leached with a soln. of Na_2CO_3 and NaOH. V is recovered from the soln., and the residue is leached with HCl or HNO_3 , and U and Ra are recovered from the soln. thus formed. Stronger acid may be applied to the residue for extg. any V still remaining in it.

Extracting vanadium, uranium and radium from ores. R. B. MOORE. U. S., 1,165,693, Dec. 28. Ra ores which may also contain V, U and Fe are leached with hot HCl or HNO_3 , and BaCl_2 and H_2SO_4 are added to the soln. obtained to ppt. BaSO_4 together with RaSO_4 . NaOH or KOH is added to the remaining soln. to ppt. U and Fe together with any Ra still remaining in soln. and then the V is pptd. from the soln. as Fe, Cu, Pb or Ba vanadate. The ppt. containing U, Fe and Ra is treated with dil. H_2SO_4 or HCl and BaCl_2 to dissolve U and Fe and the soln. of U and Fe is boiled with an excess of Na_2CO_3 , the Fe is pptd. and the U subsequently pptd. with NaOH. Na_2CO_3 may, if desired, be used instead of NaOH or KOH for the first alkali pptn. in which case Fe, Al and Ra with some of the U and V will be pptd. This ppt. is treated in the same manner as that obtained with NaOH and the U and V are successively pptd. from the remaining soln.

4. ELECTROCHEMISTRY.

COLIN G. FINK.

Michael Faraday. ERNST JENTSCH. *Naturwissenschaften* 3, 625, 640(1915).—Biographical. C. G. F.

The Vigeland aluminium factories near Venneala, Norway. J. REYVAL. *Lumiere elec.* 30, 298-303; 31, 8-14(1915).—R. describes in detail the water power development and the elec. installation. There are 3 generators each feeding 35 Al furnaces. The voltage per furnace is 7. The capacity of the plant is 2000 tons Al per annum. Details of manuf. are withheld. W. H. BOYNTON.

The electrolytic preparation of hydrogen and oxygen. YOGORO KATO. *J. Chem. Ind. Japan* 18, 919-33(1915).—The diaphragms used in the commercial production of H and O do not keep these gases completely separate as shown by diffusion data given by K. He finds that pure gases can be technically prepared without the use of a diaphragm. Special electrodes are employed; these have an inclined active surface to which the generated gas adheres by reason of its buoyancy and accordingly does not diffuse into the soln. C. G. F.

A new electrolytic cell for making pure oxygen and hydrogen. ANON. *Met. Chem. Eng.* 14, 108-10(1916); illus.—The International Oxygen Co. of New York has introduced a new style of O and H generator under the name "I. O. C. bipolar generator." This is based on patents of Moritz and Levin (cf. C. A. 8, 301, 2118). In outward appearance the new generator resembles a filter press. There is a series of metallic plates (bipolar electrodes) clamped together in a heavy frame, electrically insulated from one another by diaphragms of porous asbestos fabric. Each pair of these electrodes forms a closed cell. The electrolyte is KOH. The mingling of the O and H in each cell or compartment is prevented by the diaphragm, which while permitting the passage of the soln. resists the passage of the gases. As the gases pass upwards and thence through the off-takes, H_2O is automatically added from a supply tank. The anode side of the electrodes is heavily Ni-plated and the cathode side is of com-

mercially pure Fe. This metal combination has been found materially to facilitate the decompn. of the H_2O due to lower overvoltage as compared to older types of electrodes. Other details of construction and operation are described in full. The demand for H has materially increased within recent years. O finds a wide application in welding practice ($O-C_2H_2$ and $O-H$ welding). C. G. F.

Polarization in LeClanché cells. D. A. MACINNIS. *Trans. Am. Electrochem. Soc.* 29 (advance copy) (1916).—Thompson and Crocker (*C. A.* 9, 756) concluded from their expts. that pyrolusite combines quantitatively with the H evolved and that the only substance to which the polarization of these cells can be attributed is NH_3 . MacI. contends that it is partly H since the formation of free NH_3 is insufficient to account for polarization of the order of 0.5 v. or more since the NH_3 concn. can hardly exceed 5% even momentarily. His contention is based upon e. m. f. measurements and theoretical considerations. H will be evolved at the cathode only when its pressure reaches 1 atm. The action of the MnO_2 is to keep its pressure far below this. The system $MnO_2-Mn_2O_3-H_2-H_2O$ is univariant; under equil. conditions the system will have a definite though very small H pressure for each temp. If allowed to stand on open circuit the + electrode of the LeC. cell will reach a voltage corresponding to the soln. tension of H at this equil. pressure. MacI. regards the cell as a double one: $Z | NH_4Cl + ZnCl_2 | H_2, 1 \text{ atm.} - H_2, 1 \text{ atm.} | NH_4Cl + ZnCl_2 | H_2, x \text{ atm.}$ He measured the e. m. f. of the left half of this double cell at 25° and found -0.514 v. The e. m. f. of the right is taken as -0.986 v. ; assuming that the e. m. f. of the LeC. cell on open circuit has the av. value -1.50 v. ($-1.50 + 0.514 = -0.986$). With the aid of Nernst's equation x is then found to be $4 \times 10^{-24} \text{ atm.}$ which equals the pressure of H on the cathode at equil. on open circuit. A drop in voltage from -1.50 to -1.20 corresponds to a rise in the H pressure from 4×10^{-24} to 10^{-24} atm. C. G. F.

Electrostatic effects upon a cell with insulating walls and a liquid core. I. MALCOLM. *Compt. rend.* 161, 694-6(1915).—The dielec. properties of liquids in an electrostatic field were studied by placing the liquid in a small quartz cell located between the plates of a condenser. Preliminary work showed fused quartz to be a better insulator than crystalline quartz. The dielec. const. for fused quartz, $k = 4.86$. Upon charge or discharge, no residual effect could be detected with the empty cell alone between the condenser plates; neither was any such effect apparent when the cell was filled with H_2O or Hg. When, however, the cell was filled with an "insulating" liquid such as vaseline, turpentine, or petroleum ether, the equil. upon charge or discharge was not attained instantly (no data given). These facts may be explained by assuming the ionic particles in H_2O and Hg to have extreme mobility, while in the case of the other liquids, the ions only recombine slowly after the sepn. due to the elec. charge. M. has already detd. the cond. of certain highly non-conducting liquids in ozocerite cells. The use of the quartz cell will allow the method to be extended to all liquids.

F. A. STRAUSS.

The dimensions of the units of electrical measurement. H. MAURER. Berlin. *Elektrotechn. Z.* 19, 228-30(1915).—At present the differences between the electrostatic units and the electromagnetic units of measurement are the cause of much confusion. This difference has arisen through a mathematical misinterpretation of the factor l in Coulomb's equation for electrostatic attraction. Through this misinterpretation, the force of attraction between two charges of electricity (F) has been assigned the dimensions ($m. l t^{-2}$) where m = mass, l = distance, and t = time. Newton's law, which has been correctly interpreted and used in most electrostatic work, assigns the dimensions ($m^{-1} l^2 t^{-2}$) to F . Although the values derived by the misinterpretation of Coulomb's law can easily be shown to be incorrect, they have been generally accepted and applied in electromagnetic work. Therefore in order to avoid confusion, M. pro-

poses that the units, hitherto used solely for electromagnetic measurements, be used in electrostatic work as well. The values of the present electrostatic units are calcd. and given in terms of electromagnetic units as well as in c. g. s. units. The values of the commoner units are:

	Electrostatic.	Electromagnetic.
1 Coulomb =	10^{-1} c. g. s. units	3×10^9 c. g. s. units
1 Volt =	10^8 "	0.00333 "
1 Farad =	10^{-9} "	9×10^{11} "

F. A. STRAUSS.

Galvanic battery. M. L. KAPLAN. U. S., 1,166,414 Dec. 28. Acid manganous polymanganite is used as depolarizing agent in a battery of the LeClanche type. Cf. C. A. 10, 154.

Electric dry battery. H. WILHELM and H. OLANETA. U. S., 1,166,871, Jan. 4. Structural features.

Electrolytic recovery of copper, zinc, or nickel. N. V. HYBINETTE. Ger., 285,652, Nov. 8, 1912. The initial material, which contains the metals partly as oxides and partly as sulfides, is subjected to extn. and electrolysis in 2 steps, extg. first with a soln. not too rich in $\text{Fe}_2(\text{SO}_4)_3$ and electrolyzing the resulting ext. without diaphragms, and then employing a soln. relatively rich in $\text{Fe}_2(\text{SO}_4)_3$, and electrolytic cells with diaphragms. From the cells without diaphragms a portion of the liquor is subjected, in a 2nd phase, to the action of electrolytic cells with diaphragms, with increase of the $\text{Fe}_2(\text{SO}_4)_3$ content, and then used for further extn. of the residual difficultly sol. metal constituents. E. g., if a sulfidic ore containing about 4% Cu is to be worked, the crude material is roasted until 0.5-1% S remains unoxidized, and then extd. and electrolyzed.

Purifying electrolytic chlorine. U. ISHIKAWA. U. S., 1,166,524, Jan. 4. H present in electrolytic Cl is caused to react with Cl to form HCl, by the catalytic action of Pt, Au, Fe, Ni, Co, Cr or Cu, and the HCl thus formed is oxidized by the action of peroxides or oxidizing salts to form Cl and H_2O . MnO_2 may be used to serve both as catalyst and oxidizer, thus carrying out the process in a single step.

Tungsten lamps. A. J. LIEBMANN. U. S., 1,166,464, Jan. 4. Defective W filaments in incandescent lamps are restored to good condition by volatilizing BaF_2 within the lamp at a temp. above the usual working temp. of the filament. W fluoride is formed and this decomposes in contact with the portions of the filament which are excessively heated because of defective condition or thinness. The vacuum within the lamp is restored to its normal condition by the second reaction. Other halogen salts of alkali or alk. earth metals or Tl may be used.

Electric incandescent lamp. S. BUXBAUM. Ger., 285,964, May 2, 1914. The filaments are arranged cross-wise, but sepd., in such manner as to give the appearance of a net.

Portable electric lamp. F. SCHIKORR and G. WOLFF. Ger., 285,880, Oct. 31, 1914.

Vacuum tubes. A. LEDERER. Brit., 17,646, July 25, 1914. The small quantity of one or more alkali metals, enclosed in a lamp containing gases such as Ne, He, A, or Kr, as described in 17,036 (C. A. 10, 157) is now confined, say in the form of a deposit, to the neighborhood of the electrodes or of the anode only.

Electric endosmosis; tanning; dyeing. GES. FÜR ELEKTRO-OSMOSE. Brit., 19,849, Sept. 16, 1914. Solid bodies, and liquids for impregnating them, are subjected to elec. current between diaphragms of such character as to retain the active constit-

uents while preferably allowing the escape of impurities such as acids and bases. The process is applicable to tanning, dyeing, and other cases of adsorption. App. is specified.

5. PHOTOGRAPHY.

LOUIS DERR.

Advances in scientific photography. E. SCHLOEMANN. *Z. wiss. phot.* 15, 55-64, 78-96(1916).—Bibliography for 1914. L. DERR.

The pulverizing action of light, with especial reference to photographic problems. H. NORDENSON. *Z. wiss. phot.* 15, 1-17(1916).—There is no pulverizing effect with metals, either in vacuum or in gases. With sheet metals, in certain cases colloid formation takes place, but it is only chemical. With non-metals, in a certain few cases a change of structure appears, most readily explicable on chemical grounds. Thus a true pulverizing by light does not exist. In the usual photographic film, changes of structure by light-action are not definitely established, and are unconvincing under observation. Explanations of the latent image based on this phenomenon are therefore to be discarded. L. DERR.

The pulverizing of silver halides by light. H. LÜPPO-CRAMER. *Z. wiss. phot.* 15, 125-32(1916); cf. preceding abstract.—Even though direct pulverizing of Ag halide by light is held to be impossible, it may be assumed that splitting off the halogen effects a physical disintegration of the halide, and thus may be the cause of the increased soly. and the definitely proved increased degree of dispersion. L. DERR.

Use of potassium ferrocyanide for increasing the light-resistance of photographic silver compounds. N. SULZBERGER. *Atelier Phot.* 22, 45-7(1915).—When $K_4Fe(CN)_6$ is used as a fixer, the nature of the effect is as yet undetermined, but is certainly not like that of hypo, because compds. soluble in hypo are left in the film. The salt is effective for gas-light and printing-out papers, and requires a minimum time as compared with hypo because the long final washing is unnecessary. The image on Aristo paper is bleached by $(NH_4)_4Fe(CN)_6$, but is restored by development with rodinal, and is then light-resisting. L. DERR.

Stripping of gelatin dry plates. S. M. FURNALD. *J. Frank. Inst.* 181, 141(1916).—For stripping films from large plates, the following is recommended: flow the plates with a mixt. of collodion 30 cc., and glycerol 2 cc., and as soon as the collodion has set, cut around the portion to be stripped with a knife and immerse the plate in 4% NaF 2 parts, formalin 1 part. In about 1 min. the film can be removed. The collodion is not needed for small plates. L. DERR.

A contribution to the explanation of the formation of the latent image on exposing the photographic silver bromide plate. R. FORMHAUS. *Chem. Ztg.* 39, 917(1915).—F. supposes that the AgBr exists in the gelatin in a completely undissociated state; that light, assisted by H_2O in the gelatin, causes dissociation, and that the developer affects the dissociated salt only. Cf. *C. A.* 1, 2978; 2, 1392; 5, 1703, 3016; 6, 38, 3063; 7, 1681; 9, 2355, 2490. J. H. MOORE.

Production of duplicate negatives, methods of image reversal, lateral inversion and stripping. E. STENGER. *Z. Reprodukt.* 17, 70-2, 78-80, 86-7, 94-5(1915); cf. *C. A.* 9, 3036.—Detailed working instructions for a negative-duplicating process in which a AgBr gelatin dry plate is dichromated; exposed under the negative to be copied, slightly fogged, and developed. If the dichromate is washed out before developing, the gradation obtained is steeper than if it is not washed out, and may even exceed the normal. L. DERR.

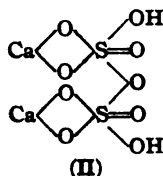
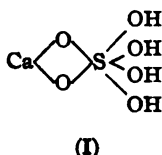
Colored photographs. W. F. Fox. U. S., 1,166,121-2-3, Dec. 28. The photographs are made from a set of color-selection negatives.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

Water of crystallization. Compounds with $2\text{H}_2\text{O}$. II. I. GUARRESCHI. Univ. Turin. *Atti accad. sci. Torino* 50, 881-902 (1915).—G. continues the report on the salts with $2\text{H}_2\text{O}$ of crystn. (cf. C. A. 9, 417). The purpose was to establish the temp. of dehydration and to see which ones follow Rosenstiehl's rule, *i. e.*, lose the $2\text{H}_2\text{O}$ mols. simultaneously. The following salts are discussed in this paper: $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, $\text{Na}_2[\text{Fe}(\text{NO})(\text{CN})_5] \cdot 2\text{H}_2\text{O}$, $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$, $\text{NaBr} \cdot 2\text{H}_2\text{O}$, $\text{NaI} \cdot 2\text{H}_2\text{O}$, $\text{Cd}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$, potassium ethylidene disulfate, $\text{MeCH}(\text{SO}_3\text{K})_2 \cdot 2\text{H}_2\text{O}$, $\text{Na}_2\text{S}_2\text{O}_8 \cdot 2\text{H}_2\text{O}$, $\text{BaS}_2\text{O}_8 \cdot 2\text{H}_2\text{O}$. *Calcium sulfate*. Much work has been done on the dehydration of $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$, part of which G. reviews in detail, giving references. He finds that the data are discordant but it seems that the temp. at which $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ eliminates all or part of its H_2O varies with the conditions. Consequently exptl. work was undertaken by G. to det. the conditions for the easiest elimination of H_2O . Pptd. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ lost no H_2O over CaCl_2 or H_2SO_4 even at 40 mm. pressure at $22-3^\circ$. After 3 hrs. in a steam oven at 99° it lost 0.3%, after 16 hrs. at 108° in an oven heated with toluene it lost 19.73% H_2O , and after 3 hrs. more in an amyl alc. oven no further loss occurred. After 5 hrs. more at $195-205^\circ$ the total loss was 20.6%. Under these conditions $\text{CaSO}_4 \cdot 0.5\text{H}_2\text{O}$ is not formed. Finely crystd. natural gypsum from Caltanisetta lost no H_2O over CaCl_2 , but heated directly at 99° for 2.5 hrs., it lost 16.15% H_2O (15.7% for 1.5 H_2O); after 10 hrs. more at 99° it had lost 19.7%. Gypsum from Moncucco, heated 2 hrs. at 99° , lost 14.8%; after 2 hrs. more the total loss was 15.36%; 8 hrs. more made it 18.8% (1.75 mol. H_2O 18.4%). Pptd. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ lost about 0.4% H_2O in 2.3 hrs. at 99° ; in 19 hrs. at 108° it had lost 18.9% H_2O . Natural gypsum (marienglas) heated 1 hr. at $98-9^\circ$, lost 9.1% H_2O (1 mol. = 10.45%); after 2.5 hrs. the loss was 15.99%; after 10 hrs. it was 19.98%; after 2-3 hrs. at 108° no more wt. was lost. No true point of arrest was observed, but there is a great slowing up of the loss after 1.5 H_2O has been lost. The natural gypsum loses a large portion of its H_2O easily in the 1st hr., while the pptd. prepn. begins to lose it rapidly only after the 2nd or 3rd hr. Gypsum crystals from Moncucco heated 3 hrs. at $98.5-99^\circ$ lost 14.83% H_2O ; after 2 hrs. more the loss was 16.1% H_2O . Pptd. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ under the same conditions lost about 0.5% H_2O in 3 hrs., 5.8% after 2.5 hrs. more, 16.4% after 6 hrs. more, etc. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ (marienglas) in an oven heated with heptane vapor ($93-4^\circ$) lost 5.7% H_2O after 1.5 hrs.; after 6 hrs. more 15.68% and after 14 hrs. more, 19.8%; no more was lost at this temp.; no point of arrest was noted. Pptd. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ heated at $98-9^\circ$ in a current of air lost 12.7% H_2O in 3 hrs., and after 3 hrs. more the loss was 19.3%; another 3 hrs. brought it to 20.25%. The pptd. prepn. heated 2 hrs. in a current of dry air lost 0.54% H_2O in 2 hrs., 9.7% in 3 hrs. more, and 20.4% in 14 hrs. more. Gypsum from Moncucco kept for 2 hrs. in current of dry air at 99° lost 9.49% H_2O ; in 16 hrs. more the loss was 20.39% H_2O . The same substance heated at $98-9^\circ$ in air, dried with CaCl_2 , H_2SO_4 , soda-lime, etc., lost 14.9% H_2O in 1.25 hrs.; after 2 hrs. more the loss was 20.5%; after 4 hrs. more the loss was 20.88%. In the 1st hr. it lost nearly 1.5 H_2O and after 4-5 hrs. more it lost the other 0.5 H_2O . This anhydrous CaSO_4 absorbs 7.95% H_2O (6.6% = 0.5 H_2O) from the air in 24 hrs. Pptd. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ heated in desiccated air at 42° , 60° , 64° and 72° lost no wt. but after 6 hrs. at $81-2^\circ$ (b. p. of $\text{C}_2\text{H}_4\text{Cl}_2$) it lost 4.8% H_2O ; after 14 hrs. more it had lost 20.26%; after 4 hrs. at 125° it had lost 20.58%. When heated in a current of dry air there is no point of arrest.

All the H_2O is eliminated, the last 0.5 mol. more slowly than the rest. The dehydration point may be $81-2^\circ$. 1.0022 g. of the pptd. prepn. in a desiccator (over H_2SO_4 or better over P_2O_5) was placed in a thermostat for 24 hrs. at 30° , 40° , 50° , 60° and 70° , resp., with a total loss of 0.004 g. but at 80° in 20 hrs., it lost 11.3% H_2O ; after 20 hrs. more the loss was 20.08%; after 24 hrs. more the loss was 20.3%. Natural gypsum heated 65 hrs. at 72° in a desiccator lost 17.9% H_2O ; after 48 hrs. more the loss was 20.04%; after 48 hrs. more it was 20.25%. In neither case was the semihydrate observed as an intermediate product. The above expts. show that $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ loses nearly all its H_2O at $81-2^\circ$ and more easily at $98-9^\circ$, which is contradictory to the statement that at 130° it still retains 0.5 H_2O . The last small portion of H_2O is eliminated very slowly but 20-20.5% may be eliminated under the above conditions in 3-4 hrs. These results agree in principle with those of Plessy (*Compt. rend.* 24, 658, 812 (1847)) who found that gypsum loses all its H_2O at $110-5^\circ$ in a current of dry H_2 . There are no facts at hand as yet that det. whether the semihydrate is $\text{CaSO}_4 \cdot 0.5\text{H}_2\text{O}$, $2\text{CaSO}_4 \cdot \text{H}_2\text{O}$ or $\text{Ca}_2\text{S}_2\text{O}_6 \cdot \text{H}_2\text{O}$. G. prefers the latter. He considers that gypsum may be (I)

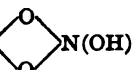
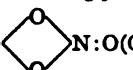


and that 2 mols. by the loss of $3\text{H}_2\text{O}$ give (II) as in the case of $\text{Cu}_2\text{S}_2\text{O}_6 \cdot \text{H}_2\text{O}$. And perhaps gypsum or cryst. $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$ is really $\text{Ca}_2\text{S}_2\text{O}_6 \cdot 4\text{H}_2\text{O}$. *Sodium nitroprusside*. Playfair (*Roy. Soc. London* 74, 328(1850)) stated that $\text{Na}_2[\text{Fe}(\text{NO})(\text{CN})_5] \cdot 2\text{H}_2\text{O}$, (a), loses no H_2O at 100° . Similar salts of Ba, Cu and NH_4 lose their H_2O at 100° . The exptl. work of G. shows that (a) loses no H_2O in a desiccator over H_2SO_4 if left for 18 hrs. When (a) is heated to 108° it loses its water rapidly; at $98-9^\circ$ the H_2O is lost rapidly, the last $\frac{1}{2}$ mol. requiring more time for its elimination than the first $1\frac{1}{2}$ mols. The fact that the last 0.5 mol. H_2O is lost with difficulty suggests that (a) should also have the double formula $[\text{Na}_2\text{Fe}(\text{NO})(\text{CN})_5]_2 \cdot 4\text{H}_2\text{O}$. At $15-17^\circ$ the anhydrous salt absorbs $2\text{H}_2\text{O}$ from the air. *Cupric chloride*. The earlier work is reviewed and references given. G. himself found that $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ lost 18.9% H_2O in 15 hrs. at 10 mm. over H_2SO_4 at $23-4^\circ$; in 30 hrs. more it had lost 20.76% and then lost no more; no HCl was lost. At 15° and 10 mm. it lost 10.21% (1 mol. = 10.55%) in 27 hrs. and the 2nd mol. (total 21.24%) in 87 hrs. more. Heated at $60-1^\circ$ in a current of dry air it lost 6.66% and became coffee-colored. In the 1st 14 hrs. it lost about 1.5 mol. H_2O and the remaining 0.5 mol. in 14 hrs. more. The dry salt is completely hydrated on standing in the air and is not deliquescent. When $\text{CuCl}_2 \cdot 2\text{H}_2\text{O}$ is left in a desiccator over H_2SO_4 , the 1st H_2O is eliminated in about 540 hrs., the 2nd in 670 hrs. Another specimen heated at 55° lost 11.6% H_2O in 9 hrs. (1 mol.) and the remainder in 46 hrs. more. Some H_2O was also lost at 41° . The temp. of dehydration over H_2SO_4 at 10 mm. may be 24° and even 15° ; in dry air it may be 55° . *Sodium bromide*, $\text{NaBr} \cdot 2\text{H}_2\text{O}$ lost 12.77% H_2O (1 mol. = 12.95%) in 23 hrs. at 30° ; after 28 hrs. more it had lost 26.6% (calcd. for $2\text{H}_2\text{O}$ = 25.9%). *Sodium iodide*, $\text{NaI} \cdot 2\text{H}_2\text{O}$, lost 11.91% H_2O in 72 hrs. over H_2SO_4 and 20.17% in 113 hrs. more. The data in the literature about *cadmium acetate* are discordant. $\text{Cd}(\text{C}_2\text{H}_3\text{O}_2)_2 \cdot 2\text{H}_2\text{O}$ lost about 1 H_2O over H_2SO_4 at $12-14^\circ$ for 32 days and 14.08% H_2O in 56 days more (calcd. 13.4% H_2O). At 30° it lost 0.66% H_2O ; at 50° $2\text{H}_2\text{O}$ were lost without any arrest point. In a desiccator over H_2SO_4 it lost 0.6% in 24 hrs. and at 20 mm. in 200 hrs. it lost $2\text{H}_2\text{O}$. At 99° it lost 11.54% H_2O in 3 hrs. or 13.54 ($2\text{H}_2\text{O}$) in 15 hrs. more. This salt probably

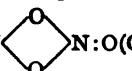
has a multiple formula since it loses 1.75 H₂O so quickly. *Potassium ethylidene disulfate* at 30° for 10 hrs. lost 11.21% H₂O and in 5.5 hrs. more had lost 11.92% (calcd. for 2 H₂O 11.91%); the 1st mol. is eliminated relatively easily. Over CaCl₂ it lost the 1st mol. much more easily than the 2nd. This salt may thus be written (MeCH₂(SO₂K)₂.H₂O).H₂O. According to Pape (*Pogg. Ann.* 125, 513) *sodium dithionate* effloresces at 55°. Kept for 12 days at room temp. over H₂SO₄, it lost 7.8% H₂O (1 mol. H₂O = 7.4%), in 35 days more 14.60% H₂O; *i. e.*, the 2nd mol. is eliminated much more slowly. In a current of dry air at 42° it lost 8.3% H₂O in 5.5 hrs.; and in 13.5 hrs. more 14.47% had been lost; *i. e.*, 1 H₂O is lost in 5 hrs. and the other in 14–15 hrs. more. It did not lose wt. at 30° nor 40° but at 50° in 24 to 30 hrs. it lost 2 H₂O. No point of arrest was observed. This salt may be represented thus: (Na₂S₂O₆.H₂O).H₂O. According to Heeren *barium dithionate*, BaS₂O₆.2H₂O, effloresces rapidly and loses 0.5 of its H₂O. In 3 hrs. at 98–9° it lost 2 H₂O. Over H₂SO₄ at 20 mm. it lost 5.01% H₂O in 4 days and 10.64% (calcd. 10.81%) in 12 days more, *i. e.*, the 1st mol. is eliminated much more rapidly. At 30° and 40° no H₂O was lost, after 17 hrs. at 50° 3.88% was lost, after 9 hrs. more 7.0%, after 16 hrs. more 10.30% and after 24 hrs. more 10.77% H₂O was lost. In the air it reabsorbs 2 H₂O in a few days. Over H₂SO₄ at 30° it lost 2 H₂O in 48 hrs. This salt may be represented thus: (BaS₂O₆.H₂O).H₂O, although there was no true point of arrest. Other expts. on salts containing 2 H₂O will be discussed in another paper. Expts. on salts with 3, 4, 5 and 7 H₂O and alums with 12 or 24 H₂O are complete.

E. J. WITZEMANN.

The constitution of nitrogen tetroxide and the products that it forms with limited amounts of water. GIUSEPPE ODDO. Univ. Pavia. *Gazz. chim. ital.* 45, I, 413–43 (1915).—Several facts, some of which need confirmation, have drawn attention to the O compds. of N. The recent work is reviewed and references are given. Hibbert (*C. A.* 9, 150) found a stable and an unstable nitroglycerin and suggests that the stable

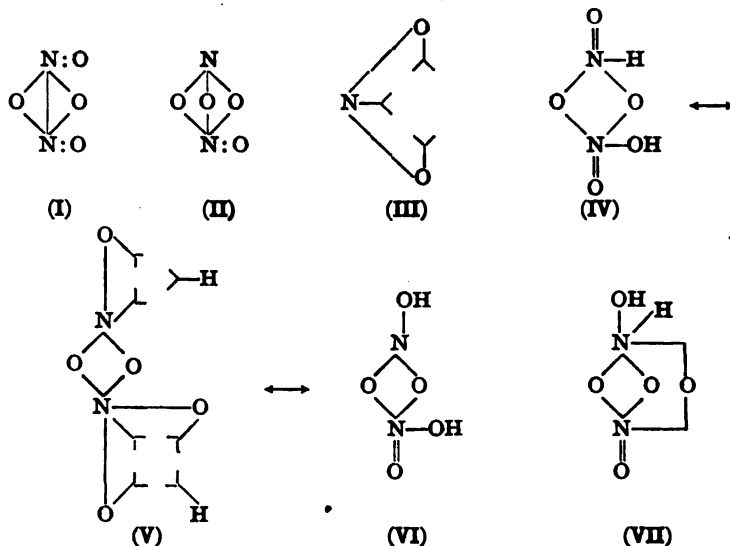
form is the ester of (HO)O:N  N(OH)  N:O(OH). O. suggests that KNO₃·

2HNO₃ may be the monopotassic salt of such a trinitric acid, and KNO₃.HNO₃ the

acid salt of (HO)O:N  N:O(OH). O. has studied N₂O₄ experimentally from some

of the new points of view. *Prepn. and properties of pure N₂O₄*. The N₂O₄ used was prepared in part in the lab. by heating Pb(NO₃)₂ and obtained in part from the factory of Schuchardt of Görlitz. When the product still contains some hydrate it is colored dark green-brown, the vapors are rutile-red, and it boiled from about 22° upward. It must be purified in all-glass app. The dehydration is completed with P₂O₅ and is slow. After long treatment the main fraction boils 22–3°, which agrees well with earlier results of others; higher values arise from incomplete dehydration. This product was further purified by crystg. fractionally 3 times by cooling with ice and HCl or NaCl without inoculating, but it was very convenient to induce crystn. with CO₂ snow, and finish in ice-NaCl bath. The pure N₂O₄ is a limpid, rose-red liquid, f. p. –9.04. Lower f. ps. found by others are attributed to impurities. The pure cryst. product appears as a compact, colorless, hyaline mass on the outside and in the center where it freezes last it often shows fractures that give the appearance of crystals. As the temp. rises in melting the upper part of the gel becomes yellow, suggesting that it is a solid soln. of NO₂ in N₂O₄. It is yellow when melted. It may be preserved unchanged indefinitely in sealed tubes or in glass-stoppered vessels in P₂O₅-desiccators. If it becomes hydrated the rose color is replaced by a greenish hue. *Dets. of the mol. wt. of N₂O₄ in various solvents*. O. repeated some expts. of earlier workers on the mol.

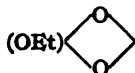
wt. purifying his solvents very carefully. Mol. wt. detns. in AcOH by the f.-p. method showed that in this solvent N_2O_4 has a mol. wt. of 77.1 to 87.5. This result differs a little from that of Ramsay (*J. Chem. Soc.* 53, 621(1888)) and coincides with that of Cundal (*Ber.* 29, 492(1892); 29, 265, 831(1896)); it shows that at the f. p. of AcOH some N_2O_4 is dissociated into NO_2 . The fact that this dissociation increases with the concn. although the f. p. is lowered, shows that the dissociation is accompanied by combination with the solvent. The mol. wt. of N_2O_4 is normal or a little higher for N_2O_4 in $PhNO_2$. O. thinks that the aggregation of N_2O_4 in this case just about balances the dissociation into NO_2 . In small concns. the mol. wt. is normal in C_6H_6 soln. but increases with increase in concn. thus showing a definite tendency to polymerize in C_6H_6 . *Constitution of N_2O_4 and the action of small amts. of H_2O on it.* O. discusses historically 3 formulas commonly assigned to N_2O_4 : (1) $ON.O.NO_2$, (2) $O_2N.NO_2$, (3) $O:N.O.O:N:O$. The most commonly accepted is (1). The formulas of Thomlinson (*C. A.* 3, 2418) and Rotarski (*C. A.* 4, 2763) are given. Much light is thrown on the constitution of N_2O_4 by its action with H_2O in excess; the result may be indicated thus: (1) $N_2O_4 + H_2O \longrightarrow HNO_3 + HNO_2$ or (2) $3N_2O_4 + 2H_2O \longrightarrow 4HNO_3 + 2NO$. O., however, has preferred to start off on a new tack. Without discussing the merits of the arguments of Raschig, Lunge and Berl on the relative stability of N_2O_4 or N_2O_3 , etc., O. points out that N_2O_4 is the most stable oxide, since all but N_2O tend to pass over into it spontaneously. Since the cyclic compds. are most stable in org. chemistry, O. proposes 2 formulas, (I) and (II). Either one is capable of explaining the reactions of



N_2O_4 . For the same reason he proposes (III) for NO_2 and suggests that it be called "hypozoside." This formula makes NO_2 a compd. distinct from N_2O_4 . True N_2O_4 is known as solid, liquid and gas, while NO_2 is known only as a gas. There ought to be a liquid and solid state for NO_2 and its physical constants would be intermediate between those of CO_2 and O_3 . NO_2 will be discussed in a later paper. Assuming that (I) or (II) acts with H_2O one gets $N_2O_4 + H_2O \rightleftharpoons H_2N_2O_4$, i. e., (IV) or (VI) are formed. O. does not consider it necessary to exclude the existence of the possible common intermediate mesohydric form (V), and considers if $H_2N_2O_4$ is really formed that the 3 products are in equil. with each other. (VI) may be a true acid formed by the union of $HNO_2 + HNO_2$ and might be called "nitrousic" acid. It is probably unstable and could

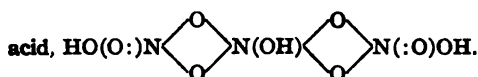
give the internal NH_4 salt (VII); but this like all nonquaternary NH_4 compds. would be unstable and by the loss of H_2O would give $\text{N}_2\text{O}_4 + \text{H}_2\text{O}$. O. made expts. to see if free nitrous acid is formed by the action of H_2O on N_2O_4 . In the cryoscopic expts. he found that N_2O_4 does not react appreciably with H_2O at -9° , the m. p.; only a small amt. is dissolved. The results of the detn. of the mol. wt. of H_2O in this solvent will be described. O. studied the effect of H_2O on N_2O_4 dissolved in the solvents used above. If N_2O_4 is (1), (2) or (3) (cf. above) and if H_2O reacts thus, (1) $\text{N}_2\text{O}_4 + \text{H}_2\text{O} = \text{HNO}_3 + \text{HNO}_2$, the cryoscopically active particles of the soln. would be increased in an amt. corresponding to that of the H_2O added, and its mol. wt. would be about 18. If (2), $3\text{N}_2\text{O}_4 + 2\text{H}_2\text{O} = 4\text{HNO}_3 + 2\text{NO}$, there are about 5 active particles on one side and 6 on the other, of which 2 are eliminable as gas, from which O. calcs. that the mol. wt. of H_2O would appear to be from a minimum of 12 to a maximum of 36. If $\text{N}_2\text{O}_4 + \text{H}_2\text{O} \longrightarrow \text{H}_2\text{N}_2\text{O}_3$ there will be no change in the f. p. and the mol. wt. would approach infinity with increasing concns. *Solns. in PhNO_2 .* H_2O is little sol. in PhNO_2 . In order to det. its mol. wt. in PhNO_2 , 16.8298 g. PhNO_2 were placed in the cryoscope and the f. p. detd.; then 1 drop of H_2O (0.0272 g.) was added and the mixt. agitated but soln. was incomplete. After adding 0.8883 g. more PhNO_2 , soln. was complete and the mol. wt. was 22.1; on adding more PhNO_2 , the mol. wt. was 19 and with still more 18.5. The mol. wt. of H_2O is simple in high diln., but increases with the concn. These results were confirmed several times. The f. p. of a mixt. containing excess H_2O was detd. and by Raoult's formula, assuming the apparent mol. wt. of water to be 22, the solubility of H_2O in PhNO_2 was calcd. as 0.1260%. The solns. of N_2O_4 in PhNO_2 used in detg. the mol. wt. of N_2O_4 above were treated with small known amts. of H_2O and gave a f. p. lowering corresponding to a mol. wt. of ≈ 53 for H_2O . This might conform to the reactions $\text{N}_2\text{O}_4 + 3\text{H}_2\text{O} \longrightarrow \text{NO}(\text{OH})_2 + \text{N}(\text{OH})_3$ or $\text{N}_2\text{O}_4 + 3\text{H}_2\text{O} \longrightarrow \text{N}(\text{OH})_4 + \text{NOOH}$, but the instability of such products renders the reaction, $3\text{N}_2\text{O}_4 + 3\text{H}_2\text{O} \longrightarrow 2\text{H}_2\text{N}_2\text{O}_3 + \text{HNO}_3 + \text{HNO}_2$, more probable and since $\text{H}_2\text{N}_2\text{O}_3$ was conceived as an addition product of $\text{HNO}_3 + \text{HNO}_2$ this dissociation would diminish with increasing concn. and would cause the apparent mol. wt. of H_2O to rise with increasing concn. as was observed. *Solns. in C_6H_6 .* O. attempted without success, to det. the mol. wt. of H_2O in C_6H_6 . Approx. 0.0137% H_2O is sol. in C_6H_6 . The solns. of N_2O_4 in C_6H_6 used in detg. the mol. wt. of N_2O_4 above were treated with small known amts. of H_2O . The results show that in C_6H_6 soln. too, $\text{H}_2\text{N}_2\text{O}_3$ is formed, which for the most part remains dissolved, and that when a solid soln. between the 2 solvents and the hydrate is formed the greater concn. of the hydrate occurs in the solid phase. *Solns. in AcOH .* The f. p. curve of H_2O in AcOH was detd. The mol. wt. of H_2O in dil. solns. of AcOH is always greater than 18; it increases with increase in concn., but even at 6.52% H_2O , it is 29, i. e., less than dimolecular. O. shows by a series of data in which the H_2O was added a little at a time that in passing from 5.15% H_2O to 6.5% H_2O the f. p. lowering corresponds to a mol. wt. of 39 for this portion of the H_2O present. By detg. the mol. wt. of H_2O in the N_2O_4 solns. in AcOH used above, the same values that are obtained in the absence of N_2O_4 were obtained, thus showing that the N_2O_4 present does not have any effect. In order to confirm the preceding, the behavior of N_2O_4 in solns. of H_2O in AcOH was studied. The results show that the only effect of N_2O_4 obtained may in this case also be ascribed to diln. But O. questions whether the N_2O_4 may not combine with the H_2O . *Action of EtOH on solns. of N_2O_4 .* The mol. wt. of EtOH in C_6H_6 varies from 54 to 89. Using a 3.722% N_2O_4 soln. in PhNO_2 and adding EtOH mol. wts. for the latter, from 46.3 to 98.0 were obtained. At strong diln. the mol. wt. is normal, and at 3% it is 98, thus showing that N_2O_4 is without effect on EtOH in PhNO_2 . The mol. wt. of EtOH in C_6H_6 varies from 63 to 80.1. Solns. containing 0.763% N_2O_4 showed mol. wts. of 74.3 to 102.7 for EtOH , which shows that part of

the N_2O_4 combines with EtOH and may give the monoethyl "nitrousate," $O:N-$



Summary. N_2O_4 in $PhNO_2$ shows nearly all simple mols., but in C_6H_6 it shows a definite tendency to polymerize and in AcOH it dissociates into $2NO_2$. H_2O shows simple mols. in small concns. in $PhNO_2$ but in solns. of N_2O_4 in $PhNO_2$ it shows triple values which shows that the hydrate of N_2O_4 (IV) or (VI) is formed. This acid arises from the addition of 1 mol. of HNO_2 to 1 mol. of HNO_3 . The basic character of the $:NOH$ group tends to cause a rearrangement that was discussed above. The formation of (IV) or (VI) was supported by the behavior of H_2O in solns. of N_2O_4 in C_6H_6 , and possibly in solns. of N_2O_4 in AcOH, as well as with solns. of EtOH in solns. of N_2O_4 in C_6H_6 . Thus the org. compds. derived from N_2O_4 and the complex nitrates

mentioned above are derivs. of binitric acid, $HO(O:)N \begin{array}{c} \diagup \quad \diagdown \\ \diagdown \quad \diagup \end{array} N(:O)OH$ and trinitric



E. J. WITZEMANN.

Chlorous acid and chlorites. G. BRUNI AND G. LEVI. *Atti ist. Veneto sci. let. arti* 74, II, 1711-32.—The following investigation of the properties of chlorites and chlorous acid is preceded by a comprehensive review of the literature of the subject. The authors prepare $KClO_2$ by the following modification of the usual method: a mixt. of 150 parts oxalic acid, 40 pts. $KClO_3$ and 20 pts. H_2O is heated to 60° , the soln. concd. to crystn. *in vacuo* at 50° , cooled and then treated with 3 vols. of abs. EtOH from which the chlorite is obtained by fractional crystn. The residue gives a further yield of chlorite on treatment with 95% EtOH. By treating $AgClO_2$ (prepared from $KClO_3$ and $AgNO_3$) with concd. NH_4OH , the authors obtained $AgClO_2 \cdot NH_3$ as yellow crystals. $AgClO_2$ dissolved in ammoniacal EtOH and pptd. with anhydrous Et_2O , yields white crystals of $AgClO_2 \cdot (NH_3)_2$. This salt is unstable in air, losing NH_3 and becoming yellow. Dry gaseous NH_3 slowly passed over $AgClO_2$ yields a white cryst. mass of $AgClO_2 \cdot (NH_3)_2$, unstable at ordinary temp., rapidly losing NH_3 and becoming yellow. $Ba(ClO_2)_2$ was prepared by passing a stream of ClO_2 (Cl_2 -free) and CO_2 into a suspension of BaO in H_2O , extg. with EtOH, adding an excess of Et_2O to the ext. and rapidly drying the ppt. thus obtained in order to free it from traces of EtOH and Et_2O . With rapid filtration and drying, the ppt. of $Ba(ClO_2)_2$ is very pure and free from chloride. In similar manner, the authors obtained $Ca(ClO_2)_2$, $Sr(ClO_2)_2$ and $LiClO_2$. $NaClO_2$ was obtained by adding Na_2SO_4 to $Ba(ClO_2)_2$ and evapp. the soln. *in vacuo*. Hydroxylamine chlorite was prepared by the action of hydroxylamine sulfate on $Ba(ClO_2)_2$. The salt is unstable at ordinary temp. $Hg(ClO_2)_2$, prepared as a red cryst. ppt. by treating $Hg(NO_3)_2$ with $Ba(ClO_2)_2$ or $KClO_3$, is extremely unstable when dry, exploding spontaneously. $HgClO_2$ prepd. similarly from $HgNO_3$ as a cryst. yellow ppt. exhibits properties similar to the mercuric salt. The mol. conds. of the salts $KClO_2$, $AgClO_2$ and $Ba(ClO_2)_2$ were detd. at 25° and the mobility of the ClO_2^- ion found to be 51.0. Detns. of the mobilities of the ClO_2^- , ClO_4^- , NO_2^- and NO_3^- ions at 25° compared with this are ClO_2^- 51.0, ClO_4^- 63.4, ClO_4^- 73.6, NO_2^- 75.4, NO_3^- 70.6. In the case of the oxygen compds. of Cl, the ion mobility apparently increases with increase in O content, while in those of N it decreases. The degree of dissociation of $KClO_2$ detd. by cryoscopic measurements over a range of 4 dilns. was found to average $\alpha = 0.938$. The chlorites do not manifest apparent hydrolysis. Measurements of the heat of decompn. of $Ba(ClO_2)_2$ give, as a mean value, $Ba(ClO_2)_2 = BaCl_2 + 2O_2 + 48.6 \text{ Cal.}$

L. T. FAIRHALL.

Alumina and aluminates. ERNEST MARTIN. *Mon. sci.* [5] 5, 225-32(1915).

—The marked differences in the properties of the hydrate of Al resulting from the auto-decompn. of alkaline aluminates according to Bayer's reaction and those of the hydrate obtained in pptg. the soln. of an Al salt with NH_4OH , suggest a difference in structure. The first, dried in air, maintains a const. compn. corresponding to $\text{Al}_2\text{O}_3 \cdot 3\text{H}_2\text{O}$ and is not hygroscopic. On being heated it begins to lose H_2O at 160° , at 225° has lost one molecule, and at 235° , a second. The last traces, however, are not expelled

below 1000° . Its formula is probably $\text{Al} \begin{array}{l} \diagup \text{OH} \\ \diagdown \text{OH} \\ \diagup \text{OH} \end{array}$. The 2nd hydrate is gelatinous and

its compn. varies according to the conditions of pptn. Dried at 80° its compn. approximates $\text{Al}_2\text{O}_3 \cdot 2\text{H}_2\text{O}$, but at higher temps. its loss of H_2O is continuous and at no point does it behave like a well defined hydrate. M. does not assign it a structural formula. In a study of the aluminates of the alkaline earths he obtained the series, $n \text{Al}_2\text{O}_3 \cdot (n + 1)\text{MO}$. Also aluminates richer in the base were formed. $\text{Al}_2\text{O}_3 \cdot 3\text{BaO}$ was formed with the use of the elec. arc at temps. above 1500° only, all mixts. below that point giving the mono-Ba compd. Mixts. of 1 Al_2O_3 to 1, 2, and 3 CaCO_3 gave at about 1500° , $\text{Al}_2\text{O}_3 \cdot \text{CaO}$, $\text{Al}_2\text{O}_3 \cdot 2\text{CaO}$ and $\text{Al}_2\text{O}_3 \cdot 3\text{CaO}$. Higher temps. produced compds. of $2\text{Al}_2\text{O}_3 \cdot 3\text{CaO}$, $5\text{Al}_2\text{O}_3 \cdot 6\text{CaO}$ and $10\text{Al}_2\text{O}_3 \cdot 11\text{CaO}$. Mixts. of Al_2O_3 , BaSO_4 and C in mol. proportions gave on being heated, thioaluminates of the compn. $\text{Al}_2\text{O}_3 \cdot 2\text{BaS}$ and $2\text{Al}_2\text{O}_3 \cdot 3\text{BaS}$ which are sol. in H_2O but which hydrolyze rapidly with evolution of H_2S . Analogous Ca compds. were obtained with the use of CaSO_4 .

H. L. O.

Thermal analysis of the alkali polyarsenates. M. AMADORI. *Atti ist. Veneto sci. let. arti* 73, II, 1665-78(1913-4).—A. has investigated the alkali polyarsenates with a view to finding compds. similar in structure to the sodium salts of the acids $\text{H}_2\text{P}_3\text{O}_{10}$, $\text{H}_2\text{P}_4\text{O}_{13}$ and $\text{H}_2\text{P}_5\text{O}_{16}$. For this purpose the salt was fused in a porcelain crucible in a resistance furnace, the temp. being followed by means of a thermoelement and galvanometer. The results of an extended series of expts. show that besides the orthoarsenates, there exist alkali metaarsenates and pyroarsenates. The temp. of solidification (*s*) and transformation (*t*) of the Na and K salts are, resp.: NaAsO_3 *s* = 615° , *t* = —; $\text{Na}_2\text{As}_2\text{O}_7$ *s* = 850° , *t* = 688° ; $\text{Na}_3\text{As}_3\text{O}_{10}$ *s* = 1260° , *t* = 410° ; KAsO_3 *s* = 650° , *t* = 450° ; $\text{K}_2\text{As}_2\text{O}_7$ *s* = 996° , *t* = 400° ; $\text{K}_3\text{As}_3\text{O}_{10}$ *s* = 1310° , *t* = 400° . Besides these derivs., thermal analysis demonstrates the formation of a compound of the type $\text{M}_4\text{As}_4\text{O}_{16}$. This is formed, on solidification by the reaction between the metaarsenate MAsO_3 and the pyroarsenate $\text{M}_2\text{As}_2\text{O}_7$. $\text{Na}_4\text{As}_4\text{O}_{16}$ is formed at 697° and $\text{K}_4\text{As}_4\text{O}_{16}$ at 630° . The formation of salts of this type also occurs at high temps., as in the case of the corresponding phosphates. As in the case of the phosphates, there is no indication of the formation of a compd. of the type $\text{M}_6\text{R}_6\text{O}_{18}$.

L. T. FAIRHALL.

Triamminoquo salts of bivalent platinum. I. CHUGAEV AND I. CHERNIAEV. *Compt. rend.* 161, 792-4(1915); cf. *C. A.* 10, 432.—A current of air passed into a

soln. of the chloride $\left[\begin{array}{ccc} \text{NH}_3 & & \text{NH}_2\text{OH} \\ & \diagdown \quad \diagup & \\ & \text{PT} & \\ & \diagup \quad \diagdown & \\ \text{HONH}_2 & & \text{NH}_3 \end{array} \right] \text{Cl}_2$ with the addition of NH_3 ,

$(\text{NH}_4)_2\text{SO}_4$ or other sol. sulfate, and a small quantity of a Cu salt, oxidizes the hydroxylamine compd., producing a cryst. ppt. sol. in warm dil. H_2SO_4 . This acid soln., filtered and cooled, gives on the addition of a soln. of K_2PtCl_4 a green cryst. ppt. of $[\text{Pt}(\text{NH}_3)_3(\text{H}_2\text{O})]\text{PtCl}_4$, the aquo base of which is $[\text{Pt}(\text{NH}_3)_3(\text{H}_2\text{O})](\text{OH})_2$. The bromo deriv. may be similarly prepared from the bromide. When the *trans*-chloride $[\text{Pt}(\text{NH}_3)_2(\text{NH}_2\text{OH})_2]\text{Cl}_2$ is similarly oxidized, an homogeneous cryst. ppt. is obtained, which is per-

factly sol. in dil. H_2SO_4 and behaves in its reactions similarly to the preceding salts.

The hypothetical formula deduced for this is $\left[(\text{NH}_3)_4\text{Pt} \begin{array}{c} \diagup \text{OH} \\ \diagdown \text{OH} \end{array} \text{Pt}(\text{NH}_3)_4 \right] \text{SO}_4$.

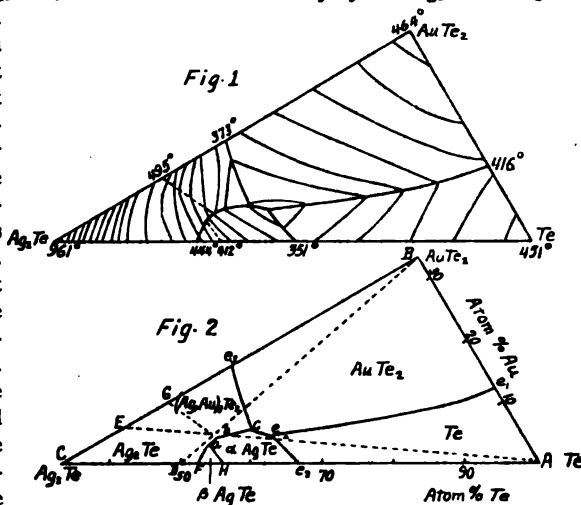
L. T. FAIRHALL.

The tellurides of silver and of gold. GIOVANNI PELLINI. Univ. Cagliari. *Gazz. chim. ital.* 45, I, 469-84(1915); cf. P. and Quercigh (*C. A.* 5, 1884, 2042).—The binary systems Te-Au and Te-Ag were previously studied and P. now reports on the ternary system Ag-Au-Te or more accurately the system $\text{Ag}_3\text{Te-AuTe}_2\text{-Te}$ since this has greater interest because of the large number of double tellurides of Ag and Au existing in nature. Besides hessite (Ag_3Te) and silvinit ((Ag, Au)Te₂) the minerals calaverite and krennerite, which have a variable compn. of the AuTe_2 type, a small part of the Au being replaced by Ag, are known. When Ag preponderates, the mineral is muthmannite (Ag, Au)Te (Zambonini, *C. A.* 5, 3783) in which the $\text{M}^{\text{I}}\text{Te}$ type of compd. found by P. and Q. (*l. c.*) occurs. Empressite (M. W. Bradley, *C. A.* 8, 3169) is nearly pure AgTe . Goldschmidtite is (Au, Ag)₂Te₃ (Gastaldi, *C. A.* 6, 1420). Petzite is thought to be hessite (Ag_3Te) in which Ag is replaced in part by Au. Speculite is similar to silvanite but differs in compn. The number of these minerals renders the study of the system Ag-Au-Te of interest especially since the attempts of Lehner (*J. Am. Chem. Soc.* 24, 335(1902)) and Tibbals (*C. A.* 3, 2420) to obtain Au tellurides in the wet way failed. Au salts react differently from the Ag salts: (1) $4\text{AuCl}_3 + 3\text{Te} \rightarrow 4\text{Au} + 3\text{TeCl}_4$; (2) $2\text{AuCl}_3 + \text{H}_2\text{Te} \rightarrow 2\text{Au} + \text{TeCl}_4 + 2\text{HCl}$; (3) $2\text{AuCl}_3 + \text{Na}_2\text{Te} \rightarrow 2\text{NaCl} + \text{TeCl}_4 + 2\text{Au}$; and Au is pptd. instead of a telluride. L. concluded that the more common deposition of double tellurides of Au and Ag depends on the reaction of AuCl_3 and AgCl in solns. of alkali chlorides with solns. of alkali sulfides containing Te. The same method was used in studying this system as was used before; 20 g. of each mixt. were used; oxidation was prevented by a current of N; the temps. were detd. with a Pt + PtRh couple. *The 3 binary systems: Ag-Te, Au-Te, and Ag₃Te-AuTe₂.* The results on the 1st 2 systems have been published. The partial systems $\text{Ag}_3\text{Te-Te}$ and $\text{AuTe}_2\text{-Te}$ are of interest for this problem. Ag_3Te melts without decompn. at 961°. With increasing Te content AgTe is formed by reacting with Ag_3Te primarily deposited. The fused mass in which AgTe is formed has a concn. of 47 atom % Ag; the temp. of formation is about 444°. At 412° AgTe undergoes the transformation: $\beta\text{-AgTe} \rightarrow \alpha\text{-AgTe}$ and the concn. of Ag in the fused mass is now 44 atom %. $\alpha\text{-AgTe}$ gives a eutectic with Te at 351° and a concn. of 33.3 atom % Ag. Pure Te m. 451°. In the partial system AuTe-Te there is only 1 eutectic point at 416° and 16 atom % Au. The telluride m. 464°, without decompn. Results for the system $\text{Ag}_3\text{Te-AuTe}_2$ are tabulated. Starting from the f. p. of AuTe_2 (464°) the primary crystn. curve drops gradually to a eutectic at 373° (at 35 atom % Ag for 100 of the ternary mixt.). From this point the curve rises rapidly to the m. p. of Ag_3Te (961°). All alloys having more than 46.5 atom % of Ag show an arrest at 495° where the compd. Ag_3Te reacts with the fused mass to give a new compd. It is not easy to det. the compn. of the new compd. (1) since at the temp. of formation no sharp arrest is observed, only superfusion taking place, and the point of max. arrest which fixes the compn. cannot be detd.; (2) the reaction between the fused mass and Ag_3Te is incomplete, which is shown by prolongation of the eutectic arrest (373°) nearly up to the concn. of the compd. Ag_3Te . For concns. higher than 55 atom % Ag, the duration of arrest was short. For a concn. of 55 atom %, Ag 5.7 atoms Au and 39.3 atoms Te are required, which corresponds to the compd. $\text{Ag}_{11}\text{Au}_2\text{Te}_{11}$, and agrees closely with the simpler formula (Ag, Au)₃Te₂ (Ag = 53.34 atom %). Such a formula is rendered plausible by the fact that umangite (cf. Klockmann, *Z. Kryst. Min.* 19, 269(1891)) is Cu_3Se_2 and

by the fact that $\text{Na} + \text{Te}$ give Na_2Te_3 (P. and Quercigh, *C. A.* 5, 1567). The numerous analyses of petzite show that the compn. of the mineral is variable not only in the Ag and Au content but also in the ratio of $\text{Au} + \text{Ag}$ to Te. Moreover Au and Ag tellurides have been found to which the formulas $(\text{Ag}, \text{Au})_3\text{Te}_2$ and $(\text{Ag}, \text{Au})_4\text{Te}_3$ may be assigned but which have been regarded as mixts. It is thus probable that by a further study of these minerals they will show their relations to the ternary compd. $(\text{Ag}, \text{Au})_3\text{Te}_2$ found in the system $\text{Ag}_2\text{Te}-\text{AuTe}_2$. The reaction taking place at 495° may be expressed thus: $(\text{Ag}, \text{Au})_3\text{Te}_2 \rightleftharpoons \text{Ag}_2\text{Te} + \text{fused mass}$. The ternary system $\text{Ag}_2\text{Te}-\text{AuTe}_2-\text{Te}$.

A large number of detns. was made on this system since the phenomena that occur during crystn. present many difficulties. The numerical data are given for 113 alloys. The results are represented diagrammatically in Figs. 1 and 2. As is shown in Fig. 2 the compds. AgTe and $(\text{Ag}, \text{Au})_3\text{Te}_2$ melt with decompn. both in the binary system and the ternary system since the compd. AgTe does not crystallize primarily on the transversal $\text{AgTe}-\text{AuTe}_2$ and also since $(\text{Ag}, \text{Au})_3\text{Te}_2$ does not crystallize primarily on the

transversal $(\text{Ag}, \text{Au})_3\text{Te}_2$. This ternary system shows 4 points of invariant equil. a , b , c and e . The point a at about 412° shows an atomic concn. of 52 Te, 44.7 Ag, 3.3 Au and is the point of invariant equil. of 3 solids and 1 liquid, thus: $\beta\text{-AgTe} + \alpha\text{-AgTe} \rightleftharpoons \text{Ag}_2\text{Te} + \text{fused mass } a$. b lies at 385° with 53 Te, 42.7 Ag, 4.3 Au and represents the point of invariant equil. for $\alpha\text{-AgTe} + (\text{Ag}, \text{Au})_3\text{Te}_2 \rightleftharpoons \text{Ag}_2\text{Te} + \text{fused mass } b$. c lies at 340° with 57 Te, 37 Ag, 6Au and the equil. is: $\alpha\text{-AgTe} + \text{AuTe}_2 \rightleftharpoons (\text{Ag}, \text{Au})_3\text{Te}_2 + \text{fused mass } c$. e lies at 335° with 60 Te, 35 Ag, 5Au and is the equil. pt. for the 3 solids $\alpha\text{-AgTe}$, AuTe_2 , Te and the fused mass e . Below 335° all alloys are solid. In this system there are 9 curves of invariant equil. (1) Gb drops from 495 to 385° ; (2) Fa drops from 444 to 412° ; (3) ab from 412 to 385° ; (4) bc from 373 to 340° ; (5) ce from 340 to 335° ; (6) e_2c from 373 to 340° ; (7) e_1e from 416 to 335° ; (8) c_2e from 351 to 335° ; (9) Ha shows no drop in temp. The solids in equil. along the lines named are indicated by the fig. The triangle is divided into 6 zones for the 6 solids and the compd. that 1st seps. from alloys in each zone is indicated in the fig. The zone of primary crystn. of the compd. Ag_2Te presents a difficulty in the interpretation of results. The location of the curve Gb is only suggested. In fact all alloys that in the course of their crystn. cross the line Gb show a lowering of the temp. corresponding to the point of intersection where theoretically the compd. $(\text{Ag}, \text{Au})_3\text{Te}_2$ should be formed by the reaction of Ag_2Te and the fused mass. Instead superfusion occurs to about 495° which is the temp. of formation of the compd. in the binary system $\text{Ag}_2\text{Te}-\text{AuTe}_2$. All alloys that cross Fa , ab or Gb in crystn. show an arrest at b 385° . Thus the superfusion at 495° depends on the irregular reaction of formation of $(\text{Ag}, \text{Au})_3\text{Te}_2$ for otherwise the alloy with a large Au content ought to lack the arrest at b at 385° and show instead a lowering in the crystn. curve corre-



sponding to ϵ_{sc} , which was not found. The curve $H\alpha$ is also only suggested.

E. J. WITZEMANN.

The systems barium oxide, acetic acid, water and magnesium oxide, acetic acid, water. J. IWAKI. *Mem. Coll. Sci. Kyoto Imp. Univ.* 1, 81-8 (1914); *J. Soc. Chem. Ind.* 34, 609.—A study of the equil. of the systems at 25° established the existence of the following acid salts: $3(\text{AcO})_2\text{Ba} \cdot 3\text{AcOH} \cdot 11\text{H}_2\text{O}$, $(\text{AcO})_2\text{Ba} \cdot 2\text{AcOH}$, $2(\text{AcO}) \cdot \text{Mg} \cdot 3\text{AcOH} \cdot 3\text{H}_2\text{O}$ and $5(\text{AcO})_2\text{Mg} \cdot 10\text{AcOH} \cdot 7\text{H}_2\text{O}$.

E. J. C.

The alloy of manganese and bismuth. N. PARRAVANO AND U. PERRI. *Univ. Padoa. Gazz. chim. ital.* 45, 390-4 (1915).—Wedekind and Weit (*C. A.* 6, 42) obtained a compd. MnBi and Hilpert and Dieckmann (*C. A.* 6, 460) by another method found the same compd. Bekier (*C. A.* 9, 779) studied the diagram of state of the alloy Mn-Bi and obtained results differing from those of P. and P. The facts that the 2 metals are partially miscible in the liquid state and form a compd. that arises through a "peritectic" reaction at about 450° were confirmed. But the results on the concn. of the 2 liquid layers in equil. at high temp., and on the compn. of the compd. differed. P. and P. analyzed the 2 layers of the alloys used in detg. the f. p. curve. They were cooled slowly and found to contain from 26.7 to 28.8% Mn in the layer poor in Mn and 81.4 to 88.8% Mn in the Mn-rich layer. In order to det. the effect of the rate of cooling, several alloys were quickly cooled with H_2O and showed 28.66 to 29.40% Mn in the one and 89.6 to 92.8% Mn in the other layer. It is thus impossible to attribute the difference observed in the Mn content of the 2 layers to a defect in the sepn. of the 2 liquids. H. and D. found that the Si in the Mn-rich layer increased from 1.53% in the original to 7.55%. P. and P. used magnesia crucibles and found an increase from 0.99% in the original to 1.25 to 1.45% in the alloy. In the diagram the invariant temp. of equil. between the 2 liquids was fixed at 1238° and the 2 liquids contain 30 and 93% Mn, resp. B. could not assign a definite formula to the compd. between Mn and Bi. P. and P. prepd. mixts. corresponding to BiMn , Bi_2Mn , and BiMn_2 and found that although the reaction of formation is always incomplete the cooling curve indicates with some security the formulas of compds. The max. thermal effect occurs at 450° and a thermal arrest of about 100 min. occurs with an alloy of 20% Mn while with alloys containing more or less Mn, the thermal arrest did not seem so great. This speaks in favor of the compd. MnBi (20.90% Mn). The presence of 2 liquid layers does not weaken this result.

E. J. WITZEMANN.

Complex salts of iron. IV. G. SPACU. *Ann. sci. univ. Jassy* 9, 117-38 (1915); *Chem. Zentr.* 1915, II, 349-50; cf. *C. A.* 9, 180; 8, 3158.—By heating 5 g. of very finely pulverized $\text{FeSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ for $\frac{1}{2}$ hr. with 30 g. of pyridine using a reflux condenser the compound $[\text{FePy}_6][\text{SO}_4\text{NH}_4]_2$ is formed as a canary yellow cryst. powder, which loses pyridine on exposure to air. It is insol. in pyridine and CHCl_3 , sol. in AcOH , dil. HCl and H_2SO_4 , sol. in oxalic acid, from which soln. the compd. later seps. In H_2O it decomposes with the formation of $\text{Fe}(\text{OH})_3$. The compound $[\text{Fe}(\text{Py}_2)(\text{H}_2\text{O})][\text{NaSO}_4]_2$ is prepared by heating 5 g. of very finely pulverized $\text{FeSO}_4 \cdot \text{Na}_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$ with 30 g. of pyridine for 45 min., using a reflux condenser. It forms as a canary yellow cryst. powder similar to the foregoing compd. The compound $[\text{FePy}_6][\text{SO}_4]_2 \cdot [\text{NH}_4]_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$ is prepared by the action of 50 g. of pyridine on 10 g. of ferric alum at room temp. for 7-8 days and subsequent drying of the product over P_2O_5 . A brick-red powder is formed which is insol. in EtOH , Et_2O , CHCl_3 , acetone and toluene, partly sol. in MeOH (with decompn.), sol. in oxalic acid, HCl and H_2SO_4 . It is decomposed by H_2O with the formation of $\text{Fe}(\text{OH})_3$. The compound $[\text{Fe}(\text{NH}_4)_4][\text{NH}_4\text{SO}_4]_2$ is prepared by passing dry, air-free NH_3 gas over very finely pulverized $[\text{FePy}_6][\text{NH}_4\text{SO}_4]_2$ for 5 hrs. This is a light yellow powder unstable in air and insol. in the usual solvents. It decomposes in H_2O with the formation of $\text{Fe}(\text{OH})_3$. The compound

$[\text{Fe}(\text{NH}_4)_2(\text{H}_2\text{O})][\text{NH}_4\text{SO}_4]_2$ is prepared as a white cryst. powder by passing dry, air-free NH_3 over finely pulverized $\text{FeSO}_4 \cdot \text{Na}_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$ for 3 hrs. It rapidly colors brown on exposure to air with the simultaneous loss of NH_3 and is insol. in most solvents with the exception of dil. HCl and H_2SO_4 . It decomposes in contact with H_2O forming $\text{Fe}(\text{OH})_2$. The compound $[(\text{FeCl}_2)_2\text{H}_5(\text{C}_6\text{H}_5.\text{NH}.\text{NH}_2)_2]\text{H}_2\text{O}$ is prepared by the action of 5 g. of phenylhydrazine added in small portions to 15 g. $\text{FeCl}_2 \cdot 6\text{H}_2\text{O}$ in 40 cc. of Et_2O . It crystallizes as colorless needles or plates, unstable on exposure to air, sol. in H_2O and EtOH , insol. in Et_2O and CHCl_3 . It is sol. with subsequent decompn. in acetone and gives off HCl on treatment with concd. H_2SO_4 . It dissolves in hot, concd. H_2SO_4 with the formation of a dark blue color and is decomposed by H_2O_2 and Caro's acid. In aq. soln. it gives the reactions of Fe^{++} and Cl^- . The compound $[\text{Co}(\text{Py})_2(\text{H}_2\text{O})_2](\text{KSO}_4)_2$ is formed as a violet cryst. powder by treating 5 g. of finely pulverized $\text{CoSO}_4 \cdot \text{K}_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ with 50 g. of pyridine using a reflux condenser. The product becomes red on standing exposed to air or in an atm. of moist pyridine and is stable only over P_2O_5 . It is sol. in H_2O , insol. in EtOH , Et_2O , CHCl_3 , acetone, toluene and pyridine, sol. in AcOH , dil. HCl and H_2SO_4 , and also in oxalic acid from which the crystals later separate. By the action of air or moist pyridine vapor for 12 hrs. on the foregoing compd., the compound $[\text{Co}(\text{Py})_2(\text{H}_2\text{O})_2](\text{KSO}_4)_2$ is formed as a red colored cryst. powder which is stable on exposure to air and similar in its solubilities to $[\text{Co}(\text{Py})_2(\text{H}_2\text{O})_2](\text{KSO}_4)_2$. It is transformed into the latter by boiling. When $\text{NiSO}_4 \cdot (\text{NH}_4)_2\text{SO}_4 \cdot 6\text{H}_2\text{O}$ (5 g.) is heated for 1.5 hrs. with 60 g. of pyridine in a refluxing app., the compound $[\text{Ni}(\text{Py})_2(\text{H}_2\text{O})_2](\text{NH}_4\text{SO}_4)_2$ is formed as a greenish blue powder, somewhat stable in air, sol. in H_2O , insol. in Et_2O , CHCl_3 , pyridine, acetone, toluene, boiling EtOH , MeOH and amyl alc. It is sol. in AcOH , tartaric and oxalic acids, dil. HCl and H_2SO_4 . The compound $[\text{Cu}(\text{Py})_2(\text{Cl})_2]\text{K}$ is prepd. by treating 5 g. of $\text{CuCl}_2 \cdot 2\text{KCl} \cdot 2\text{H}_2\text{O}$ with 30 g. of pyridine at room temp. for 12 hrs. A greenish blue powder is formed which is stable on exposure to air, sol. in cold H_2O , hydrolyzed by hot H_2O , sol. in hot EtOH from which the compd. crystallizes in blue-green needles, insol. in Et_2O , toluene and xylene, sol. in AcOH and tartaric acid, dil. HCl and H_2SO_4 , sol. in oxalic acid from which soln. the compd. later crystallizes. In aq. soln. the above double salts with pyridine never form amines of similar structure. L. T. FAIRHALL.

Chromium hypophosphite. FR. MAWROW AND J. ZONEW. *Sophia. Z. anorg. allgem. Chem.* 93, 311-2 (1915).— $\text{Cr}(\text{H}_2\text{PO}_2)_2 \cdot 2\text{H}_2\text{O}$ was prepd. as a dark green mass by satg. a soln. of H_2PO_2 with $\text{Cr}(\text{OH})_3$, filtering and evapg. over H_2SO_4 . G. W. M.

The ammonium salts of boric acid. B. L. VANZETTI. *Atti ist. Veneto sci. let. arti* 74, II, 465-71.—V. has investigated the equilibria established between solns. of H_3BO_3 and NH_3 . There is some question as to the compn. of ammonium borate in soln. Lundén's investigations indicate that the compd. $\text{NH}_4\text{H}_2\text{BO}_3$ exists in soln. partially ionized into NH_4^+ and H_2BO_3^- ions. V. prepd. the ammonium salt by treating a soln. of NH_3 (218 g. NH_3 per l. soln.) with an equiv. quantity of pure H_3BO_3 . A white cryst. mass sep'd. (fraction I) and further yields of crystals were obtained from the mother liquor. Analyses showed that NH_3 varied from 7.02% in fraction I to 6.20% in fraction V, while B_2O_3 varied from 60.10% in fraction I to 66.05% in fraction V. The analytical data show a continual diminution in % NH_3 and a corresponding increase in % B_2O_3 due to the volatility of the base formed by hydrolysis. If evapn. is continued for some time, there seps. a cryst. conglomerate which has a compn. approaching that of the pentaborate octahydrate and is stable through all processes of concn. The various solid fractions obtained show somewhat confused cryst. habits. Sodium borate dissolves readily in cold H_2O in the presence of NH_4Cl and deposits crystals corresponding to the compd. $(\text{NH}_4)_{2.0.5}\text{B}_2\text{O}_3 \cdot 8\text{H}_2\text{O}$.

L. T. FAIRHALL.

An explosive mixture of phosphorus and liquid air. A. PIUTTI. *Rend. accad. Lincei* 24, 252-3(1915); through *Ann. chim. applicata* 4, 290.—P. observed that yellow P, immersed in liquid air, did not combine with O at that low temp., but acquired the property of exploding with violence when taken out of the liquid and struck or even touched with a piece of warm Fe, or subjected to the action of an elec. spark. Red P, under the same conditions, does not explode, but burns with a bright flame. Ordinary S behaves similarly. S. LEVY.

7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Deceptive color changes of indicators. F. LIEBERT. *Chem. Weekblad* 12, 1088-91 (1915).—L. calls attention to the fact that some indicators in the presence of strong alkali and strong H_2SO_4 show a color other than that expected. Phenolphthalein, *e. g.*, in presence of 1:1 KOH is colorless; partial neutralization with acid causes the normal color to return, which proves that the phenolphthalein was not decompd. Rosolic acid and $PhNMe_2$ act in a similar way. Methyl orange, notwithstanding its close relation to $PhNMe_2$, retains its normal color with strong alkali, even when heated. Not only concd. alkali, but also concd. H_2SO_4 is able to produce an abnormal color with phenolphthalein, $PhNMe_2$ and methyl orange. Diln. of the strong H_2SO_4 soln. of these indicators changes the apparent alkaline colors to their normal acid colors. It was furthermore shown that a large number of organic dyes behave in a similar way and L. tabulates the acid, alkaline and strong H_2SO_4 colors of 16 quinone-imide, di- and triphenylmethane and azo dyes. In nearly every case, it was found that the color of the strong H_2SO_4 soln. of these dyes is different from the normal acid color. Only in a few cases, however, the alkaline color was the same as the color of the strong H_2SO_4 soln. of the dye. F. therefore concludes that the apparent alkaline reaction of some indicators with concd. H_2SO_4 is merely accidental and adds that shades of the color in similar cases may differ considerably, as may be seen in the case of phenolphthalein, the alkaline color being red and the strong H_2SO_4 soln. pink. J. T. FLOHL.

Micro balances and their application in chemical analysis. F. EMICH. *Graz. Naturwissenschaften* 3, 693-8(1915); cf. *C. A.* 10, 319.—E. describes the underlying principles and advantages of these balances and then proceeds to discuss the various types in historical order, starting with the Nernst balance (1902). Numerous literature references are appended. C. G. F.

A method for the titration of calcium oxide or hydroxide in the presence of some aluminates or silicates. WARREN E. EMLEY. U. S. Bureau of Standards, Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 720-6(1915).—By the method here given CaO or $Ca(OH)_2$ can be detd. without difficulty in the presence of $CaOSiO_3$, $2CaOSiO_3$, $CaOAl_2O_3$, $5CaO_3Al_2O_3$, $CaCO_3$ or $CaSO_4$. If $3CaOSiO_3$ is present the method is still applicable but the end point is a little harder to recognize; to a less extent the same is true if MgO is present. With $3CaOAl_2O_3$ special precautions must be taken to insure the absence of H_2O . The alc. should be redistd. from quick-lime immediately before using. The method follows: "In a 250 cc. flask, put 2 cc. of glycerol and 10 cc. of alc. Add the finely powdered sample in sufficient quantity to give about 0.1 g. of free CaO. Add 5 drops of phenolphthalein soln. Bring to a boil, and keep near the boiling point throughout the titration. Titrate with 0.2 N alc. soln. of $NH_4C_2H_3O_2$. The end point is reached when the pink color is discharged and does not return after boiling for 1 min." Many check analyses were run with good results. C. H. KERR.

Electroanalysis of copper without platinum electrodes. J. GUZMAN CARRANCIO AND J. SANZ ULZURRUM. *Anales soc. espñ. fis. quim.* 13, 289-93(1915).—A steel

wire 2 mm. in diam., carefully cleaned with emery and immersed in HNO_3 (1.4 sp. gr.) for 1 or 2 min. was used as an anode in the electrolytic detn. of Cu in CuSO_4 ; a Cu cathode was employed. The electrolyte contained 0.2–0.3 g. Cu and to this were added 5 g. $(\text{NH}_4)_2\text{SO}_4$ and 5 cc. concd. NH_4OH ; successive const. potential differences of 3, 2.5 and 2 volts were maintained during the course of the electrolysis. The same mean % of Cu was obtained under the above conditions as was found when Pt electrodes were employed and HNO_3 was added to the electrolyte. When ammeter, voltmeter and adjustable resistance were eliminated from the circuit (the terminals of the battery being attached directly to the electrodes) and 1 instead of 5 storage cells was used the time required for deposition of Cu was 1 hr. instead of 15 mins. (under the 1st conditions); the other conditions, including stirring, were the same as at first. The amt. of Cu recovered was slightly decreased under these conditions. When stirring was dispensed with (the other conditions being those described immediately above) the amt. of Cu recovered was further decreased to a slight extent and the time required for the deposition of 0.2 g. Cu was increased to 2.5–3 hrs. In order to prevent deposition of Zn, when this metal is present as an impurity in CuSO_4 , it is necessary that the difference of potential shall not exceed 2 volts. Fe and Mg, when present as impurities in small amts., do not interfere with the electrolytic detn. of Cu in CuSO_4 . Mg may be present in considerable amt. without causing inconvenience; Fe in corresponding amt. would, however, be pptd. in the prepn. of the electrolyte. Data showing the results of the analysis of com. CuSO_4 by the 2nd and 3rd procedures described above are given.

H. S. PAINE.

A new method of determining nickel volumetrically. GINO ZUCCARI. Univ. Padoa. *Atti reale ist. Veneto sci. lettere ed arti* 74, 579–82(1915); see C. A. 9, 2200.

E. J. WITZEMANN.

The qualitative separation of silver from univalent mercury. N. VON ZWEIF-BERGK. Upsala. *Z. anorg. allgem. Chem.* 93, 320–6(1915).—The ordinary method in qual. analysis for the sepn. of Ag and Hg, i. e., dissolving the AgCl from the mixed chlorides with NH_4OH , and repptg. by acidifying, is not applicable to mixts. in which Hg is preponderant, and in any case the relative amt. of the 2 cannot be estd. from the bulk of the ppt. When NH_4OH soln. is poured over the mixed chlorides, a variable portion of the Ag is reduced or otherwise retained by the ppt., the amt. being controlled by unknown factors, but the longer the soln. remains in contact with the Hg ppt. the less Ag remains in the NH_4OH soln., and Böttger's procedure of pouring the same liquid over the ppt. repeatedly makes matters worse. For the estn. of Ag, all the HgCl should be oxidized to sol. HgCl_2 , preferably with NaOCl and HNO_3 . G. W. M.

The estimation of small amounts of arsenic, with special reference to the Smith method. K. BECK AND MERREO. *Arch. kais. Gesundheitsamte* 50, 38–49(1915).—A brief summary of the principles upon which the methods of Marsh and others are based is followed by a report of experiences with the procedure as outlined by Smith (cf. C. A. 6, 3381). The authors have found the colorimetric method applicable to amts. not greater than 0.04 mg. and that it is easy to distinguish between 0.002, 0.005, 0.01, 0.02, 0.03 and 0.04 mg., as shown by the colored chart published as an illustration. If for any reason greater accuracy is desired, use the colorimetric method only as a preliminary and employing a larger quantity of material weigh the HgCl formed, or titrate the As_2O_3 . The method has been applied successfully to meat exts., gelatin, hardened oils, etc. The only alteration noted in app. and technic is the substitution of a bulb absorption vessel for the Smith-Erlenmeyer. H. M. LANCASTER.

The determination of antimony in the products obtained by roasting stibnite. W. T. HALL AND J. BLATCHFORD. *Bull. Am. Inst. Mining Eng.* 1916, 99–101.—*Total Sb.* Dissolve by boiling 0.25 g. with 40 cc. concd. HCl , 2 g. KI and 4 g. tartaric

acid. The large end of a CaCl_2 tube is loosely inserted in the throat of the flask to act as a trap. Boil gently for a few minutes, cool under the tap, remove free I by cautious addition of $\text{Na}_2\text{S}_2\text{O}_3$, nearly neutralize with NH_4OH , then pour the slightly acid soln. into 200 cc. of NaHCO_3 soln. and titrate with 0.1 N I and starch. Det. S as in mfd. irons (Blair, *Chem. Analysis of Iron*, 7th Ed., p. 60) by boiling with strong HCl and passing evolved H_2S into Cd soln. etc. To the Sb soln. from this operation, add 4 g. tartaric acid, dil., nearly neutralize with NH_4OH , pour into soln. of NaHCO_3 and titrate with 0.1 N I. The difference between Sb thus found, and total Sb, represents Sb present in pentad form. From these data calc. Sb_2S_3 , Sb_2O_3 , and Sb_2O_5 , assuming that $\text{Sb}_2\text{O}_3 + \text{Sb}_2\text{O}_5 = 2\text{Sb}_2\text{O}_4$.

E. WALLER.

Dissolved gold in slime residue. L. R. BENJAMIN. *J. Chamber Mines W. Australia* Sept., 1914; *J. Chem. Met. Soc. S. Africa* 15, 337-42; *J. Soc. Chem. Ind.* 34, 965.—The proportion of dissolved and undissolved Au in slime residues is best ascertained by filtering and assaying the soln., and calcg. the dissolved Au from the proportion of soln. to dry slime. The undissolved Au is found by difference, after detg. the total Au content in the dried material. In the latter assay, the usual practice of drying the pulp over a fast fire leads to low results, ascribed chiefly to the imperfect removal from the sides of the iron dish of incrustations contg. the Au from the more concd. soln. formed during the later stages of the drying. The error is largely overcome by pptg. the dissolved Au prior to drying, by adding 10 cc. of 5% CuCl_2 soln. per kg. of pulp. After thorough stirring, the mixt. is evapd. as usual. The direct detn. of undissolved Au is untrustworthy, as the slime cake cannot be washed abs. free from sol. Au.

E. J. C.

Two analytical methods involving the use of hydrazoic acid. FRIEZ SOMMER AND HEINRICH PINCAS. *Ber.* 48, 1963-9(1915).—(1) *Detn. of HN_3* : Raschig's method which depends upon its oxidation with an excess of I_2 soln. through the catalytic action of $\text{Na}_2\text{S}_2\text{O}_4$ formed on adding a crystal of $\text{Na}_2\text{S}_2\text{O}_4$, fails with dil. solns. of HN_3 . The authors propose the use of salts of tetravalent Ce which in neutral or acid soln. react according to the equation $2\text{HN}_3 + 2\text{CeO}_2 = 3\text{N}_2 + \text{H}_2\text{O} + \text{Ce}_2\text{O}_3$. Use a 200 cc. flask with a long neck as the generator, immerse it in water of the temp. of the azotometer, insert a 30 cc. stoppered tube containing the Ce salt (2-3 g. to 0.1 g. HN_3) and after temp. equil. has been established, mix the reagent and sample by shaking. In general $(\text{NH}_4)_2\text{Ce}(\text{NO}_3)_6$ is employed but in the presence of free HCl, to avoid evolution of Cl_2 , use $\text{Ce}(\text{SO}_4)_2$ with an excess of AcONa . The authors weighed 0.06340 g. NaN_3 ; found 0.06342. (2) *Detn. of HNO_2* : With HNO_2 , HN_3 reacts according to the equation $\text{HN}_3 + \text{HNO}_2 = \text{N}_2 + \text{N}_2\text{O} + \text{H}_2\text{O}$. Add a known excess of HN_3 soln. to the nitrite, acidify it with 0.5 N acid and shake for 2 min. Make alk. with clear $\text{Ba}(\text{OH})_2$ soln., boil off N_2O and det. the amt. of HN_3 remaining by method (1). To detect HNO_2 in the presence of HNO_3 add HN_3 soln. to decompose the latter, drive off the excess, boiling until the soln. is odorless and gives no red color with FeCl_3 . Identify HNO_2 by the diphenylamine color reaction.

H. L. OLIN.

A new method for the estimation of methyl alcohol in the presence of ethyl alcohol. G. RIGF. *Arb. kais. Gesundheitsamte* 50, 50-6(1915).—The equation $\text{MeI} + \text{Me}_2\text{S} = \text{Me}_2\text{SI}$ represents a reaction taking place readily at room temp. or lower. The other alkyl halides require a much higher temp. for a similar reaction and upon this is based a quant. method. In examg. a mixt. of MeOH and EtOH the first step is to make the alkyl iodides. Place 10 cc. sample in small distn. flask kept cool by standing in ice-water. Add red P (1 cc. EtOH requires 0.18 g. P, 1 cc. MeOH 0.26 g. P). Connect with an upright condenser using a ground-glass joint and return the flask to the ice-water during the next 20 min. Add I gradually in about 3 g. portions (1 cc. EtOH requires 2.2 g. I, 1 cc. MeOH 3.18 g. I). Control the reaction by cooling the flask in

the bath. When I is all added place the flask on an unheated water bath and connect the upper end of the condenser with a bulb tube dipping into KOH. If the reaction does not start within a few minutes, heat the bath cautiously with a small flame. Keep the liquid in the flask in steady ebullition by cooling in ice-water or heating as required. When the HI is all off (1-1.5 hrs.) allow the flask to cool and disconnect the condenser. Place the condenser in an inclined position and distil off the MeI and EtI, using as a receiver an 80-cc. sepg. funnel containing 10 cc. cold H₂O. In the distn. raise the temp. gradually and distil off the first portions slowly. To drive over the last traces raise the temp. of the upper part of flask by wrapping it in a towel. This distn. usually requires about one hr. To the iodides in the sepg. funnel add 15 g. KOH (10%) soln. well cooled. Shake about 50 times and allow to stand about 15 min. Remove the supernatant liquid with a pipet. Wash twice more using 40 cc. cold H₂O. Allow the clear colorless iodides to stand with the last wash water overnight or for 4 hrs. at least, in an ice bath. Then pour into a weighed measuring cylinder with ground-glass stopper. From the wt. and vol. of the iodides it is possible to judge approx. the Me content. If MeI content is less than 5% add 0.5 cc. dry Et₂O as this assists in preventing formation of Et₃SI. If larger amts. of MeI are present it is not necessary to add Et₂O. To an aliquot of the iodides (2 cc.) in a 20 cc. flask add 2 cc. Me₂S, if the MeI is over 5%. If not, add 1.5 cc. Me₂S and 0.5 cc. Et₂O. Close with a cork stopper and allow to stand in a closed desiccator for 20-24 hrs. at 19-20°, or the mixt. may be sealed in a glass tube and left in an incubator at 19° for 20 hrs. Rinse out the Me₂SI with Et₂O previously dried and distd. from metallic Na. Transfer ppt. quantitatively to a stoppered flask, dissolve in H₂O and titrate with N/1 or 0.1 N AgNO₃ according to amt. present. Add the AgNO₃ gradually with shaking to slight excess (shown by greenish coloration), titrate back with NH₄CNS and Fe alum. One mol. AgNO₃ = 1 mol. Me₂SI = 1 mol. MeOH. The Me₂S should be kept in sealed tubes in a cool, dark place because of its unpleasant odor. Filtration and washing is best conducted in the open air. Residues should not be thrown out but should be destroyed with fuming HNO₃. In 10% mixts. contg. 2, 0.5, 0.20, 0.20, 0.10% MeOH, the remainder of the 10% being EtOH, the following respective amts. were found: 1.87, 0.56, 0.27, 0.20, 0.21, 0.13. Detailed procedures are also given for the estn. of MeOH in brandy. H. M. L.

The determination of reducing sugars. A volumetric method for determining cuprous oxide without removal from Fehling solution. F. M. SCALES. U. S. Dept. Agr., Bur. Plant Ind. *J. Biol. Chem.* 23, 81-7 (1915).—In this method the Cu₂O is converted into Cu₂Cl₂; a definite vol. is pipetted into I soln. and the excess of I is titrated with Na₂S₂O₃ soln. Mix 25 cc. each of the Cu portion (34.639 g. of CuSO₄·5H₂O in 500 cc. of H₂O) and the alk. portion (173 g. of Rochelle salts and 50 g. of NaOH in 500 cc. of H₂O) of Fehling soln. in a 400 cc. Jena beaker, add the sugar soln. and make up to 100 cc. Cover with a watch glass and heat on an asbestos mat with a flame regulated so that boiling begins in 4 min. Boil for 2 min. As soon as the Fehling soln. is placed over the flame, measure approx. 250 cc. of distd. H₂O into each of two 500 cc. Erlenmeyer flasks and add 25 cc. of 0.05 N I soln. (6.5 g. of resublimed I and 9 g. of KI per l.) from a pipet with a mark on the tip at a point where the soln. stops, so that exactly the same vol. may be measured each time. Seal the flasks with rubber stoppers. Place a 75 mm. funnel with a long stem in a 200 cc. volumetric flask which should be marked to contain and should be cut off about 20 mm. above the mark; the edge is polished and flared so that a rubber stopper may be pressed down to within 12-14 mm. of the mark. Add 15 cc. of concd. HCl and 15 cc. of H₂O at 80-95° just before the boiling of the Fehling soln. is completed. The tip of the funnel must be below the surface of this soln. After the Fehling soln. has boiled for 2 min., bring the ppt. into suspension by agitating the soln. and pour it rapidly onto the funnel.

Wash the beaker, watch glass and funnel with hot H_2O and fill the flask to the mark. Insert the rubber stopper and distribute the contents evenly by tilting the flask back and forth 5-6 times. Pipet 50 cc. of the mixed soln. into each of the flasks containing the I soln. A one-holed rubber stopper with a vent in the side should be slipped onto the 50 cc. pipet in such a way that the tip of the pipet will be about 1 cm. below the surface of the 275 cc. of soln. when the stopper is in the 500 cc. Erlenmeyer flask. Agitate the Erlenmeyer flask to prevent the formation of a ppt. by an excess of acid accumulating in one place. As the soln. drains down, draw out the stopper and tilt the pipet so that the contents run out slowly. Withdraw the pipet as soon as the soln. reaches the mark on the tip. Seal the flask with a rubber stopper. Titrate the excess of I with 0.05 $N Na_2S_2O_3$ soln. (standardized against 0.05 $N K_2Cr_2O_7$ soln.), adding 2 cc. of starch soln. when the end point is nearly reached. Multiply the difference between the number of cc. of 0.05 $N Na_2S_2O_3$ soln. oxidized by 25 cc. of I soln., as detd. by the standardization, and the number of cc. acted upon by the I remaining after the addition of the Cu_2Cl_2 soln. by 14.315 to obtain the mg. of Cu_2O in the whole soln. Amts. of dextrose from 4 to 150 mg. may be detd. by these 0.05 N solns. and amts. up to the limit of the Fehling method can be detd. by taking a smaller quantity of the Cu_2Cl_2 soln. or by changing the strength of the reagents. A single detn. can be made in 20 min. The method yields results fully as accurate as those of the standard gravimetric method. The method may be used for the quant. detn. of Cu by reducing the Cu in an alk. soln. with dextrose. Dextrose, maltose, lactose and invert sugar may be estd. by the method.

A. P. LOTROP.

Estimation of thiophene in benzene. PAOLINI AND SILBERMAN. *Rend. accad. Lincei* 24, 209-11(1915); through *Ann. chim. applicata* 4, 289.—Thiophene in C_6H_6 is detd. in the form of the tetra-Hg acetate. A little more than the calcd. quantity of HgO is dissolved in twice its wt. of glacial $AcOH$, and the Hg acetate allowed to settle. Then the C_6H_6 contg. the thiophene is added, and the liquid heated on the salt bath with reflux condenser for 15 min. After cooling, the ppt. of thiophene tetra-Hg acetate is collected. This compd. is insol. in all solvents, except warm glacial $AcOH$, in which it dissolves in the proportion of 1:5.

S. LEVY.

Platinum boats for carbon determination by combustion (SIEVER) 1.

8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

Microscopic tests on opaque minerals. EVEREND L. BRUCE. *School Mines Quart.* 35, No. 3; *Chem. News* 111, 121-2(1915).—B. discusses the prepn. of the sample, the instruments used, and the methods employed for examn. The latter consist in first noting color and appearance, and then etching with cold HCl ; if unattacked, cold HNO_3 is used; finally, if the substances resist both single acids, aqua regia is used. The chief reactions employed are given, and also an outline of a determinative scheme.

J. H. BOWER.

The problem of the diamond. E. BAUR, K. SICHLING AND E. SCHENKER. *Zürich Z. anorg. allgem. Chem.* 92, 313-28(1915).—Calcs. based on Roth's value of the heat of transformation of diamond to graphite indicate that the pressure on the curve in the P - T projection representing the "the 2 forms increases with increasing temp. at such a rate that there may be a stable form in the earth's crust. Since diamonds are not found, it is probable that the ex-

ever be a stable form in the
 ons after the diamond are
 ich the diamond is stable,

and hence the P - T curve probably does not have the above form. By making appropriate assumptions, the equation for a curve with a max. at 2300° abs. and 35000 atms. is calcd. for the above equil. By making the necessary assumptions in regard to the rise in temp. with increasing depth, it is calcd. that the conditions necessary for the formation of diamonds would be found at 3000° and 100 kilometers depth; the mechanism by which the diamonds thus formed were brought to the surface is probably the geologic process by which the South African "pipes" were formed. A number of attempts to prepare diamonds at ordinary pressure with thermite charges containing C and a silicate mixt. with FeO and CaC_2 in an atm. of CO, and with $\text{Na}_2\text{B}_4\text{O}_7$ melts containing CaC_2 or SiC in an atm. of CO, and at high pressures (8000 atm.) with various melts containing FeO, CaC_2 and SiC all gave negative results.

GEORGE W. MORREY.

The hardness and microstructure of fusions of tellurium and sulfur compounds.

P. SALDAU. *Ann. inst. mines Petrograd* 4, 228-37(1913); *Neues Jahrb. Min. Geol.* 1915, II, Ref. 21.—The hardness of altaite (PbTe), 31.85 kg. per mm^2 , exceeds that of the components, Pb 3.92 and Te 18.43 kg. per mm^2 . A max. in the hardness curve occurs at 49.8 atomic % Te. Solid solns. of Pb in PbTe occur up to 5 atomic % Pb; they are absent in PbTe + Te. PbS forms solid solns. in FeS, Ag_2S and Cu_2S up to 2% by wt. PbS and PbTe do not form a continuous isomorphous mixture series.

E. T. W.

Ilmenite from Val Devero (Ossola). ANGELO BIANCHI. *Rend. accad. Lincei* 23, 722-7(1914); *Neues Jahrb. Min. Geol.* 1915, II, Ref. 22-3.—The mineral, which occurs in chlorite schist and wehrlite, is described crystallographically. E. T. W.

Studies in the magnesian silicates. The group of zillerite, zermattite and palygorskite. A. FERSMANN. *Mem. acad. sci. Petrograd* 32, No. 2, 430 pp.(1913); *Neues Jahrb. Min. Geol.* 1915, I, Ref. 312-29.—A report of an investigation which has extended over several years, in which many samples of "mountain-leather" and similar substances from all possible sources have been carefully purified by hand picking, and analyzed. The problem was to characterize the mineral species represented from the physico-chem. standpoint, to throw light on their genetic relations with other species, to improve their nomenclature and to establish their correct classification. The question of natural decomposition products is discussed at length. Two new structural terms are defined: pilolitic, referring to irregularly matted fibers, and neurotic, to parallel fibers. The minerals are classified into: Zillerite group: tremolite-zillerite and actinolite-zillerite; serpentine-mountain cork group: zermattite and schweizerite (the latter with Fe replacing some Mg); Al-palygorskite group: paramontmorillonite, $\text{H}_{10}\text{Al}_2(\text{SiO}_4)_4$, lassalite = α -palygorskite, $\text{H}_{10}\text{Mg}_2\text{Al}_4(\text{SiO}_4)_{11}$, β -palygorskite $\text{H}_{18}\text{Mg}_3\text{Al}_3(\text{SiO}_4)_7$ (the most stable mineral; has a Ca-analog); α -pilolite, $\text{H}_{20}\text{Mg}_4\text{Al}_2(\text{SiO}_4)_{10}$, β -pilolite, $\text{H}_{24}\text{Mg}_6\text{Al}_3(\text{SiO}_4)_{11}$, parasepiolite, $\text{H}_2\text{Mg}_2(\text{SiO}_4)_3$ and the Fe-palygorskite-xylolite group, with formulas corresponding to some of the above, with Fe replacing Al. An exhaustive review of the literature and a historical discussion is then given. The methods of investigation are also described. The deposits of these minerals in Russia are discussed in detail. They occur mostly in connection with magnesian limestones and marls, and are believed to have been formed by atmospheric decompn. of clays, and reactions between liberated Al_2O_3 and SiO_2 gels and the carbonates. Deposits in western Europe are then taken up, then those in Austria and adjoining countries, and those of other continents; the U. S. occurrences belong almost entirely to the palygorskite group, parasepiolite being especially widely distributed. The compns. and origins of each of the species recognized are then discussed. The first 2 groups (cf. list at forms of well known minerals. The palygorskite group is very important role in the zone of weathering and being especially

stable. A table is given showing the theoretical formulas and compns. of the members of this and the xylotile group, and compared with the results of 41 old and 22 new analyses, good agreement being found, except as to H_2O content in a few cases. The constitution of the palygorskites can only be explained by assuming the existence of aluminosilicic acids, the nucleus being $H_3Mg_2(SiO_4)_3$ with an aluminosilicate, $H_{10}Al_2(SiO_4)_4$, as addition product; the ratios between this and side chains are found to be small integers, frequently 1. Some isomorphous mixture occurs between different members. H_2O is present in 3 different forms: constitutional, zeolitic, and absorbed. With increase of Al content the decomposibility of these minerals by acids and bases decreases. For β -palygorskite $n = 1.55$; and with increasing MgO -content this increases. The double refraction is $0.015-0.020$, this also increases with the Mg. An elaborate table of the properties, genesis, etc., of the minerals is given. The Fe-palygorskite or xylotile group is discussed in like manner. The n 's and double refractions are higher than in the corresponding Mg minerals. Chapters are also added on the general characters and classification of pilolitic asbestos, and on the identification of the various minerals. Staining expts. with acid-fuchsin, methylene-blue, methylene-green, and methyl orange were found to be of use in the latter connection. Some of F.'s analyses have been previously published (cf. *C. A.* 8, 647; Doelter's *Handbuch Min. Chem.* 2, 378, 434, and 609); 37 additional ones are here given. R. T. W.

Potassium salts. An economic geological study. E. MACKAY HERIOT. *Eng. Mining J.* 100, 660-72, 712-4 (1915).—H. describes the known K deposits, shows that the only considerable source is marine depositions, in the form of beds of Tertiary or earlier age, and points out that the chance of finding new deposits is good. W. B. H.

The potash deposits of the Sand Hills region of northwestern Nebraska. VICTOR ZIEGLER. *Colo. School Mines Quart.* 10, No. 3, 6-26 (1915).—The history, topography, climate and general geology of the region are described, and a detailed account of the numerous lakes given. The larger lakes are fresh, the smaller ones in part highly saline, as shown by detns. of the salts listed; and the K_2O of content of the salts is high, often exceeding 10 and in one case 35%. Complete analyses given for several lakes show the salts to be largely carbonates and sulfates of Na and K. The source of these salts is believed to be chiefly the ashes of forest and prairie fires, carried by surface waters into lakes without outlet and concd. by gradual evapn. In analyses of the ashes of grasses K is higher than Na, whereas in the lakes the reverse is true, but it is thought that the excess Na has been contributed by the surrounding sediments, through leaching by rain water. An account is given of the method of commercial exploitation of the deposits of Jesse Lake; the process consists in submitting the water to solar evapn., and concg. the brines with steam heat. The K and Na salts are not sep'd. at present, the mixt. of the two being used as fertilizer. This lake probably contains over 100,000 tons of salts, and although no large accumulations of salines can be expected in the district, it is thought that other plants could be made profitable if located so as to draw water from groups of the smaller lakes. E. T. W.

The origin of petroleum and asphalt. CLIFFORD RICHARDSON. *J. Ind. Eng. Chem.* 8, 4 (1916).—The theory is suggested that petroleum and asphalt form by surface action between natural gas and colloidal "sands." The character of the petroleum will depend on the nature of the gas and on that of the "sand." If the gas contains S, a S petroleum will result; if the "sands" contain S, a different type of S petroleum may result, the difference between Trinidad and Mexican petroleum being thus explained. Colloidal sand, being more active, would produce asphaltic petroleum whereas a true sand with less surface action would produce a paraffin petroleum.

F. M. ROGERS

The correlation of potassium and magnesium, sodium and iron, in igneous rocks. HENRY S. WASHINGTON. *Proc. Nat. Acad. Sci.* 1, 574-8(1915).—W. claims that the view that in igneous magmas K and Mg on the one hand, and Na and Fe on the other, tend to vary together, is greatly strengthened if not quite established by cumulative evidence of two kinds: mineralogical and petrographical. A number of examples are given, and the relation is further brought out by plotting $\text{Na}_2\text{O}-\text{K}_2\text{O}$ against $\text{FeO}-\text{MgO}$. J. H. BOWER.

The loess of the Argentine pampas formation. W. MEIGEN AND P. WERLING. *Ber. naturf. Ges. Freiburg* 21, 1-26; *Chem. Zentr.* 1915, II, 433-4.—The authors give the varied mechanical and chem. analyses of the Lehman-Nitsche loess tests. For detn. of solubility in acids the sample was digested in 5% HCl and the residue from the soln. of sepd. SiO_2 treated with NaOH and finally with HCl. Since the alkalies in the different samples were always detd., the 3 filtrates from the analysis could be combined. For the detn. of the solubility in alkalies the sample was heated for 1½ hrs. on the water-bath with 100 cc. of 5% NaOH. The analyses (which are reported in the original) show that all samples of loess from Córdoba were considerably coarser grained than the German loess. It shows traces of carbonates whereas the German loess contains 25-30%. This may have its basis in the original material. The Argentine loess has a larger content of alumina and a greater solubility in HCl than the German which points to an irregular original material and to a greater, more lateritic decompn. On the whole, the analyses confirm Doering's supposition that the Argentine loess owes its origin essentially to great volcanic ash showers. J. H. BOWER.

Basal Kalevien formations of Mölönjärvi. W. W. WILKMAN. *Bull. Comm. Geol. Finland* 1915, No. 43, 32 pp., with 4 p. summary in French.—Chiefly geological. A talc-magnesite is described composed of the minerals in nearly equal proportions, with small amts. of calcite, chlorite, magnetite and chromite. The serpentines are produced by decompn. of peridotite, the metabasites are metamorphic derivatives of gabbro, while the talc-magnesites constitute the final product of the disintegration of serpentine rocks. The various formations are regarded as products of dynamic metamorphism. R. L. SIBLEY.

Chemistry of sandstone weathering on the Cologne dome. R. E. LIRSEGANG. *Der Steinbruch* No. 13-4, 1-7; *Chem. Zentr.* 1915, II, 443.—L. rejects the explanation that the origin of the scaly crusts on the Cologne dome is due to the presence of layers of Ca and Mg sulfates. The "rhythmic crystn." is only possible by intermediate soln. through the presence of bicarbonates. L. W. RIGGS.

Tellurides of silver and gold (PELLINI) 6. Studies of the imperfect crystals formed in a colloidal medium (MARY) 2.

9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Furnaces and temperatures. H. D. COLEMAN. *Metal Ind.* 14, 15-6(1916).—A general discussion based on observations made in the U. S. Mint at Phila.

F. W. SMITHER.

Flotation test tank for mill or laboratory. ANON. *Met. Chem. Eng.* 14, 112 (1916).—The app. is practically a small Parral tank, with a central cylinder acting as a filler to reduce the capacity. A baffle is so placed as to deflect the froth from the surface into a receiving box at one side, making use of the circular motion of the pulp

produced by the Parral system of agitation. Drawings are given of an app. to take 100 lbs. of ore. Patent rights to the system are waived when used for testing purposes.

W. L. BADGER.

Influence of heat in cyaniding gold ores. E. A. WRAIGHT. *Inst. Mining and Metallurgy, Bull.* 135, 1-18(1915).—From parallel expts. in extg. 60-mesh, 4-oz. Au ore with 0.40% KCN solns. W. concludes that heating is of doubtful value. Extn. may be increased for a short period but the rise in solubility of other minerals results in loss of KCN with a consequent decrease in soln. of Au. While the addition of O_2 in a more active form, either as H_2O_2 or in heated air, raises the solvent activity of cyanide solns., other oxidizing agents, e. g., $CaCl_2O$, $K_2Cr_2O_7$, etc., are either inert or positively deleterious.

H. L. OLIN.

Clay: its relation to ore dressing and cyaniding operation. A. W. ALLEN. *Inst. Mining and Metallurgy, Bull.* 135, 1-19(1915).—A. presents an extensive review of the literature of colloids and discusses the properties of clays in suspension. Ores with which clay is associated are difficult to treat and complete extn. of Au from even the finest slime is impracticable because of the absorptive effects of the colloidal particles. Clay slime therefore should not be weathered and it should be allowed an extended time of contact with wash soln.

H. L. OLIN.

The behavior of stibnite in an oxidizing roast. H. O. HOFMAN AND J. BLATCHFORD. *Bull. Am. Inst. Min. Eng.* 1916, 91-7.—Expts. were conducted in an elec. furnace with regulated temp. with ore ground to 20 mesh. Conclusions: At about 200° S begins to burn; there is sharp visible formation of Sb_2O_3 at 336°—white fumes. The formation of Sb_2O_3 proceeds slowly. All S can be eliminated at 400° without a large loss of Sb. The formation of Sb_2O_3 begins only when all S is gone. Loss of Sb increases with the temp.

E. WALLER.

Cyanide plant of the Baker Mines Co., Cornucopia, Ore. R. M. KRENEY. *Met. Chem. Eng.* 13, 947-53(1915).—K. describes the mill buildings, equipment, power, and operation. Operating data and costs are given. The total cost per ton of ore is \$2.103.

C. A. NOWAK.

Coke for the iron blast furnace. TAIZO KURODA. *J. Chem. Ind. (Japan)* 18, 668-72(1915).—K.'s experiences during a period of several years in the Imperial Steel Works have shown that good blast furnace coke should contain less than 1.0% S, 0.018% P, 9.0% ash and 4% moisture; its porosity should generally be 40-50% and the crushing strength 80 kg. per sq. cm. The importance of using coke of the right qualities in smelting iron in the blast furnace is emphasized.

E. J. C.

Utilization of blast furnace slags. E. C. BROWN. *Iron Age* 96, 1476-7(1915).—Mainly a review.

F. W. SMITHER.

Washing blast furnace gas at South Chicago. ANON. *Iron Age* 97, 53-7(1916).—High efficiencies in the blast furnace gas consumption are due to thorough washing of the gas by the Brassert 2-stage method. This system employs a single vertical tower designed to handle the entire output from one furnace. Into the lower half a heavy rain of water is introduced, and redistributed by screens, perforated trays and grids. The first rough washing takes place here. The upper section contains inclined baffles arranged to intercept the flow of the gas by means of a strong impinging action which insures a positive contact of the gas with the baffle surfaces. In the Brassert drier the gas impinges against vertical baffles which permit the intercepted water to escape promptly.

H. L. OLIN.

Metallurgy at the plant of Sons of Gwalia, Australia. A. WAUCHOPE AND THOMAS B. STEVENS. *Met. Chem. Eng.* 13, 925(1915); 14, 106-7(1916).—A description of a

plant working \$7.50 Au ore by all sliming treatment, with flow sheets and cost and efficiency data.

H. L. OLIN.

High and low sulfur in basic steel. J. S. UNGER. *Iron Age* 97, 146-50 (1916).

—The purpose of the investigation was to prepare steels of different degrees of hardness, each containing varying amts. of S, then work these steels into finished products and exam. them carefully during the manuf. and after completion for differences in quality. The expts. are reported in detail with numerous illustrations and tables. In practically every case finished articles in common everyday use were made; the work was carried out by the ordinary methods practiced, and in such sizes as are manufd. in the mills or shops. The author does not advocate paying no attention whatever to S content of steel, but believes that a steel containing less than 0.100% is not necessarily bad, and that it will show little, if any, difference in quality when compared with the same steel of much lower S, other conditions being the same. F. W. SMITHER.

The microchemistry of corrosion. IV. Gun metal. C. H. DESCH AND H. HYMAN.

Univ. of Glasgow. *J. Inst. Metals* (advance copy) 12, 11 pp. (1915); cf. *C. A.* 7, 3956; 9, 432, 1294.—Alloys of (1) 88 Cu, 10 Sn, 2 Zn and (2) 84 Cu, 14 Sn, 2 Zn were electrolytically corroded in NaCl soln. at various voltages between the sample as anode and Pt as cathode. Polished samples gave inconsistent results and it was found that to eliminate errors due to the flow of the surface in polishing, it was necessary to remove the flowed layer by etching in acid soln. of FeCl₃. Alloy 1, moderately slow-cooled, contained α - and very slowly cooled $\alpha + \delta$ -metal; alloy 2, slow-cooled, $\alpha + \delta$ -metal and quenched from 800°, $\alpha + \beta$ -metal. The sample showing pure α -metal was slightly more corroded than the others, which differed but little. The total corrosion is less than in brasses as a coating of basic tin salts is formed which protects the surface. H. W. GILFILL.

Physico-chemical studies of the roasting process (REINDERS) 2. Alloy of manganese and bismuth (PARRAVANO) 6. Determination of antimony in the products obtained by roasting stibnite (HALL) 7.

Treating ores. GRAF B. SCHWERIN. *Brit.*, 19,313, Sept. 1, 1914. Prior to the magnetic concn. of ores, an acid or alk. electrolyte is added to a slime in order to loosen the close adhesion to each other of the constituents of the suspended composite particles and facilitate the settling of the ore particles.

Working ores and furnace products. GEBR. BORSCHERS. *Ger.*, 285,791, Aug. 9, 1911. The process is suitable for ores and materials containing Co, Ni, and Ag, together with Fe and As, as well as speiss and Ni-Co oxides. These materials are roasted with alkali bisulfate. See *Brit.*, 18,276, 1912 (*C. A.* 8, 317).

Concentrating ores. L. BRADFORD. *Brit.*, 19,844, Sept. 18, 1913. In the sepn. of metallic sulfides by selective flotation processes, such as are described in 21,104, 1913, (*C. A.* 9, 593) a soln. of one or more substances such as sulfites or thiosulfates of alkali metals or SO₂ is added to the medium before the flotation is effected, with the object of retarding the flotation and avoiding the tendency of the particles of one sulfide to agglomerate and include particles of another sulfide.

Concentrating ores. MINERALS SEPARATION and DE BAVAY'S PROCESSES AUSTRALIA PROPRIETARY, LTD. *Brit.*, 19,373, Sept. 2, 1914. Mixed PbS and ZnS ores, particularly slimes, are sepd. by subjecting them to a froth-flotation process in the presence of or after preliminary treatment with an amt. of H₂SO₄ less than that required to float both the Pb and the Zn and with or without a frothing or emulsifying agent, sepg. the resulting froth containing the PbS, and thereafter, if necessary,

submitting the tailings to a froth-flotation process for the flotation of the Zn. Cf. C. A. 9, 2220.

Concentrating ores. MINERALS SEPARATION and DE BAVAY'S PROCESSES AUSTRALIA PROPRIETARY, LTD. Brit., 19,374, Sept. 2, 1914. Mixed PbS and ZnS ores, particularly slimes, are sepd. by subjecting them to a froth-flotation process in the presence of an amt. of a frothing agent not more than that required for the flotation of the PbS only, and thereafter, if necessary, submitting the tailings to a further froth-flotation process with an increased quantity of frothing agent for the flotation of the ZnS. The process may be applied in the presence of the salts mentioned in 11,939, 1913 (C. A. 8, 3552).

Concentrating ores. A. H. HIGGINS and MINERALS SEPARATION, LTD. Brit., 19,855, Sept. 16, 1914. Products obtained by treating organic substances such as fats, oils, alcs., phenols, or their homologs with H_2SO_4 are employed as frothing agents in froth-flotation processes of ore concn. The use of a product obtained by adding 5 g. of β -naphthol to 10 g. of concd. H_2SO_4 while stirring in a water-cooled vessel is described.

Concentrating ores. MINERALS SEPARATION, LTD. Brit., 19,856, Sept. 16, 1914. Products obtained by treating hydrocarbons, particularly unsatd. hydrocarbons, with H_2SO_4 are employed as frothing agents in froth-flotation processes of ore concn. Acid sludge obtained in refining hydrocarbons may be used. The products may be allowed to stand for some time before use or may have been mixed with H_2O for some time. Cf. C. A. 10, 169.

Ore-roasting furnace. K. J. BRSKOW and A. RAMEN. U. S., 1,166,654, Jan. 4.

Apparatus for calcining, desulfurizing and agglomerating ores. F. MEYER. U. S., 1,166,142, Dec. 28.

Furnace for smelting iron ore. C. K. DAVIS. U. S., 1,165,393, Dec. 28.

Extracting metals; furnaces. G. GRÖNDAL and H. NILSSON. Brit., 20,361, Sept. 30, 1914. Fine Fe or other ore to be agglomerated, with or without reduction, is packed into receptacles open at both ends which are arranged one against the other so as to form a long chamber through which hot gases from a burner are passed, the ore masses being formed with passages to allow this. When the receptacle next to the burner chamber has been sufficiently heated, it is transferred to the other side of such chamber and is then traversed by the air or gas for combustion, which is thus heated, a fresh receptacle being added at the other or chimney end. Where the ore is to be oxidized, air is supplied at a suitable point and gas enters the burner chamber directly, but where the ore is to be reduced, the gas and air supplies are exchanged. Instead of a gas, powdered fuel may be used. The burner chambers are similar in shape to the ore receptacles and have openings which are closed when the chamber is not in the "burner" position.

Sintering flue dust. S. W. OSGOOD. U. S., 1,166,927, Jan. 4. Flue dust from blast furnaces is mixed with CaO and H_2O and the mixt. is formed into pellets or globules, dried and sintered in a reducing flame.

Agglomerating ores. P. O. HARDING. U. S., 1,166,903-4, Jan. 4. The ore, *e. g.*, fine Fe ore or flue dust is passed downward through a combustion zone and as it falls below the combustion zone, broken and treated with a current of air to carry back the friable unchanged portions to the combustion zone where they are ignited and agglomerated.

Briquetting ores before smelting. O. BALTIN. U. S., 1,166,171, Dec. 28. The ore is mixed with gypsum and pitch and the mixt. is compressed into briquets for

smelting. By using gypsum as binder, less pitch is required and the amt. of noxious fumes from smelting decreased.

Smelting complex sulfide ores. F. W. HIGHFIELD. U. S., 1,167,176, Jan. 4. Sulfide ores of Zn, Pb, Fe, Cu and Ag are roasted to remove S, mixed with reducing material and heated in an elec. furnace in a reducing atm. to about 950° to volatilize the Zn without volatilizing the Pb. The molten Pb is sepd. from the residual mat and the latter is heated electrically to 1350° to form silicious slags; the liquid mat of Cu and Fe sulfides is treated with a d. c. to decompose Cu and Fe sulfides and promote sepn. of Cu and Fe. Cf. C. A. 9, 2353.

Reducing iron ores. E. B. PRATT. U. S., 1,167,016, Jan. 4. Ore is heated to a reducing temp. with H, in the absence of any oxidizing gases and with just sufficient C to give the desired C content in the metal produced and the temp. of all parts of the charge is so regulated as to effect reduction of Si in the ore or added flux such as to give the desired proportion of Si in combination with the Fe.

Puddling iron. G. A. JARVIS. Brit., 20,163, Sept. 25, 1914. Non-phosphoric Fe is puddled in an acid-lined furnace with additions of an acid silicate of Fe to obtain a malleable and fibrous product. Dephosphorized metal from the basic open-hearth may be used, such metal being recarburized, if necessary, and after starting the process, the silicate of Fe employed may be the slag resulting from the process, with the addition of hammer or mill scale.

Retorting impure zinc ore. C. A. H. DE SAULLES. U. S., 1,166,447, Jan. 4. The front portion of a retort or muffle is filled with a briquetted charge of ore which is low in Fe and Pb, mixed with coal or coke which serves to filter out Fe and Pb from the main portion of the charge which is placed in the rear of the retort or muffle.

Extracting zinc from ores. O. BALTIM. U. S., 1,166,170, Dec. 28. Zn ore is reduced after forming into rounded briquets with reducing material, the briquets being placed in a reducing chamber so that they contact with each other at only a single point and have almost their entire surface exposed to the direct action of the heat.

Pure zinc oxide; pure zinc. H. WILLIAM BARON DE STUCKLÉ. Ger., 285,617, Dec. 8, 1912. Pure ZnO or metallic Zn may be obtained by treating purified solns. of Zn salts with $(\text{NH}_4)_2\text{SO}_4$, with regeneration of the sulfite and ignition of the resulting ZnSO_4 . See Fr., 465,816 (C. A. 8, 3415).

Recovery of zinc. E. GELLBACH and M. MATT. Ger., 285,866, May 11, 1913. Zn or other volatile metals are recovered from briquetted poor pulverulent materials in the blast furnace, by mixing the material directly with the required amt. of coke or coal powder, introduced preferably with the blast, whereby no binder is required for the briquetting process.

Separating cobalt from speiss. P. M. McKENNA. U. S., 1,166,067, Dec. 28. Speiss containing Co and Ni is fused with B_2O_3 about equal in wt. to the Co in the speiss and a gravity sepn. is effected between the speiss and the boric Co slag formed. The latter is then heated to about 1000° in an oxidizing atm. to expel As and Sb. The Fe present may be removed, if desired, by melting with SiO_2 as a preliminary operation.

Purifying metallic bismuth. W. C. SMITH. U. S., 1,166,721, Jan. 4. Metallic Bi carrying impurities such as Cu, Pb, Te, Ag, Au, As and Sb is treated, while molten, with S to eliminate As, Sb and Cu, which are removed by skimming. The molten residue is treated with NaOH and skimmed to remove Te together with As, Sb and S remaining from the previous treatment. Then Zn is dissolved in the molten residue and Cu, Ag and Au are removed by cooling and skimming. Zn is removed by treatment with NaOH and skimming and the Bi is freed from Pb by crystn.

Castiron molds. A. S. REEDER. U. S., 1,166,934, Jan. 4. Cast-Fe molds, *e. g.*, for use in molding glass, are freed from strain after casting by gradually heating to 760° or higher and the mold is finished after gradual cooling.

Pouring a series of molds. F. DAHL. Ger., 285,469, Dec. 24, 1912. The construction and operation of a traveling sepg. device for the liquid metal.

Galvanizing iron. E. BROEMME. Ger., 285,923, Oct. 30, 1913. The etching preliminary to the coating with Zn is effected by treating the Fe articles with a soln. mixt. of alkali hydrogen sulfate and alkali chloride, especially NaCl. By employing these substances to remove the rust, FeSO₄ and Na₂SO₄ are obtained as by-products and may be sepd. by fractional crystn. However, the mixt. may be evapd. and ignited, and after cooling the Na₂SO₄ may be washed out, leaving the Fe₂O₃ as a crude powder suitable as a pigment. *E. g.*, NaHSO₄ 120 kg. and NaCl 60 kg. are dissolved in warm H₂O, and the Fe to be treated is passed through the soln. slowly. A violent reaction results, with a marked rise in temp., the resulting HCl, in the nascent state, being much more active than ordinary HCl. Further, the H liberated exerts a strong reducing action, so that a clean metallic surface is obtained in a much shorter time than by acid treatment. After drying in the air the surfaces are ready for coating.

Alloy for electric contact points. P. R. HEVL. U. S., 1,166,129, Dec. 28. An alloy of Ag with Pd containing 40-80% of Pd is used for elec. contacts which have great resistance to spark erosion.

Alloy for making rolls. H. E. FIELD and F. C. T. DANIELS. U. S., 1,166,342, Dec. 28. A hard, tough alloy for making cast rolls for shaping metals is formed of Si 0.25-1.5%, S 0.025-0.20%, P 0.01-1.0%, Mn 1.5-3.5%, C 1.5-3.5% and Fe to make 100%.

Alkali-resistant metal vessel. B. STRAUSS. U. S., 1,166,866, Jan. 4. Vessels for boiling alkali solns. are formed of Ni steel alloy containing about 25% Ni and 0.5-2% Cr, with an oxidized surface.

Coating iron with aluminium. S. UYENO. U. S., 1,165,920, Dec. 28. Fe articles, *e. g.*, plates, are first coated with Sn and then swept with a metal brush while immersed in molten Al to remove the Sn entirely and replace it with Al. A smooth coating is produced if the sheets are passed between rollers.

Gold alloy. K. G. P. RICHTER. U. S., 1,165,448, Dec. 28. A malleable white alloy is formed of Au 57, Pd 35 and Ni 7.5 "atoms per cent."

10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

Some homologs of menthol. EYVIND BOEDTKER. Univ. Christiania. *Bull. soc. chim.* 17, 360-7(1915).—Alkylmenthones described by Haller (*Compt. rend.* 138 1139), when treated with Na in Et₂O satd. with H₂O, gave rise to the corresponding alkylated menthols. *Methylmenthol*, C₈H₁₈.CHMe.CHOH, *b_m* 129-30°, *d₄¹⁸* 0.9124

n_D²⁰ 1.4692, [*α*]_{D²¹} (C₆H₆) -2° 26', possessing a camphoraceous odor; *acetate*, *b₁₇* 125°, *d₄¹⁸* 0.9313, *n_D²⁰* 1.4578, [*α*]_{D²²} (C₆H₆) -18° 7', possessing a sharp odor; *ethylmenthol*, *b₁₈* 124°, *d₄¹⁸* 0.9246, *n_D²⁰* 1.4769, [*α*]_{D²²} (C₆H₆) 4° 55', possessing a camphor-like odor; *acetate*, *b₁₄* 131-2°, *d₄¹⁸* 0.9366, *n_D²⁰* 1.4636, [*α*]_{D²¹} (C₆H₆) -6° 6'; *propylmenthol*, *b₁* 141-5°, *d₄¹⁸* 0.9075, *n_D²⁰* 1.4675, [*α*]_{D²²} (C₆H₆) 29° 7'; *acetate*, incompletely purified *b₁₀* 152°, *d₄¹⁸* 0.9515, *n_D¹⁹* 1.4741, [*α*]_{D²²} -8° 58'; *isoomylmenthol*, *b_m* 150°, *d₄¹⁸* 0.8985, *n_D²⁰* 1.4661, [*α*]_{D²²} (C₆H₆) 33° 44'. *Benzylmenthol* [cf. Wallach, *Ann.* 305, 263; Semmler, *Ber.* 1904, 236], *b_m* 203-5°, *d₄²⁰* 0.9819, *n_D²⁰* 1.5257, [*α*]_{D²⁰} (C₆H₆) -43° 19', *w_m*

formed by reducing benzylidenementhone in Et_2O , satd. with H_2O , with Na. *Benzylmenthone*, b_p 177°, d_4^{18} 0.9979, n_D^{19} 1.5232, $[\alpha]_D^{23}$ (C_6H_6) 28° 4', was prepd. by treating menthone in Et_2O with NaNH_2 , heating to remove the NH_3 , and subsequently adding PhCH_2Cl .

LOUIS E. WISE.

Benzylidenementhones. EYVIND BORDTKER. *Bull. soc. chim.* 17, 374-80(1915).

—Benzylidenementhone hydrochloride (A) whose constitution has hitherto been uncertain (cf. Wallach, *Ann.* 305, 261; Martine, Thesis, "Study of the Menthones," Paris, 1904), when treated with PhH in the presence of AlCl_3 , yielded a menthodiphenylmethane, m. 159° (identical with the compd. previously reported, m. 160.5-1.5°; cf. C. A. 6, 1133). (A) therefore has the constitutional formula $\text{CO.C}_6\text{H}_{16}\text{CH-}$

CHPhCl . A by-product of the above reaction was a stereoisomeric menthodiphenylmethane, m. 135-6° (previously formed by the action of PhMgBr upon benzylidenementhone (B)). Martine's work on the condensation of menthone with BzH and HCl was repeated and his results were confirmed. B. thus obtained a 75% yield of (B) and 25% of a Cl-containing oil (C), which could not be crystd. When (C) was heated under reflux with alc. KOH, the alc. removed by distn., the residue poured into H_2O and extd. with Et_2O , the ext. dried, and the Et_2O removed, B. obtained α -benzylidenementhone (D), d_4^{19} 1.0105, n_D^{20} 1.5403, $[\alpha]_D^{21}$ (in C_6H_6) -82° 23', not solidifying -18° and stereoisomeric with (B) (which according to M. is itself a mixt. of 2 isomers). Apparently (C) is a mixt. of isomeric benzylidenementhone hydrochlorides. When treated with KCN in alc. (A) and (C) both yielded the same series of nitriles (type formula: $\text{CO.C}_6\text{H}_{16}\text{CHCHPhCN}$, but not further characterized). The interaction of

(D) and H_2NOH led to the formation of $\text{CO.C}_6\text{H}_{16}\text{CHCHPhNHOH}$, m. 160°, pre-

viously prepd. by Wallach, M., *et al.* (D) adds HCl to form a non-crystallizable oil. When oxidized with KMnO_4 , (D) in acetone yielded largely BzOH, besides α, α' -methylisopropyladipic acid, m. 105-6°, and α -isopropylglutaric acid, m. 95-6°. Heated with alc. KOH, (D) forms menthone, BzOH, and PhCH_2OH . (D) when treated with PhMgBr and subsequently with BzCl gave rise to a new menthodiphenylmethane, m. 156-7°, isomeric with those derived from (A).

LOUIS E. WISE.

Oxidizing effect of sunlight. EYVIND BORDTKER. *Bull. soc. chim.* 17, 369-74 (1915).—A flask filled with $(\text{Me}_2\text{CHCH}_2)_2$ (A), but poorly stoppered, at the end of 15 yrs. contained, besides pure (A), about 1 g. of the compound (B), $\text{C}_6\text{H}_{22}\text{O}_6$, m. 106°, without action upon $\text{NH}_3\text{-AgNO}_3$ or Fehling soln., but giving a red color with Schiff's fuchsine reagent and giving rise to a terpene-like odor when treated with hot HCl. (B) on drying *in vacuo* loses H_2O and yields a substance with a powerful odor. (B) was not obtained by the action of H_2O_2 upon (A). The formation of (B) was somewhat accelerated (1 g. being formed in 3 years) by exposing (A) in a loosely stoppered flask to the action of direct sunlight as much as possible. (B) appears to be the ketone of a polyvalent alc., but owing to poor yields its identity was not established. Pure $\text{Me}_2\text{CH}(\text{CH}_2)_2\text{NO}_2$ when exposed to sunlight in well-stoppered bottles was gradually and partially converted into methanetetra-carboxylic acid, $\text{C}(\text{CO}_2\text{H})_4 \cdot 5\text{H}_2\text{O}$ (C), plates in the form of parallelograms, m. 132°, with the loss of H_2O ; barium salt, cryst. ppt. (C) does not reduce Fehling soln. or $\text{NH}_3\text{-AgNO}_3$. When heated on the steam bath (C) is converted into $(\text{CO}_2\text{H})_4$, and if the heating is carried further to 190°, a compd., probably tartrellic acid, $\text{C}_4\text{H}_4\text{O}_6$ (prepd. by Fremy, ref. not given), is formed, together with substances which reduce Fehling soln.

LOUIS E. WISE.

Some color reactions of triphenylmethane derivatives. E. NOELTING AND A. KNOFF. *Bull. soc. chim.* 17, 385-9(1915).—The yellow color formed when Ph_3COH

is dissolved in concd. H_2SO_4 is intensified when OH or MeO groups are introduced into the ring, and the basic properties of the mol. are accentuated. Rosolic acid, which does not ordinarily dye cotton, is fixed by tannin-treated cotton. Its hexa-MeO deriv., eupittonic acid, behaves similarly. Trianisylcarbinol (A), which is itself colorless, dyes tannin-treated cotton a deep orange. In neutral soln. (A) is fixed by silk, which remains colorless, however, until further treated with acid. An orange-yellow color then develops. Trianisylmethane dissolves in concd. H_2SO_4 with an orange color, disappearing on diln. with the pptn. of the colorless hydrocarbon. Similarly phenylanisylmethane (B), [3,4-Me(MeO) C_6H_3] CHPh (C), and [3,6-Me(MeO) C_6H_3] CHPh (D) give resp. orange, orange, and violet colors with concd. H_2SO_4 (cf. Feuerstein and Lipp, *Ber.* 35, 3252). None of these hydrocarbons dyes tannin-treated cotton. v. Baeyer and Villiger's theory that the color of hydrocarbons of this type in concd. H_2SO_4 might be due to oxidation to the corresponding carbinols is rendered untenable by N. and K.'s recovery of the unchanged hydrocarbons from their acid solns. When (B), (C) and (D) in AcOH were treated with PbO_2 , the corresponding carbinols were obtained. The deriv. of (B) dyes tannin-treated cotton a reddish orange. The (C) deriv. dissolved in H_2SO_4 with a red color and dyed tannin-treated cotton an intense red, and the (D) deriv. gave a claret-red color with H_2SO_4 but failed to dye treated cotton. (Ref. to v. B. and V.'s work, which is mentioned throughout the article, is not given.) Carbinols formed by the introduction of $p\text{-NH}_2$ and -NR_2 substituents in the Ph_3COH mol. (e. g., malachite green) react with 1 mol. of acid to form green, red, or purple salts, all of which give orange colors with concd. H_2SO_4 very similar to the color produced by Ph_3COH itself. In these cases apparently the characteristic influence of the auxochrome group is lost by the combination of the NH_2 with H_2SO_4 . Compds. formed by the introduction of simple or substituted NH_2 groups into the Ph_3CH mol. dissolve in H_2SO_4 without color. Triphenylcarbinols containing OH and simple or substituted NH_2 groups (the hydroxymalachite greens) dissolve in H_2SO_4 with a yellowish orange color. The leuco bases of these complex carbinols, provided they contain but 1 OH group, give no color with H_2SO_4 . The cumulative effect of several OH substituents was noted in the case of 3,4-(HO) $_2\text{C}_6\text{H}_3\text{CH}[\text{C}_6\text{H}_4\text{NMe}_2]_2$, which gives a faint color with H_2SO_4 . The isomeric 2,3-(HO) $_2$ deriv. gave a somewhat deeper color, whereas 2,3,4-(HO) $_3\text{C}_6\text{H}_2(\text{Me}_2\text{NC}_6\text{H}_4)_2\text{CH}$ in H_2SO_4 gave a rather distinct yellow color.

LOUIS E. WISE.

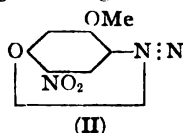
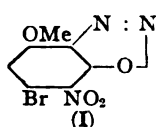
Attempted preparation of cyclic compounds analogous to the indazoles. E. NOELTING AND F. STEINLE. *Bull. soc. chim.* 17, 389-99(1915).—The article deals with a series of unsuccessful attempts to form compds. of the type $\text{R.O.CH}_2\text{N:N}$ or

R.O.CH.N.NH (where R = a phenylene radical containing 1 or more NO_2 or Br substituents) from substituted *o*-anisidines. The addition of 40 g. Br in 50 cc. AcOH to 20 g. of 2,4- $\text{H}_2\text{N}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{OMe}$ (A) in 100 cc. AcOH led to the formation, in nearly quant. yield, of 3,5-dibromo-4-dinitro-*o*-anisidine (B), 2,3,5,4- $\text{H}_2\text{NBr}_2(\text{O}_2\text{N})\text{C}_6\text{HOMe}$.

orange leaflets, m. 102°; acetyl derivative, yellow needles, m. 182°. Bromination of 5-nitro-*o*-anisidine (C) in AcOH, with subsequent treatment with aq. NaHSO_4 to decomp. the hydrobromide and to remove the excess of Br, yielded 3-bromo-5-nitro-*o*-anisidine (D), yellow, m. 140-1; acetyl derivative, needles, m. 204-5°, which in the presence of small amts. of KOH gives an intense yellow color. Ten g. of (A) in 15 cc. concd. H_2SO_4 and 100 cc. H_2O , when treated at 0° with 43 g. NaNO_2 in 20 cc. H_2O , the excess of HNO_2 being destroyed by urea, yielded a mixt. which showed typical diazo reactions and from which, on standing, was deposited a reddish brown

cryst. compd. (E), exploding 118°. (E) is apparently 4- $\text{O}_2\text{NC}_6\text{H}_3\text{O.N:N}$ or

$4\text{-O}_2\text{NC}_6\text{H}_4\text{O.N:N}$, previously obtained by Griess (ref. not given) from diazonitrophenol. The conversion of (E) into $2,4\text{-Cl(O}_2\text{N)C}_6\text{H}_3\text{OH}$, m. 110° , was effected by means of Cu_2Cl_2 in HCl . (E) coupled with $\beta\text{-6-C}_{10}\text{H}_6(\text{OH})\text{SO}_3\text{H}$ gives a reddish brown dyestuff, which is converted into a brownish black compd. on treatment with $\text{K}_2\text{Cr}_2\text{O}_7$. Attempted diazotization of (A) in glacial AcOH led only to the formation of *diazonitroanisolenitroanisidide* (F), $\text{R}'\text{N:N.NHR}'$ ($\text{R}' = 2,4\text{-MeO(O}_2\text{N)C}_6\text{H}_3$), microscopic yellow prisms, m. 205° (decompn.), forming readily hydrolyzed salts with alc. alkali. The weak basic properties of (B) rendered the diazotization difficult. The reaction was carried out in cold concd. H_2SO_4 or in glacial AcOH . In the latter case, the formation of a diazoamino compd. was not observed. The diazo solns. deposited the compound (I), orange needles, m. 189° , and exploding a few degrees above the m. p. The



diazotization of (C) proceeds smoothly in both H_2SO_4 and AcOH . The deriv of (C) in H_2SO_4 when treated with AcONa and 1 mol. PhNH_2 in aq. AcOH yielded *diazonitroanisoleanilide* (G), $2,5\text{-MeO(O}_2\text{N)C}_6\text{H}_3\text{N:N.NHPh}$, orange needles, m. 123° , forming readily hydrolyzed reddish brown salts with alc. alkali. When heated with a large excess of Ac_2O , (F) and (G) are decompd. with the quant. liberation of N. (D) formed a diazo deriv., stable in cold H_2SO_4 and AcOH . 4,5-Dinitro-*o*-anisidine, when diazotized in AcOH , readily yielded the compd. (II), previously prepd. by Meldola and Eyre (ref. not given), which when treated with Cu_2Cl_2 in HCl gave rise to $3,4,6\text{-O}_2\text{N-(HO)(MeO)C}_6\text{H}_2\text{Cl}$.

LOUIS E. WISE.

Aspirin. III. Anomalies of the decomposition of aspirin by water. D. E. TSAKALOTOS AND S. HORSCH. Univ. Athens. *Bull. soc. chim.* 17, 401-6(1915); cf. C. A. 9, 787, 2228.—Studies of the rate of decompn. of aspirin detd. by titrametric methods and by cond. measurements indicate that the reaction is exceedingly complex. The speed of reaction measured at 20° , 50° and 60° showed 2 minimum values. A similar anomaly was noted by Wijs (*Z. physik. Chem.* 12, 514 (1893)), in the rate of hydrolysis of AcOMe by H_2O . The anomalies of T. and H.'s reaction are probably due in part to the catalytic action of H and OH ions. Tabulated data are given.

LOUIS E. WISE.

***m*-Phenetidine and some of its derivatives. I.** FRÉDÉRIC REVERDIN AND J. LOKIETEK. Univ. Geneva. *Bull. soc. chim.* 17, 406-9(1915).—*m*-Phenetidine (A) was obtained in excellent yield by the following method: 150 g. of $3\text{-AcHNC}_6\text{H}_4\text{OH}$ with 48 g. NaOH in 400 cc. alc. were gradually treated under reflux with 150 g. of EtBr . The resulting product was hydrolyzed with HCl and (A) freed by means of aq. NaOH . The following derivs. of (A) were prepd.: *hydrochloride*, thin leaflets; *picrate*, yellow needles, m. 158° ; *formyl derivative*, grayish blue, m. 52° ; *benzoyl derivative*, needles, m. 103° ; *toluene-p-sulfonyl derivative*, pale yellow leaflets, m. 157° ; *toluene-o-nitro-p-sulfonyl derivative*, brilliant needles, m. 88° ; *1-ethoxy-2',4'-dinitro-3-diphenylamine*, $2,4\text{-(O}_2\text{N)}_2\text{-C}_6\text{H}_3\text{NHC}_6\text{H}_4\text{OEt}$, yellowish orange, m. 151° . The following azo dyestuffs were prepd. from the diazo deriv. of (A): *β -naphthol derivative*, red needles, m. 107° ; *sodium salt*, insol. in H_2O ; *salicylic acid derivative*, dyeing wool yellow; *resorcinol derivative*, dyeing wool brownish red; *naphthionic acid derivative*, dyeing wool reddish orange; and *naphthol-4-sulfonic acid derivative*, dyeing wool red.

LOUIS E. WISE.

Synthesis of mixed cycloglycylglycines formed by the action of glycerol on α -amino acid mixtures. L. C. MAILLARD. *Ann. chim.* 3, 225-52(1915).—A continuation of

M.'s previous work (cf. *C. A.* 9, 1911). The following cyclic dipeptides were prepd. by the usual methods: cyclo-*dl*-alanylglycine, $\text{CO.NH.CHMe.CO.NH.CH}_3$ (*A*) (purified by extn. of the crude product with abs. alc. to remove the less sol. cycloglycylglycine, evapn. of the ext. and re-extn. of the residue), fine needles, m. 229° (decompn.) (cor.). Fischer and Otto (*Ber.* 36, 2106 (1903)) give $244-5^\circ$, with partial preliminary decompn. Results of a detailed study of the m. p. of (*A*) seem to indicate that the crude product begins to turn brown at 230° , and m. about 260° . F. and O.'s samples were therefore probably impure. Cyclo-*dl*-leucylglycine, $\text{CO.NH.CH(C}_6\text{H}_5\text{).CO.NH.CH}_3$, bitter needles from alc., m. 227° (F. gives $244-5^\circ$). A mixt. of valine and leucine obtained by the HCl hydrolysis of horn, when treated in the usual manner, gave rise to cyclo-*dl*-leucylvaline, $\text{Me}_3\text{CHCH.CO.NH.CH(CH}_3\text{CHMe}_2\text{).CO.NH}$, silky needles, from alc., m. 260° . Literature relating to researches on the mixed dipeptides is critically reviewed.

LOUIS E. WISE.

Aromatic-aliphatic diazoamino compounds: Arylazodicyanodiamides. R. von WALTHER and W. GRIESHAMMER. Dresden. *J. prakt. Chem.* 92, 209-55 (1915).—*1-Phenyltriazeno-2-cyanoaminoiminomethane* (*a*), NCNHC(:NH)NHN:NPh , was prepd. by adding 44 g. NCNHC(:NH)NH_2 in H_2O to a cold diazotized soln. of $\text{PhNH}_2\cdot\text{HCl}$, then adding an excess of NaOH (the color changes from yellow to red), allowing to stand 0.5-1.0 min. and then acidifying with dil. HCl. By making the filtrate alk. and again acidifying and repeating the process 5-6 times, 70 g. of (*a*) was obtained, prisms from alc., decomp. 123° , easily sol. in alkalis and forms a yellow salt with $\text{C}_6\text{H}_5\text{N}$. With boiling H_2O it gives N, dicyanodiamide (*b*) and PhOH, stable toward NH_3 , H_2S and CS_2 . With HCHO, Ac_2O and BzCl it forms resinous products; *sodium salt*, yellow needles from alc.; *ammonium salt*, prisms from alc., partially dissociates in H_2O ; *silver salt*, yellow powder, explodes on heating; *lead salt*, yellow powder; *cobalt salt*, bluish red powder; *ferric and ferrous salts*. *2-Phenyl-2-methyltriazeno-1-cyanoaminoiminomethane*, $\text{NCNHC(:NH)N:NNMePh}$, prepd. by warming for 2 hrs. 2 g. of the above Na salt with 2 g. MeI in 100 cc. alc., and pptg. with H_2O , or better, by treating the Na salt with Me_2SO_4 , yellow needles from alc., decomp. $167-8^\circ$. *2-Phenyl-2-benzyl derivative*, $\text{NCNHC(:NH)N:NN(CH}_2\text{Ph)Ph}$, from the Na salt and ClCH_2Ph in $\text{C}_6\text{H}_5\text{N}$, fibrous needles from alc., decomp. $165-6^\circ$. *2-Phenyl-2-p-nitrobenzyl derivative*, similarly prepd. from *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Cl}$, needles from AcOEt, decomp. 162° . *1-p-Tolyltriazeno-2-cyanoaminoiminomethane*, $\text{NCNHC(:NH)NHN:NCC}_6\text{H}_4\text{Me}$, prepd. like (*a*) from $\text{H}_2\text{NC}_6\text{H}_4\text{Me}$, yellow rhombic crystals from alc., begin to decomp. 133° (darkening); *sodium salt*, yellow needles from alc. *2-p-Tolyl-2-methyl derivative*, $\text{NCNHC(:NH)N:NN(C}_6\text{H}_4\text{Me)Me}$, from the Na salt and Me_2SO_4 , yellow needles from alc. or 90% AcOH, decomp. $155-8^\circ$. On heating for 3 hrs. with 3% H_2SO_4 (until evolution of N ceased) it gave (*b*), $\text{H}_2\text{NC}_6\text{H}_4\text{Me}$ and a small amt. of $\text{HOC}_6\text{H}_4\text{Me}$, showing that in the methylation of the phenylazo compd., the Me group goes chiefly to the N atom of the aromatic amine, while at the same time a small amt. of the isomeric compd. is formed. *2-p-Tolyl-2-benzyl derivative*, from the Na salt and ClCH_2Ph , fibrous needles from alc., decomp. 163° ; *2-p-tolyl-2-p-nitrobenzyl derivative*, from *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}_2\text{Cl}$, pale yellow needles, decomp. 158° ; warmed with BzH it decomps. into its components, giving (*b*), N and PhOH, stable toward SnCl_4 in acid, and toward H_2S and Zn in alkalis, and on warming with *p*- $\text{H}_2\text{NC}_6\text{H}_4\text{Me} + \text{H}_2\text{NPh.HCl}$, the usual rearrangement characteristic of diazonium salts into aminoazo deriva. does not take place, but a cleavage into its components. *1-o-Tolyl derivative*, $\text{NCNHC(:NH)NHN:NCC}_6\text{H}_4\text{Me}$, was prepd. similarly to the corresponding *p*-deriv. but purified by dissolving in dil. NaOH and pptg. with HCl, yellow needles from alc., decomp. 114° ; *sodium*

salt, yellow needles; *2-o-tolyl-2-methyl derivative*, $\text{NCNHC}(:\text{NH})\text{N}:\text{NNMeC}_6\text{H}_4\text{Me}$, from the Na salt and Me_2SO_4 , pale yellow leaves from C_6H_6 , decomp. 152° , more stable toward heat than the corresponding *p*-deriv.; *2-o-tolyl-2-benzyl derivative*, pale yellow needles, decomp. 160° ; *1-m-tolyl derivative*, yellow needles from alc., decomp. 115° ; *2-m-tolyl-2-methyl derivative*, yellow needles from alc., sinters 130° , decomp. 148° ; yield poor; *2-m-tolyl-2-benzyl derivative*, yellow lustrous needles and prisms from alc., decomp. 153° ; *1-p-chlorophenyl derivative* (c), from $\text{H}_2\text{NC}_6\text{H}_4\text{Cl}$, HCl , NaNO_2 and $\text{NCNHC}(:\text{NH})\text{NH}_2$, yellow rhombic crystals from alc., decomp. 140° (slow heating); it forms a salt with $\text{C}_6\text{H}_5\text{N}$, and is decompd. by H_2O , giving (b) and resinous products; *2-p-chlorophenyl-2-methyl derivative*, yellow needles, decomp. $160\text{--}70^\circ$; *2-p-chlorophenyl-2-benzyl derivative*, needles, decomp. $170\text{--}5^\circ$. Several attempts to obtain aminodicyanodiamide by reduction of (c) gave negative results as in the case of (a). *1-p-Bromophenyl derivative*, obtained similarly to (c), yellow rhombic crystals from alc., decomp. 160° ; it forms a yellow salt with $\text{C}_6\text{H}_5\text{N}$; *2-p-bromo-2-methyl derivative*, yellow needles, decomp. 185° ; *2-p-bromo-2-benzyl derivative*, fibrous needles, decomp. 186° . By diazotizing *o*- $\text{H}_2\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ and treating with (b) *phenylazodicyanodiamide-o-carboxylic acid* (d), $\text{NCNHC}(:\text{NH})\text{NHN}:\text{NC}_6\text{H}_4\text{CO}_2\text{H}$, was obtained, yellow crystals from MeOH , decomp. 98° ; it is decompd. by boiling H_2O , yielding $\text{HOC}_6\text{H}_4\text{CO}_2\text{H}$ and (b); *sodium salt*, from (d) and NaOEt , $\text{C}_{18}\text{H}_{13}\text{O}_4\text{N}_{12}\text{Na}_3$; *silver salt*, same compn. as the Na salt. An attempt to esterify the CN group in (c) with abs. alc. + HCl gave, instead of the ester, *p-chlorophenylguanyllurea hydrochloride*, $\text{ClC}_6\text{H}_4\text{NHC}(:\text{NH})\text{NHCO-NH}_2\cdot\text{HCl}$, prisms from alc., m. $172\text{--}3^\circ$. It can also be obtained by warming (c) with 14% HCl ; *chloroplatinate*, yellow crystals. The free base (e) was obtained by decompg. the HCl deriv. with NaOH , rhombic crystals from H_2O , m. 125° ; *silver salt*; *picrate*, m. 195° ; with Ac_2O it forms the *acetyl derivative*, prisms from AcOEt , m. $150\text{--}1^\circ$. The following analogous derivs. were similarly prepd.: *phenylguanyllurea*, prisms from H_2O , m. $62\text{--}3^\circ$; *picrate*, m. $181\text{--}2^\circ$; *hydrochloride*, prisms from H_2O , m. $174\text{--}5^\circ$; *p-tolyl derivative*, stellar leaves from H_2O , m. 143° ; *hydrochloride*, prisms from H_2O , m. $167\text{--}8^\circ$; *o-tolyl derivative*, octahedrons from H_2O , m. 136° ; *hydrochloride*, needles from H_2O , m. $73\text{--}4^\circ$; *m-tolyl derivative*, hexagonal leaves from H_2O , m. $97\text{--}8^\circ$; *hydrochloride*, prisms, m. $183\text{--}4^\circ$; *p-bromophenyl derivative*, prisms from 80% alc., m. 152° ; *hydrochloride*, leaves, sinter 165° , m. 170° . *Phenylguanyllurea-o-carboxylic acid*, $\text{HO}_2\text{CC}_6\text{H}_4\text{NHC}(:\text{NH})\text{NHCONH}_2$, prepd. by warming 10 g. of (d) in 50 cc. alc. with concd. HCl (yield, 3 g.), prisms and needles from AcOEt , sinter 250° ; decomp. $275\text{--}80^\circ$; *silver salt*. The constitution of the arylguanyllureas described was detd. by synthesizing, for comparison, phenylguanyllurea by evapg. a soln. of phenylcyanoguanidine in dil. HCl . The product formed was identical with that obtained by decompg. (a) with alc. + HCl . By suspending (a) in cold Et_2O and passing in HCl , the *hydrochloride* of the syn-form of (a) was obtained, m. 100° (decompn.). When warmed with H_2O it decompd., giving N , HCl and $\text{PhNHC}(:\text{NH})\text{NHCN}$. In the same way the following analogs were prepd.: *p-tolylcyanoguanidine*, leaves, m. $207\text{--}8^\circ$; *m-tolyl derivative*, leaves, m. $193\text{--}4^\circ$; *p-chlorophenyl derivative*, leaves, m. $197\text{--}8^\circ$; *p-bromophenyl derivative*, leaves, m. $196\text{--}7^\circ$. The labile HCl deriv. was obtained only in very small amts. *Phenylazodicyanodiamidine*, $\text{PhN}:\text{NNHC}(:\text{NH})\text{NHCONH}_2$, was obtained by diazotizing 22 g. dicyanodiamidine sulfate, 9.3 g. PhNH_2 , 7.2 g. NaNO_2 and 20 cc. concd. HCl , and making strongly alk., yellow needles from alc. + $\text{C}_6\text{H}_5\text{N}$, decomp. $176\text{--}7^\circ$. It has both acid and basic properties, and is decompd. by warm dil. acids, giving N ; *hydrochloride*, yellow prisms, decomp. 92° ; *picrate*, needles, begin to decomp. 70° . *Phenylazocycanoamide*, $\text{PhN}:\text{NNHCN}$, prepd. by adding 25 g. NCNHNa in H_2O , neutralized with HCl , to a mixt. of 31 g. PhNH_2 , 80 cc. concd. HCl and 24 g. NaNO_2 , decomp. 70° .

D. BREESE JONES.

Derivatives of *o*-aminophenol and α -amino- β -naphthol. F. VON MEYER. *J. prakt. Chem.* **92**, 255-71 (1915).—The main reactions described involve the formation of heterocyclic compds. which are derivs. of benzoxazole, $\text{C}_6\text{H}_4\text{N}:\text{C}(\text{OH})\text{O}$, and benz-

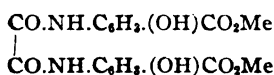
oxazolone, $\text{C}_6\text{H}_4\text{NH.CO.O}$. These formulas also represent the tautomeric forms of

carbonyl-*o*-aminophenol (*a*). Schmitt and Hentschel (cf. *J. prakt. Chem.* **37**, 28 (1888)) obtained (*a*) in 50% yield by shaking *o*- $\text{H}_2\text{NC}_6\text{H}_4\text{OH}$ in C_6H_6 with COCl_2 in CHCl_3 , but by dissolving the former in $\text{C}_6\text{H}_5\text{N}$ and then adding COCl_2 and allowing the soln. to become warm, M. has obtained a better product in 82% yield, reddish needles, m. 137° . By interrupting the reaction and keeping the mixt. cool, a compd. was obtained whose properties and analysis agree with those of *o*-hydroxyphenylcarbamic acid, $\text{HO-C}_6\text{H}_4\text{-NHCO}_2\text{H}$, m. 95° ; on fusion or long standing it changes, with loss of H_2O , into (*a*). The following derivs. of (*a*) were prepd.: benzoyl derivative, $\text{C}_6\text{H}_4\text{.NBz.CO.O}$, from BzCl

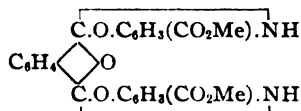
in $\text{C}_6\text{H}_5\text{N}$ and (*a*), crystals, m. 165° ; ethoxy derivative, from (*a*) in NaOH and $\text{CO}(\text{OEt})_2$, leaves from alc., m. 78° ; phenylcarbamino derivative, by heating equimol. amts. of (*a*) and carbanil in C_6H_6 , short needles, m. 125° , nitro derivative, yellow needles from alc., m. 242° . Carbonyl- α -amino- β -naphthol (*b*) was prepd. similarly to (*a*) from $\alpha,\beta\text{-C}_{10}\text{H}_6(\text{NH}_2)\text{OH}$ in $\text{C}_6\text{H}_5\text{N}$ and COCl_2 , small, stout needles, by pptg. from alc. with H_2O , m. 206° ; with concd. H_2SO_4 at 150° it decomps. into CO_2 and $\text{H}_2\text{NC}_{10}\text{H}_6\text{OH}$. The following derivs. of (*b*) were prepd.: methyl derivative, from (*b*) in KOH and an excess of MeI , reddish needles from alc., m. 184° ; ethyl derivative, from EtI , fine needles, m. 141° ; acetyl derivative, by boiling (*b*) in Ac_2O containing a little AcONa , reddish needles, m. 121° ; benzoyl derivative, from BzCl in $\text{C}_6\text{H}_5\text{N}$, white needles by pptg. from alc. with H_2O , m. 256° ; phenylcarbamino- α -amino- β -naphthol, $1,2\text{-C}_{10}\text{H}_6(\text{OH})\text{NHCONHPh}$, obtained by heating (*b*) with PhNH_2 at 250° , needles from alc., m. 229° , easily sol. in alkalis, showing the presence of an OH group; by the action of Cl on (*b*) in cold AcOH , α -chlorocarbonylaminonaphthol was obtained, bluish crystals from alc., does not m. below 310° ; if the above reaction be conducted in CHCl_3 instead of AcOH , an isomeric β -chloro derivative is obtained, yellow crystals having a very high m. p.; prolonged action of Cl on (*b*) in hot AcOH yields dichloro- β -naphthoquinone, $\text{C}_{10}\text{H}_4\text{O}_2\text{Cl}_2$; dichloro derivative, by heating (*b*) with PCl_5 , reddish compd. with a very high m. p.; tetrachloroacetyl derivative, from Cl and (*b*) in AcOH , yellow cryst. powder, m. 75° , difficultly sol. in all org. solvents, and by heating with dil. NaOH loses 75% of its Cl ; monobromo derivative, from Br and (*b*) in AcOH at room temp., small yellow needles from alc., decomp. 250° ; dibromo derivative, by heating the components in AcOH , yellow needles m. above 300° ; mononitro derivative, from HNO_3 and (*b*) in AcOH , small yellow needles from alc., decomp. 270° ; NaNO_2 reacts with (*b*), forming a nitroso derivative, yellow crystals, decomp. 170° and m. 194° , gives a violet color with PhOH and H_2SO_4 , and on reduction with Zn dust and NH_4OH yields (*b*). In describing the following reactions M. uses the term " α -orthoform" for $2,3\text{-HO}(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{CO}_2\text{Et}$ (*c*) and " β -orthoform" for $2,3\text{-H}_2\text{N}(\text{HO})\text{C}_6\text{H}_3\text{CO}_2\text{Et}$ (*d*). Derivs. of (*d*) possess stronger basic properties than those of (*c*). A mixt. of HCO_2H and (*c*) forms a thick liquid which on standing *in vacuo* over H_2SO_4 yields crystals of the α -orthoform formyl derivative, $2,3\text{-HO}(\text{HCONH})\text{C}_6\text{H}_3\text{CO}_2\text{Me}$, leaves from alc., m. 225° ; on heating to 240° it loses 1 H_2O , forming 4-carbomethoxybenzoxazole, $\text{MeO}_2\text{CC}_6\text{H}_3\text{N}:\text{CH.O}$, yellow needles

from C_6H_6 , m. 99° , b. $260\text{--}70^\circ$; (*d*) and HCO_2H react, forming a salt, m. $110\text{--}12^\circ$, which is decompd. by H_2O , giving (*d*), and on drying *in vacuo* over H_2SO_4 loses 1 H_2O , yielding the β -orthoform formyl derivative, also easily obtained by heating the components, lustrous needles from alc., m. 222° ; on distn. it forms 5-carbomethoxybenzoxazole

small needles from C_6H_6 , m. 107° ; with hot alc., the formyl deriv. is regenerated; AcOH readily forms a salt with (d), needles, m. 127° ; α -orthoform acetyl derivative, 1,2,4-AcNH-(HO) $C_6H_3CO_2Me$, prepd. from (c) and AcCl in C_6H_6 , white needles from MeOH, m. 188° ; heated with $ZnCl_2$ at 160° it yields 4-carbomethoxymethylbenzoxazole, fine needles, m. $103-4^\circ$; β -orthoform acetyl derivative, from (d) and AcCl in C_6H_5N , m. 204° ; heated with Ac_2O at $140-50^\circ$ it forms 5-carbomethoxymethylbenzoxazole, lustrous needles, m. 66° ; with boiling H_2O the Ac deriv. is regenerated. All of these acyl derivs. give with $FeCl_3$ deep colors, which are not formed with the benzoxazole derivs. A salt is formed from (c) and $(CO_2Et)_2$ (2 mols. (c) : 1 mol. $(CO_2Et)_2$), small needles, m. 112° ; heated for several hrs. with an excess of $(CO_2Et)_2$ it loses 2 mols. alc., giving oxalyl-bis- α -orthoform (I), short yellow prisms from C_6H_5N , m. $298-300^\circ$; ammonium



(I)



(II)

salt, $C_{18}H_{16}O_8N_2(NH_3)_2$, yellow powder; diacetyl derivative, from (I) and Ac_2O , stellar clusters of prisms from $C_6H_6 + AcOH$, m. 171° ; dibenzoyl derivative, from $BzCl$ in C_6H_5N , needles from C_6H_5N , m. 231° ; (d) and $(CO_2H)_2$ form a salt which on boiling with H_2O yields oxalyl-bis- β -orthoform, needles from C_6H_5N , m. $312-13^\circ$; phthalyl-bis- α -orthoform, prepd. from (c) and $(C_6H_4CO)_2O$, short prisms, m. 229° ; it does not give a color with $FeCl_3$, and is sol. in alkalis, and accordingly M. suggests for it the structure (II). 5-Carbomethoxythiolbenzoxazole, prepd. from $SO_2 + (d)$ in alc., needles, m. 228° . $COCl_2$ in PhMe reacts vigorously with (d) in dil. NaOH, forming 4-carbomethoxybenzoxazolone, leaves from alc., m. 228° ; with Me_2SO_4 it gives a methyl derivative, m. 168° , and with Ac_2O an acetyl derivative, leaves, m. 170° . Both (c) and (d) react with $NaNO_2$, forming the α - and β -diazooanhydrides, decomp., resp., 70° and 117° .

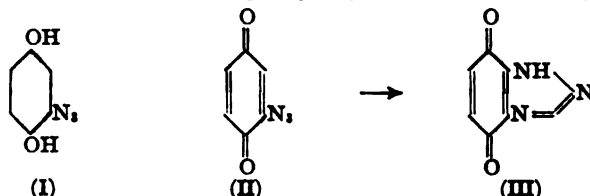
D. BRESE JONES.

Preparation of aliphatic aminohydrazines. A. DARAPSKY AND H. SPANNAGEL. Heidelberg. *J. prakt. Chem.* **92**, 272-96(1915).—Compds. having the character of both amines and hydrazines are known only in the aromatic series. This paper describes various attempts to prep. the analogous aliphatic compds. $HON:CMcAc$ (a) reacts with N_2H_4 in 2 ways: (1) with N_2H_4 salts in H_2O , giving the ketazine, $(HON:-CMcMe:N-)_2$ (b), and (2) with free N_2H_4 in alc., forming the oximehydrazone, $HON:-CMcMe:NNH_2$ (c). (b) was obtained in 83.3% yield from (a) in H_2O at 50° and $N_2H_4 \cdot H_2SO_4$, yellow powder, m. 229° (decompn.) (Forster and Dey give 230° ; *C. A.* **7**, 970); benzoyl derivative, from (b) in 6% KOH + $BzCl$, orange clusters from xylene, m. 215° . (c) (also described by F. and D.) was obtained in 67.8% yield, crystals, m. 138° , stable toward boiling alc. and concd. NaOH, but decompd. by mineral acids into (b) and N_2H_4 salts. o-Hydroxybenzaldiacetyloxime hydrazone, $HON:CMcMe:NN:-CHC_6H_4OH$, prepd. by boiling (c) with $HOCC_6H_4OH$ in alc., m. 168° , yellow needles from alc. $BzCl$ with (c) in 6% KOH gave a mixt. of the mono- and di-Bz derivs., while with PhNCS was obtained the thiosemicarbazone derivative, flesh-colored needles from alc., m. 201° ; yield, quant. Diacetyldihydrazone (d) was obtained by boiling (a) with $N_2H_4 \cdot H_2O$ for 8 hrs., short needles, m. 157° (previously prepd. and named "dimethylbishydrazinemethylene" by Curtius and Thun, *J. prakt. Chem.* **44**, 174(1891)), easily oxidized by HgO , evolving N and a gas having the odor of $MeC:CMc$. With dil. mineral acids (d) loses a mol. of N_2H_4 , forming dimethylazethane, yellow powder, m. above 260° , identical with that obtained by C. and T. With aldehydes (d) forms well-characterized condensation products; dibenzaldiacetyldihydrazone, from (d) and

BzH, fine, yellow needles from alc., m. 120° ; *di-o-hydroxybenzal derivative*, yellow fibrous needles from alc., m. 245° . Attempts to form an aminohydrazine by reduction of (c) were unsuccessful on account of the instability of the latter. In an analogous way its prepn. was tried from β -benzylmonooxime (e). Benzylloximehydrazone, prepd. by evapg. 2.3 g. (e) in 20 cc. alc. with 0.5 g. $N_2H_4 \cdot H_2O$, m. $167-8^{\circ}$, stout prisms from xylene; yield, 2 g. On reduction with Na-Hg in alc. it yields $(CHPhNH_2)_2$. Neither did $BzCH_2NH_2$ (f) lend itself to the formation of an aminohydrazine. The action of N_2H_4 on (f) leads to 3 different compds. according to the conditions of the expt.: (1) with HCl + $N_2H_4 \cdot H_2O$ in H_2O , (f) yields diphenyldihydropyrazine (cf. Gabriel, *Ber.* 41, 1133(1908)), red crystals, m. $167-8^{\circ}$; (2) N_2H_4Cl + (f) in dil. HCl, after neutralizing with NaOH, give $H_2NCBz : CPhCH_2NH_2$, yellow prisms, m. 130° ; (3) by boiling (f)-HCl with an excess of $N_2H_4 \cdot H_2O$ for 1 hr., *aminoacetophenoneazine*, $(H_2NCH_2CPh : N-)_2$, is formed, needles from alc., m. 157° . $MeCHBrCH_2NH_2$ with N_2H_4 + HBr did not give the expected hydrazinoamine, but lost 1 mol. HBr, forming a thick, basic oil which gave no cryst. deriv. for its identification. Diphenylhydroxyethylamine (cf. Polonowska, *Ber.* 20, 492(1887)) gives directly with PCl_5 $(PhCHCl)_2$, but by shaking a suspension of the former in freshly distd. $AcCl$ + an excess of PCl_5 , *diphenylchloroethylamine hydrochloride* (g), $PhCHClCHPhNH_2 \cdot HCl$, is obtained, cryst. powder, m. 233° (decompn.); free base, oil; *chloroplatinate*, deep yellow needles, m. 204° ; *nitrate*, large tablets from H_2O , m. 185° ; *benzoyl derivative*, m. 195° . By boiling 2.7 g. of (g) with 3 mols. anhydrous N_2H_4 , 1.9 g. of an oil was obtained which crystd. on cooling,

and was identified as *diphenylethyleneimine*, $PhCH.NH.CHPh$, long needles, m. 83° ; *chloroplatinate*, long needles, m. 204° . $BzNHN : CHPh$ was obtained by shaking with BzH the oily product formed by boiling $BzNH(CH_2)_2Cl$ with dry N_2H_4 , needles, m. 204° .
D. BRESEE JONES.

Action of hydrazoic acid on quinone. E. OLIVERI-MANDALÀ AND E. CALDERARO. *Gazz. chim. ital.* 45, I, 307-13(1915).—In the following expts. the study of the condensation and addition reactions that O.-M. has been making with HN_3 on unsatd. compds. is continued. From benzoquinone + HN_3 a compd. composed of 1 mol. of each, which behaves like an azide, was obtained. This result shows that HN_3 does not combine simultaneously through 2 N atoms but that it is united through 1 N atom, which is in harmony with the results previously obtained with the ketenes and with the esters of iso- and thiocyanic acids. The action of HN_3 on *p*-quinone in C_6H_6 gives, according to the conditions of the expt., quinhydrone and an azide (probably (I)).



The mechanism of this addition may be explained either by the theory of partial valences or by the addition at the ethylene bond. The results do not agree with those of Escales (*Chem. Ztg.* 29, 31(1905)) who, having obtained a dark violet compd. free from N, concluded that HN_3 does not react on quinone like HCl. O.-M. and C. found that the compd. free from N is quinhydrone and that the azide was not found by E. because his solns. were too dil. If HN_3 in C_6H_6 is added to quinone in C_6H_6 , the mixt. becomes orange-yellow and then dark red and finally deposits quinhydrone in gray-green crystals with a metallic reflex, m. $167-90^{\circ}$. The quinhydrone may be formed thus: (1) 1 quinone + 2 $HN_3 \longrightarrow$ 1 quinol + 3 N_2 ; (2) 1 quinol + 1 quinone $\rightleftharpoons$

quinhydrone. The fact that on further addition of HN_3 the quinhydrone dissolves and ppts. (I) slowly, makes it possible that the addition of HN_3 to quinone proceeds in the same way as for HCl . Thus HCl acting on quinone first gives quinhydrone, which then dissolves and gives chloroquinol. Of the numerous explanations of this reaction O.-M. and C. prefer that of Schmidlin (*C. A.* 5, 3252), according to which the chloroquinol that is formed through direct addition of the HCl to the quinone gives finally chloroquinone and quinol. The equil. arising between quinone, chloroquinone, quinol and chloroquinol is destroyed by the formation of insol. quinhydrone. The HCl reacts further on the quinhydrone to give chloroquinol and quinol, and the quinol finally is oxidized to quinone and reduces the chloroquinone to chloroquinol. This explanation may be applied to the action of quinone on HN_3 as follows: (1) quinone + $\text{HN}_3 \rightleftharpoons$ (I); (2) (I) + quinone $\rightleftharpoons$ $\text{O}:\text{C}_6\text{H}_4\text{N}_3:\text{O}$ (corresponding to (I)) + quinol; (3) quinone + quinol $\rightleftharpoons$ quinhydrone; (4) quinhydrone + $\text{HN}_3 \rightleftharpoons$ quinol + (I); (5) quinol + $\text{O}:\text{C}_6\text{H}_4\text{N}_3:\text{O} \rightleftharpoons$ quinone + (I). In all these reactions is assumed the temporary formation of the azide (II), which is reduced to (I). But owing to the facility with which the N_3 isomerizes itself the existence of (II) is possible only when the velocity of transformation into the triazole compd. (III) is small with respect to the velocity of reaction (5). 50 g. NaN_3 in a fractional distg. flask in a boiling H_2O bath treated dropwise with dil. H_2SO_4 (1:1) evolved HN_3 which was passed through a good condenser, the inner tube of which contained CaCl_2 , and collected in 50 cc. C_6H_6 . This soln., dried with Na_2SO_4 , was poured into a concd. soln. of 5 g. quinone in C_6H_6 . The gray-green compd. first pptd. decomps. $\approx 100^\circ$, with slow heating 130° . The N content is low, which indicates that the compd. is mixed with quinone or quinhydrone or a mol. compd., $\text{C}_6\text{H}_4\cdot\text{C}_6\text{H}_4\text{O}_2\cdot\text{HN}_3$, of C_6H_6 , HN_3 and quinone. The last seems more probable since in solvents it seps. into quinone and HN_3 , while (I) decomps. to give N_2 . That this addition compd. ($\text{C}_6\text{H}_4\cdot\text{C}_6\text{H}_4\text{O}_2\cdot\text{HN}_3$) is formed is rendered probable by the work of Meyer (*C. A.* 2, 3078), who found that quinone forms colored unstable addition compds. with acids and metallic chlorides containing C_6H_5 of crystn. Using more concd. solns. of HN_3 quinhydrone seps. as was stated above and redissolves in C_6H_6 with the evolution of heat and ppts. *triazosquinol* (I) as pearl-white leaves, quite sensitive to light, sol. in dil. alkalis; its properties exclude the other possible or quinonic formula. (I) is highly explosive. It is sol. in NH_4OH with a green color that changes to red, evolving N_2 . With acids and alkalis it undergoes this decompn. in the cold. Shaken with quinone in C_6H_6 it gives quinhydrone without the evolution of N_2 .

E. J. WITZEMANN.

The isomerism of erucic, brassidinic and isoerucic acids. II. L. MASCARELLI AND B. TOSCHI. Univ. Bologna. *Gazz. chim. ital.* 45, I, 313-9(1915); cf. *C. A.* 9, 1761.—The cryoscopic behavior of the above 3 acids when dissolved in the corresponding satd. acid, behenic acid, is discussed in this paper. Of the 3 acids only 1 (erucic acid) is cryoscopically normal in behenic acid; the other 2 show higher mol. wts. Thus 2 of the acids may have a similar configuration (if the double bond is in the same position in all 3 of the acids) and the other a different one. If Bruni is correct that the unsatd. compds. form a solid soln. with a relatively satd. compd., i. e., of the *trans* type, erucic acid belongs to the *cis* and the other 2 compds. to the *trans* type. These conclusions with regard to the configuration of erucic acid and brassidinic acid are in accord with the physical properties of the 2 acids and with what was pointed out by Bruni, according to whom the unsatd. acid (brassidinic) when dissolved in the solid state in the corresponding satd. acid (behenic acid) has a higher m. p., is less sol., and is more stable than the isomeric erucic acid which does not give mixed crystals, all of which is in accordance with Michael's (*J. prakt. Chem.* [2] 52, 345(1895)) stability rule which says that the malenoid form of ethylenic compds. m. lower, are more sol. and

more volatile than the fumaroid form. The f. p. const. for behenic acid, which had not been previously used for mol. wt. detns., was detd. The com. erucic acid contains arachic acid which was removed by dissolving 100 g. in 400 cc. warm glacial AcOH, when crystals of arachic acid sepd. in 2 or 3 days and were filtered off *in vacuo* and the erucic acid recrystd. from EtOH in a CO₂ atm.; pearly scales, m. 33-4°. The brassidinic acid was obtained by Reimer and Will's method (*Ber.* 19, 3321 (1886)) and crystd. from EtOH in a CO₂ atm. as white scales, m. 59-60°. Erucic acid treated with PI₃ was transformed into iodobehenic acid (Ponzio, *Gazz. chim. ital.* 1904, II, 52) and this boiled with KOH-EtOH to remove HI; the isoerucic acid m. 52-3°. The behenic acid was obtained by reducing erucic acid in EtOH (Skita, *C. A.* 7, 2558) with colloidal Pt and 2 atm. pressure of H₂. The muddy brown liquid was poured into H₂O and sepd. white behenic acid, shining scales, m. 82-3°, b₁₅ 262-5°; the last trace of Pt was removed by distg. and that of erucic acid by washing with EtOH. The f. p. const. of behenic acid, detd. in C₁₀H₈, (PhCH₂)₂, BzOH, *p*-Br₂C₆H₄, oleic acid and elaidinic acid, gave an av. value of 44.4. The value calcd. according to Raoult's rule is 210.8. The heat of fusion of behenic acid according to van't Hoff's formula is 19.0 cal. per g. mol. The cryoscopic behavior of erucic in behenic acid was next detd. The mol. wt. was found to be normal. Thus one cannot speak of the soly. in the solid state of erucic acid in the corresponding satd. acid and according to what was stated in the previous paper the *cis* form is the probable constitution of erucic acid. The mol. wt. of brassidinic acid in behenic acid is slightly above normal so that there is a certain soly. in the solid state of brassidinic and behenic acids which makes the *trans* configuration probable for brassidinic acid. The mol. wt. of isoerucic acid in behenic acid gives high values that indicate the formation of a solid soln. and speaks for the *trans* configuration for isoerucic acid.

E. J. WITZEMANN.

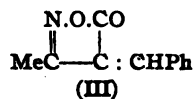
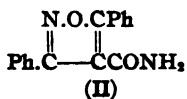
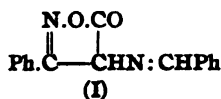
Aromatic nitro derivatives. III. Dinitromethoxybenzoic and dinitroaminobenzoic acids. MICHELE GIUA. Milan. *Gazz. chim. ital.* 45, I, 352-8 (1915).—In order to complete exptl. results on 2,3,4- (a) and 3,4,6-(O₂N)₂C₆H₂CO₂H (b) (*C. A.* 9, 1479, 2089) the behavior of these compds. with KOMe and EtOH-NH₃ was studied. KOH (2 mols.) reacts in MeOH to give 3,2,4- (c) and 3,4,6-MeO(O₂N)₂-C₆H₂CO₂H (d) and EtOH-NH₃ at room temp. gives 3,2,4- (e) and 3,4,6-H₂N(O₂N)₂-CH₂CO₂H (f) exactly as β- and γ-C₆H₂(NO₂)₃Me give H₂NC₆H₂(NO₂)₂Me with NH₃ in Me₂CO. The behavior of these acids is in accord with the rule on the reactivity of the NO₂ group in the C₆H₄ ring developed by Körner and Laubenheimer. This facility of reaction is explained by the adjacency of the 2 NO₂ groups ("loosening" action of 1 group on the other) and not by the influence of the CO₂H, as is indicated by the case of 3,4,5-(O₂N)₃C₆H₂CO₂H, which replaces NO₂ with OH in boiling H₂O (Körner and Contardi, *C. A.* 9, 1478). The weakening influence of the NO₂ is exercised on other groups also; thus Körner (*Gazz. chim. ital.* 1874, 305) converted Cl(O₂N)₂C₆H₃OMe into Cl(O₂N)₂C₆H₃NH₂ with NH₃. Laubenheimer (*Ber.* 9, 760, 766, 1826 (1876); 11, 1155, 1448 (1878)) found that KOH, EtOH-NH₃ and PhNH₂, resp., give with (O₂N)₂C₆H₃Cl Cl(O₂N)₂C₆H₃OH, Cl(O₂N)₂C₆H₃NH₂ and Cl(O₂N)₂C₆H₃NHPh. Such cases of substitution are too numerous to require further comment. Both (a) and (b) heated a little above their m. p. evolve CO₂. Of the 2 (b) is more stable. Attempts to eliminate CO₂ from about 1 g. (a) fused in a distg. flask under 15 mm. gave a violent explosion after 5 or 6 mins. Attempts were made to eliminate CO₂ by long boiling with H₂O acidulated with HCl (this gave good results with *sym*-C₆H₂(NO₂)₂CO₂H); on cooling much unchanged (a) sepd. and a small quantity of an oily compd. that solidifies at once and m. 105-6° was obtained: since 1,2,3-C₆H₃(NO₂)₃ made by Körner and Contardi (*C. A.* 9, 1478), m. 127°, was the only compd. sought. β-Trinitrotoluene or (a) heated with concd. HNO₃ for 3 or 4 days gave (a).

but it was decompd. 0.4 g. (b) mixed with 0.6 g. MgO and kept at 200° 10 mins. was extd. with EtOH after cooling and sepd. reddish lamellas of *asym*-C₆H₅(NO₂)₂, m. 61–2°. Prolonged boiling of (b) with HCl-H₂O failed to give appreciable amts. of this compd. 5 g. (a) in 30 cc. MeOH treated with 10 cc. of 20% KOH seps. in about 15 mins. yellowish needles of the salt of 2,4-dinitro-3-methoxybenzoic acid (c). Thrown into dil. HCl, white needles of the free acid, browns 235°, m. 240–1°, seps.; it gives no color with cold alkali, and a bright yellow color when heated; 10% AgNO₃ ppts. the silver salt in small white cubes from the aq. soln. of (c). (b) treated as above gives the K salt of 4,6-dinitromethoxybenzoic acid, yellow shining lamellas; the free acid seps. as white needles, m. 186–7°, gives a yellow color with hot alkali. 10 g. (b) in 40 cc. EtOH satd. with dry NH₃ sepd. quant. a yellow NH₄ salt of 3,6-dinitro-3-aminobenzoic acid, which, treated in H₂O with HCl, sepd. the free acid, yellow needles, m. 270° (decompn.); with alkali it gives an intense wine red color; the silver salt, obtained as usual, crystd. in golden yellow needles with 1 H₂O; the anhydrous salt seps. from concd. solns.; the MeOH soln. of (d) ppts. the potassium salt on the addition of 22% KOH as a bright yellow powder. 5 g. (a) in 25 cc. EtOH satd. with dry NH₃ pptd. the yellow NH₄ salt of 2,4-dinitro-3-aminobenzoic acid, m. 240° (decompn.). Further results will be described later.

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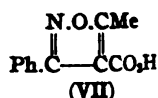
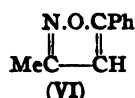
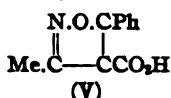
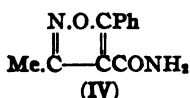
Spontaneous oxidation in the presence of aldehydes. The transformation of benzalphenylisoxazolone into diphenylisoxazolecarboxylic acid. MARIO BETTI. *Gazz. chim. ital.* 45, I, 362–71 (1915).—It was shown (C. A. 1, 857; 2, 3343) previously that benzalmethylphenylpyrazolone in NH₃ in the presence of atm. O₂ gives rubazonic acid by spontaneous oxidation. This oxidation is favored by the BzH which is detached from the pyrazolone and acts as a catalyzer. The analogy of the above to the oxazolone compds. induced B. to try this reaction with benzalphenylisoxazolone (a), PhC:N.O.CO.C:CHPh. The reaction in this case proceeds quite differently from the

preceding and it is necessary to add BzH if a good yield is desired. The product is colorless and has a neutral reaction and its compn. corresponds to (I) which contains the



rubazonic acid group. But this formula does not conform to the chem. properties, which conform with (II). (II) may be formed by oxidation of an amide derivable from (a) thus: HO.N:CPh.C(CONH₂):CHPh + O → (II). The correctness of (II) was confirmed by transforming the compd. into the free acid *diphenylisoxazolecarboxylic acid* (b), which by the elimination of CO₂ gave diphenylisoxazole, previously prepd. by Goldschmidt (*Ber.* 28, 2540 (1895)) by the action of α,β-dichlorobenzalacetophenone. Not wishing to base the structure of (b) on a pyrogenic reaction a synthesis analogous to that used by Claisen (*Ann.* 277, 173 (1893)) in the prepn. of dimethylisoxazolecarboxylic acid was carried out. Thus NH₂OH treated with Bz₂CHCO₂Et and sapond. gave a product identical with (b). This new synthesis of a deriv. of isoxazole is a fine example of the formation of a heterocyclic nucleus as the result of spontaneous oxidation in the presence of BzH and NH₃. 20 g. phenylisoxazolone prepd. by the action of NH₂OH.HCl on Bz₂CHCO₂Et in 200 cc. hot EtOH treated with a small excess of BzH soln. gave a citron-yellow soln. which was boiled a few mins. On cooling (a) sepd. as bright yellow pearly crystals, m. 190–1°. It was dissolved in a little cold NH₃-EtOH, and treated with a little BzH and boiled on the H₂O bath 1 hr. The orange-red liquid was concd. to a small vol., cooled with H₂O and again made slightly alk. with NH₃, when it deposited *diphenylisoxazole*-

carboxylic amide (II), nearly rose-colored shining leaves or massive rose prisms, m. 229–30° (browns), insol. in cold alkalis, but on heating dissolves with the evolution of NH_3 . The EtOH mother liquors give on concg. rose crystals that at 160–180° undergo a change and finally m. 229–30°, dissolves with the loss of NH_3 in alkalis. The compd. was not identified owing to the lack of material. 4 g. of (II) heated with rather concd. NaOH dissolved and evolved NH_3 . The filtered liquid sepd. the sodium salt of (b) as pearly scales. The aq. soln. acidified with HCl ppts. the free acid (b) as cryst. flocks, which sep. as white cubes or rhombohedra from boiling H_2O -EtOH, m. 233°. A small amt. of a 2nd product, rose needles, m. 153°, was sepd. from the mother liquors. The above Na salt purified by recrystn. and treated with AgNO_3 gave a white flocculent ppt., nearly insol. in boiling H_2O but sol. in NH_3 ; with BaCl_2 it gave a white powdery ppt. sol. in hot H_2O and repptg. on cooling; CuSO_4 gave a S-yellow ppt. that dissolves on boiling and apparently undergoes some change; HgCl_2 causes a faint whitening; $\text{Pb}(\text{OAc})_2$ gives a flocculent ppt., sol. in hot H_2O and sepg. on cooling; FeCl_3 gives a silver-colored ppt. even in dil. soln. which is not changed by boiling. Although the CO_2H acids of other N-rings are decompd. by superheating quite neatly into CO_2 and decarboxylated deriv. (b) when treated in this way undergoes a profound decompn. and gives only a little diphenylisoxazole. 0.5 g. (b) heated slowly in a small distg. flask began to lose CO_2 above 233° (the m. p.) and formed yellow vapors which recondensed to an oily liquid and solidified as a brown mass. Dissolved in EtOH, some brown crystals, m. 140–1°, were sepd. In the synthesis of (b) from $\text{Bz}_2\text{CHCO}_2\text{Et}$ the latter was prepd. at first by the method found in the literature (Ber. 16, 2133(1883)). Later it was prepd. thus: $\text{BzCH}_2\text{CO}_2\text{Et}$ was emulsified in dil. NaOH and treated gradually with BzCl with energetic shaking. When the soln. becomes only slightly alk. or neutral the whole solid mass is filtered, washed with H_2O , pressed and the $\text{Bz}_2\text{CHCO}_2\text{Et}$ crystd. from EtOH as white rosetts, m. 110°. 12 g. $\text{Bz}_2\text{CHCO}_2\text{Et}$ warmed until dissolved with 110 g. AcOH were treated with the mol. amt. of $\text{NH}_2\text{OH}\cdot\text{HCl}$ and NaOAc in 5 cc. hot H_2O . The mixt. was agitated and heated at 60° for a few hrs. and poured after 12 hrs. into H_2O containing ice which pptd. a yellow semi-cryst. mixt. of diphenylisoxazolecarboxylic ester (c) and phenylisoxazolone. Grinding the mixt. with hot. dil. aq. alc. gave brilliant prisms of (c), m. 51–2°. 4.50 g. (c) boiled 0.5 hr. under a condenser with dil. NaOH gave a yellow soln. from which the salt sepd. on cooling. The soln. of the Na salt gave with dil. HCl a pale rose ppt. identical with (b), m. 233°. The Na salt was similar and gave all of the reactions described above. Derivatives of benzalmethylisoxazolone. MARIO BETTI AND LUIGI ALESSANDRI. *Ibid* 462–9.—Benzalmethylisoxazolone (III) in NH_2EtOH containing BzH undergoes an oxidation analogous to that above, giving the α -phenyl- γ -methylisoxazolecarboxylic amide (IV) which was then converted into the



free acid (V) and α -phenyl- γ -methylisoxazole (VI) successively. (VI) has been obtained by Goldschmidt (Ber. 28, 1532(1895)) by means of chlorobenzalacetoxime and by Moureu and Brachin (Compt. rend. 137, 795(1903)) by the action of NH_2OH on $\text{AcC}::\text{CPh}$. B. and A. also attempted to prep. (V) by the action of NH_2OH on $\text{BzCHAcCO}_2\text{Et}$ but obtained an isomer (m. 189°) which is probably α -methyl- γ -phenylisoxazolecarboxylic acid (VII), since by loss of CO_2 it gives (VI). The relationship of (V) and (VII) will be further discussed in subsequent papers. To (III) in a little NH_2EtOH BzH was added and the mixt. heated 0.5 hr. under a condenser on the H_2O bath; the cool mixt. was again made strongly alk. with NH_3 and after 24 hrs. minute rose-colored

leaves of (IV) were filtered off, m. 250° (decompn.). By evapg. the filtrate additional crops were obtained. (IV) is sol. in hot H_2O or hot $EtOH$ from which it seps. as rose needles, m. $256-7^{\circ}$ (brown liquid). 4 g. (IV) boiled with dil. $NaOH$ evolves NH_3 , becomes yellow, and on acidifying with dil. HCl gives rose or straw-yellow coarse crystals of (V); it crysts. from H_2O as nearly colorless rhombohedra, m. 157° , decomp. 220° ; *calcium salt*, $C_{11}H_8O_2N_2Ca \cdot 3H_2O$, brilliant prisms. 3 g. (V) heated carefully with a direct flame in a distg. flask decomp. with the formation of tar and a viscous brown oil. that solidifies on cooling. This, ground up with H_2O , made alk. with $NaOH$ and distd. with steam, gave a colorless oil which forms pearly crystals of (VI) having an aromatic odor, m. $67-8^{\circ}$, b. $265-70^{\circ}$. A better result is obtained by boiling (V) for 2 hrs. under a condenser with concd. HCl ; the cold liquid filtered, treated with $NaOH$, etc., gives (VI). $BzCHAcCO_2Et$ (Claisen, *Ann.* 291, 68(1896)) in glacial $AcOH$ was treated with the mol. amt. of $NH_4OH \cdot HCl$ and $NaOAc$ in the minimum amt. of H_2O ; the mixt. was agitated and heated for $\frac{1}{4}$ hr. on the H_2O bath, cooled and poured into much ice H_2O , which sepd. a yellow ppt. of *ethyl phenylmethylisoxazole-carboxylate* (d), $C_{12}H_{14}O_2N$, recrystd. from $EtOH$, m. $52-3^{\circ}$; 5 g. (d) heated with dil. $NaOH$ gave on adding dil. HCl a ppt. of *phenylmethylisoxazolecarboxylic acid*, prisms from $EtOH$, m. 189° , which, heated in the distg. flask, gave finally *phenylmethylisoxazole* in pearly crystals, m. $67-8^{\circ}$, identical with (VI). E. J. WITZEMANN.

The esters of silicic acid. GIOVANNI PELLINI. Univ. Palermo. *Gazz. chim. ital.* 45, I, 380-5(1915).—The chem. individuality of a number of hydrates derivable from SiO_2 has not been established with certainty. Knowledge of the constitution of silicic acids has been gained by a study of their organic esters; thus silicon halides react with alcs. and phenols to give tetra-alkyl silicates: $4ROH + SiX_4 \longrightarrow Si(OR)_4 + 4HX$. The hexa-Me and hexa-Et esters of $H_6Si_2O_7$ are known. The di-Et deriv. of H_2SiO_2 was obtained by Ebelman (*Ann.* 57, 331(1846)) but could not be obtained by Friedel and Crafts (*Ann.* 136, 210(1865)); a polymer $(Et_2SiO_2)_n$ was obtained by Troost and Hautefeuille (*Ann. chim.* [5] 7, 472). Thus our knowledge of the esters of the polysilicic acids is very limited. The purpose of these expts. was to prep. some organic polysilicates in order to contribute to the constitution of polysilicic acids and natural silicates. P. prepd. the chlorosilicic acid esters by the action of $SiCl_4$ on the normal esters and these react in abs. Et_2O with Ag_2O thus: (1) $2Si(OR)_2Cl + Ag_2O \longrightarrow Si_2O(OR)_4 + 2AgCl$; (2) $Si(OR)_2Cl_2 + Ag_2O \longrightarrow SiO(OR)_2 + 2AgCl$; (3) $2Si(OR)_3Cl + 3Ag_2O \longrightarrow Si_2O_3(OR)_6 + 6AgCl$. The esters of $H_6Si_2O_7$, H_2SiO_2 and $H_4Si_2O_5$ were obtained. Treating Et_2SiO_2 with $SiCl_4$ in known amts. at high temps. in the sealed tube gave a mixt. of 3 chlorohydrins which on fractional distn. gave no const. boiling fractions; the b. p. rose gradually while distg. Fractions collected at the b. ps. given by Friedel and Craft (*Ann. chim.* [4] 9, 5(1866)) and heated in abs. Et_2O on the H_2O bath with excess of Ag_2O containing only a trace of H_2O (cf. Madsen, *C. A.* 7, 3120) gave, after removing $AgCl$ and evapn., liquid products. $(EtO)_2SiCl_2$ treated in this way gave the *ethyl diorthosilicate*; no other product of const. compn. was isolated from the treatment of the other Cl derivs. Better success was had with the derivs. of *l*-borneol. This treated with the proper mol. amt. of $SiCl_4$ gives rise to 4 compds., $(C_{10}H_{17}O)_2Si$ (a), $(C_{10}H_{17}O)_3SiCl$ (b), $(C_{10}H_{17}O)_2SiCl_2$ (c), and $(C_{10}H_{17}O)SiCl_3$ (d). All are quite stable; the 1st is difficultly sapond. by boiling $EtOH \cdot KOH$; the last is sapond., by H_2O ; *l*-borneol is recovered from the products of sapon. The $(C_{10}H_{17}O)SiCl_3$ treated with Ag_2O gave $(C_{10}H_{17})_2Si_2O_5$ corresponding to $H_2Si_2O_5$. Recently Morey (cf. *C. A.* 8, 1248) prepd. $K_2Si_2O_5$, $KHSi_2O_5$ and $Na_2Si_2O_5$. The mineral rivaite, $(Ca, Na_2)_2Si_2O_5$ (Zambonini, *C. A.* 9, 774), is a salt of $H_2Si_2O_5$. Okenite, apofillite, petalite and milarite are less certainly derived from it. 1 mol. of $SiCl_4$ in petr. ether treated gradually with 4 mols. *l*-borneol and heated on the H_2O bath as long as HCl is evolved, then evapd.,

redissolved in petr. ether + an equal vol. of EtOH sepd. on spontaneous evapn. *tetra-l-bornyl silicate* (a), crystals, m. 291–2°, sol. in ligroin, C₆H₆ and PhMe. 1 mol. SiCl₄ similarly treated with 3 mols. *l*-borneol gives on distg. in *vacuo* *tri-l-bornyl monochlorosilicate* (b), b_{7–8} 260–90°, crystals, m. 215–8°. *Di-l-bornyl dichlorosilicate* (c) was obtained similarly as a dense colorless liquid. b₁₀ 203–5°, gives white crystals below 20°. *Mono-l-bornyl trichlorosilicate* (d) is a liquid which b₇₀₀ 140–2°. The optical rotations (the 1st 2 in PhMe) are as follows: (a) $[\alpha]_D^{24.9^\circ} -20.09^\circ$, (d) $[\alpha]_D^{20^\circ} -42.88^\circ$; liquid (c) $[\alpha]_D^{25.4^\circ} -36.72^\circ$; liquid (b) $[\alpha]_D^{24.9^\circ} -20.09^\circ$. (b) in Et₂O heated for a long time with excess of Ag₂O gives glassy scales of *l-bornyl dimetasilicates*, (C₁₀H₁₇O)₂Si₂O₃, softens about 92°, liquefies $\pm 135-40^\circ$, sol. in org. solvents. The expts. are to be continued.

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Derivatives of diaminoguanidine. AUGUSTO GAITER. Univ. Genoa. *Gass. chim. ital.* 45, I, 450–61 (1915).—By the action of BrCN on NH₂NH₂, Pellizzari and Cantone (*Idem* 35, I, 291) obtained HN:C(NHNH₂)₂.HBr and P. and Gaiter (*C. A.* 9, 450) improved the method. The unsym. or hydrazone formula H₂NN:C(NH₂)NHNH₂ for diaminoguanidine (a) is also possible. If the >NNH₂ group can exist in triaminoguanidine (cf. *C. A.* 9, 450) it may also exist in (a). Thiele gave it the imide formula while Ponzio and Gastaldi (*C. A.* 8, 80) admitted that in the formation of diaminotetrazine it reacts in the hydrazone form. G. found that BzCl reacting with (a) gives a di-Bz deriv. and tetrabenzoyldiaminoguanidine which on hydrolysis gives 2 mols. of *sym*-dibenzoylhydrazide thus: HN:C(NHNH₂)₂ → HN:C(NBzNHBz)₂ which with 2H₂O → 2(NHBz)₂ + CO₂ + NH₃. Moreover there is a strict analogy between (a) and aminoguanidine since both give addition products with aliphatic and aromatic aldehydes, HN:C(NHNH₂)₂ + 2RCHO → 2H₂O + HN:C(NHN:CHR)₂, which are described below. Although free (a) cannot be obtained on account of its great soly. and instability these condensation products are easily sepd. as well as crystd. compds. The product obtained with glyoxal is the result of the action of 1 mol. with (a) and is probably a heptagonal ring depending on whether it reacts in the usual or in the desmotropic form. The action of the fatty acids on (a) was also studied; in this the components react in monomol. quantities, probably giving HN:C(NHNH₂)NHNHCHO (in the case of HCO₂H) which then loses H₂O to give HN:C.NH.N:CH.NH.NH (b) or HN:C.NH.N:CH.NNH₂ (c). Since this deriv.

gives a condensation product with BzH which contains an NH₂ group and since with HNO₂ it gives a NO deriv. identical with aminotriazole (Thiele and Manchot, *Ann.* 303, 45 (1898)), G. considers its formula to be (c). But (c) may exist as the tautomer H₂N.N:CH:N.N:CNH₂ (d). Although T. and M. prefer formula (c) G. prefers (d),

since it does not react with 2 mols. of BzH as (c) should be able to do. This base (c) or (d), which is called *N-aminoiminodihydrotriazole*, is intermediate between HC:N.N:CH.NNH₂ (*Ber.* 39, 2619, 3372, 4106), and HN:C.NH.NH.C:(NH.NNH₂)

(*Gass. chim. ital.* 37, II, 317). One mol. diaminoguanidine-HBr (e) + 2 mols. *o*-HO-C₆H₄CHO in H₂O reacting in the presence of a few drops of HBr gave a cheesy ppt. of *salicylidenediaminoguanidine hydrobromide*, HN:C(NHN:CHC₆H₄OH)₂.HBr, m. 240°; treated in H₂O with Na₂CO₃ the *salicylidenediaminoguanidine*, C₁₄H₁₁O₂N₄, seps. in shining yellow scales from EtOH, m. 201–3°. 1 mol. (e) treated in EtOH with the calcd. amt. of *m*-O₂NC₆H₄CHO gave a yellow powdery ppt., which gradually reddens in the light, of *m-nitrobenzylidenediaminoguanidine hydrobromide* (f), HN:C(NHN:CHC₆H₄NO₂)₂.HBr, little sol. in EtOH, insol. in other common solvents, m. 292° (decompn.). (f) boiled in NH₄OH gave minute yellow crystals of *m-nitrobenzylidenediaminoguanidine*, C₁₄H₁₁H₇O₄, m. 240–2°. 2 g. (e) in 20 cc. H₂O + 1.7 g. BzCl +

1.97 g. KOH sepd. *dibenzoyldiaminoguanidine* (g), HN:C(NH.NHBz)_2 , pearly crystals from EtOH, m. $210-1^\circ$. If to the alk. liquid from which (g) was sepd. is added HCl until faintly acid a white cheesy substance, *sym-tetrazobenzoyldiaminoguanidine* (h), seps., white shining cryst. powder, m. 169° , sol. in H_2O and other solvents but if heated in liquids slightly acid or alk. it is hydrolyzed. On boiling (h) with $\text{H}_2\text{O.NH}_3$ is evolved and on concg. the soln. (NHBz)₂ seps. 1 mol. $\text{HCO}_2\text{H} + 1$ mol. (e) boiled 3 hrs. on the H_2O bath gave white needles of *N-aminoimidohydrotriazole hydrobromide* (i) (salt of (c) or (d)), m. $216-8^\circ$. (i) treated with the calcd. amt. of wet Ag_2O for 48 hrs., filtered and dried gave *N-aminoiminodihydrotriazole* (j), $\text{C}_2\text{H}_4\text{N}_4$, yellowish crystals, m. 208° ; its aq. soln. gives with AgNO_3 a white ppt. sol. in cold NH_3 or in HNO_3 . A soln. of (i) treated with picric acid ppts. the *picrate*, $\text{C}_2\text{H}_4\text{N}_4.\text{C}_6\text{H}_3\text{N}_3\text{O}_7$, minute shining crystals, m. 192° . 10 g. (e) treated with 9.19 g. $\text{Pb(NO}_3)_2$ in H_2O with warming sepd. PbBr_2 on cooling; the filtrate when concd. and recrystd. gave finally the *nitrate* of (e), $\text{C}_2\text{H}_4\text{N}_4.\text{HNO}_3$, as shining white needles, m. 194° . (i) treated with BzH and some drops of HBr seps. nothing but on making alk. with KOH the *benzylidene derivative* of (i), $\text{HN:C.NH.N:CH.N:CHPh}$, seps. as shining yellow laminas, m. $235-6^\circ$; treated with

AgNO_3 it gives a yellow ppt. sol. in HNO_3 and repptd. by NH_3 but sol. in excess. 10 g. (i) in 100 cc. cold H_2O treated with 4.4 g. KNO_3 at room temp. became orange-yellow, evolved much gas and pptd. a *nitroso derivative* (k), $\text{C}_2\text{N}_4\text{H}_2\text{NO}$, as yellow crystals that give Liebermann's reaction; it decomposes very easily from 170 to 220° , depending on the rate of heating. (k) treated with AgNO_3 gives a yellow ppt. insol. in NH_3 or HNO_3 . 6 g. diaminoguanidine nitrate (l), 7.5 cc. H_2O , 3.5 cc. glacial AcOH and 2 drops concd. HNO_3 heated 6 hrs. under a condenser on a H_2O bath gave a citron-yellow syrup which, evapd. several times after adding EtOH, gave *N-aminoiminomethylidihydrotriazole nitrate* (m), $\text{HN:C.NH.N:CMe.N.NH}_3.\text{HNO}_3$, white crystals, m. 184° . Equimol.

amts. of (m) + BaCO_3 in H_2O sepd. $\text{Ba(NO}_3)_2$; the mother liquor evapd. on the H_2O bath, extd. with EtOH, etc., gave *N-aminoiminomethylidihydrotriazole*, $\text{C}_2\text{H}_4\text{N}_4$, needles, m. 193° , with properties similar to those of (j). (l) treated in H_2O with satd. picric acid seps. *N-aminoiminomethylidihydrotriazole picrate*, $\text{C}_2\text{H}_4\text{N}_4.\text{C}_6\text{H}_3\text{N}_3(\text{NO}_2)_3\text{OH}$, minute yellow crystals, m. 189° (decompn.). (l) in H_2O and concd. H_2PtCl_6 sep. *N-aminoiminomethylidihydrotriazole chloroplatinate*, $(\text{C}_2\text{H}_4\text{N}_4\text{HCl})_2\text{PtCl}_4$, orange-yellow prismatic crystals, m. 226° .

E. J. WITZEMANN.

The detection of iodine in organic iodo derivatives and in mixtures with bromo and chloro derivatives by means of ammonium bromide. III. ICILIO GUARESCHI. *Atti accad. sci. Torino* 50, 803-8(1915).—In a preceding paper (C. A. 9, 2358-9) G. showed that by heating iodides with NH_4Br (as well as iodides mixed with much bromide or chloride) a trace of iodide could be detected. The results with organic I derivs. are now reported. There are many organic I derivs. in which no special reaction is needed for the detection of I since they readily decomp. on heating and evolve violet I vapors. Many others, however, fail to decomp. G. found that dry NH_4Br and sometimes NH_4Cl not only liberate the I from its organic compds. but also when these are iodonitro derivs. or are mixed Cl or Br derivs. or chloro- or bromonitro derivs. The more stable I derivs. heated with NH_4Br in a long straight glass tube develop I vapors which may be tested with starch soln. after cooling. MeI mixed in small quantities with NH_4Br (or NH_4Cl) gives I vapors with the starch test. A mixt. of little MeI with much PhBr boils $156-8^\circ$ but with NH_4Br gives a strong test for I. Much EtBr mixed with a little MeI gives a strong test for I when heated with NH_4Br . EtI or EtBr containing EtI give good tests for I with NH_4Br or NH_4Cl . A trace of EtI in CHCl_3 gave a strong test for I with NH_4Cl . EtI mixed with much $\text{C}_2\text{H}_4\text{Cl}_2$ (b. $41-2^\circ$) gave the test with NH_4Br . Similarly for mixts. of EtI with CH_2Cl_2 . CHBr_3 heated

with NH_4Br gave red-brown vapors and other products. The reaction is being studied further. CHBr_3 with NH_4Cl gives Br vapors. A mixt. of little EtI (1-2%) with CHBr_3 heated with NH_4Br gave violet vapors and a violet soln. in CHCl_3 . CHCl_3 with NH_4Br evolves Br vapors and leaves a metallic residue, but CHCl_3 mixed with EtI (1-2%) gives the I test as well as Br vapors. EtI mixed with CHCl_3Br_2 gives a good test for I. A trace of iso-AmI heated with NH_4Br gives an intense reaction for I; a trace of the preceding is easily detd. in *tert*-AmBr. PrI was easily detected in the bromide. PhI boiled with an equal amt. of NH_4Br (or NH_4Cl) gives a fine test for I; the reaction is probably $\text{PhI} + \text{NH}_4\text{Br} \rightarrow \text{PhBr} + \text{NH}_4\text{I}$ and $\text{NH}_4\text{I} \rightarrow \text{NH}_3 + \text{H} + \text{I}$ (H was not tested for). PhBr or PhCl containing a trace of PhI gave good tests for I. Likewise 1 drop of a mixt. (0.50 g. PhBr + 0.50 g. PhCl + 0.001 g. PhI) gave the test for I with 4 parts of NH_4Br . A trace of PhI mixed with $\alpha\text{-C}_{10}\text{H}_7\text{Br}$ with NH_4Br gave the test; heated without NH_4Br , the result was negative. A positive result was obtained with PhI in $\text{C}_2\text{H}_4\text{Cl}_2$. $p\text{-O}_2\text{NC}_6\text{H}_4\text{I}$ (0.001 g.) gave a sharp test with NH_4Br but a weak test without NH_4Br . Heating a mixt. of the above with the Br deriv. gave no test for I, but 1 part of the I deriv. with 100 parts of the Br deriv. in the presence of NH_4Br gave a strong test for I. PhI with $p\text{-BrC}_6\text{H}_4\text{Me} + \text{NH}_4\text{Br}$ (not so well with NH_4Cl) gave the I test. Positive results with mixts. of PhI with $\text{C}_6\text{H}_4(\text{NO}_2)_2$ or PhOH were obtained. Compds. such as PhNH_2 , $\text{IC}_6\text{H}_4\text{CO}_2\text{H}$, etc., which evolve I on heating, were not tested.

E. J. WITZEMANN.

Salts of some aminoazo compounds. L. CASALE AND MARIA CASALE-SACCHI. Univ. Turin. *Atti accad. sci. Torino* 50, 903-18 (1915); *Gazz. chim. ital.* 45, I, 490-501 (1915).—The study of aminoazo compds. derived from $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$ (cf. C. A. 9, 795) led to the observation that the sulfates of these have a chem. compn. different from the sulfates of analogous compds. studied by Weselsky and Benedikt (*Ber.* 12, 228). This has led C. and C.-S. to exam. the salts of the aminoazo compds. derived from $\alpha\text{-C}_{10}\text{H}_7\text{NH}_2$. The results reported are limited to the salts of H_2SO_4 , HCl and HNO_3 . All of the above aminoazo compds. form salts with H_2SO_4 in the ratio 1 mol. base : 1 mol. acid, but some also form neutral salts, *i. e.*, 2 mols. base : 1 mol. acid. With HCl both series are formed but the former are stable and the latter are unstable and are rapidly transformed into the former in air, with the exception of α -naphthaleneazo- α -naphthylamine, of which both are stable. With HNO_3 the former series is also stable and the 2nd unstable. The latter also undergo a characteristic scission on fusion which will be described in another paper. The same exception is found with HNO_3 derivs. The stable sulfates, hydrochlorides and nitrates all cryst. in green prisms with a reflex changing from red to violet, are sol. in common organic solvents containing OH, are insol. in Et_2O and in hydrocarbons. The analysis of the double nitrates by combustion gave unreliable values for N. The HNO_3 was detd. volumetrically, using Me red as indicator. Treating 4-phenylazo-1-naphthylamine (a) in dry Et_2O with H_2SO_4 in Et_2O or boiling the base with dil. H_2SO_4 (various concns.) always gave $\text{C}_{16}\text{H}_{13}\text{N}_3\cdot\text{H}_2\text{SO}_4$, recrystd. from EtOH or glacial AcOH , m. $214\text{-}5^\circ$. HCl gas in Et_2O added to (a) in Et_2O ppts. $\text{C}_{16}\text{H}_{13}\text{N}_3\cdot 2\text{HCl}$ as a greenish violet ppt., which, washed with dry Et_2O and dried rapidly over H_2SO_4 in the presence of HCl , is very unstable. The preceding loses HCl to give stable $\text{C}_{16}\text{H}_{13}\text{N}_3\cdot\text{HCl}$, m. 205° , either when left in the air or on crystg. from AcOH or EtOH . It is also obtained on boiling (a) with aq. HCl . 2 g. of (a) in 200 cc. dry Et_2O treated at 0° with 150 cc. of an 8.6% Et_2O soln. of HNO_3 seps. $\text{C}_{16}\text{H}_{13}\text{N}_3\cdot 2\text{HNO}_3$ as blood-red crystals which may be washed repeatedly with Et_2O without decompn. Left in the air or on crystg. from EtOH it loses HNO_3 to give $\text{C}_{16}\text{H}_{13}\text{N}_3\cdot\text{HNO}_3$. 4-o-Tolylazo-1-naphthylamine (b) in Et_2O with a satd. Et_2O soln. of H_2SO_4 or with an aq. soln. of H_2SO_4 of not less than 10% gives $\text{C}_{17}\text{H}_{15}\text{N}_3\cdot\text{H}_2\text{SO}_4$ (c), long green prismatic needles from AcOH , m. $195\text{-}6^\circ$, which in warm EtOH or AcOH

with 1 equiv. of (b) seps. $(C_{17}H_{15}N_3)_2 \cdot H_2SO_4$ (d), m. 163° (decompn.), on cooling, also obtained by boiling (c) with 2.5% H_2SO_4 . If H_2SO_4 containing 5% excess acid is added to (c) whether (c) or (d) is obtained on filtration will depend on the temp. of the soln. at the time of filtering. (b) treated like (a) with HCl gives $C_{17}H_{15}N_3 \cdot 2HCl$, dark green; crystg. the preceding from AcOH or boiling (b) with aq. HCl gives $C_{17}H_{15}N_3 \cdot HCl$. Likewise (b) treated with HNO_3 like (a) gives $C_{17}H_{15}N_3 \cdot 2HNO_3$ as a dark coffee-colored mass, decomp. on standing or on fusion; heated on the H_2O bath it explodes at $\approx 80^\circ$. The former compound still wet with Et_2O dissolved in hot EtOH seps. $C_{17}H_{15}N_3 \cdot HNO_3$, emerald-green prisms, m. 170° . *4-m-Tolylazo-1-naphthylamine* (e) treated with H_2SO_4 like (b) gave $C_{17}H_{15}N_3 \cdot H_2SO_4$, bronze-green rectangular laminas, m. 189° . (e) in dry Et_2O treated with a satd. Et_2O soln. of HCl gave only $C_{17}H_{15}N_3 \cdot HCl$, bright green prisms with a blue reflex which cryst. unchanged from EtOH or AcOH. (e) in Et_2O treated with a 8.6% HNO_3 soln. in Et_2O gave only $C_{17}H_{15}N_3 \cdot HNO_3$, green-violet, m. 172° . 17.2% HNO_3 solns. sep. a different nitrate, probably $C_{17}H_{15}N_3 \cdot 2HNO_3$, but too unstable for analysis. *4-p-Tolylazo-1-naphthylamine* (f) gave $C_{17}H_{15}N_3 \cdot H_2SO_4$ in either aq. or Et_2O solns.; green prismatic needles with a red reflex, m. 211° . (f) treated with HCl as with (b) gave $C_{17}H_{15}N_3 \cdot 2HCl$, violet cryst. ppt. with deep green reflex. (f) with aq. HCl or the preceding recrystd. from AcOH gave $C_{17}H_{15}N_3 \cdot HCl$, short grass-green prisms, m. 211° (decompn.). Et_2O solns. of (f) treated with $Et_2O \cdot HNO_3$ ppt. $C_{17}H_{15}N_3 \cdot 2HNO_3$, dark greenish coffee-colored, unstable. On standing or when crystd. the preceding gives $C_{17}H_{15}N_3 \cdot HNO_3$, violet prismatic needles, m. 163° ; it is also obtained from a soln. of (f) with aq. HNO_3 . 2 g. *4-o-anisylazo-1-naphthylamine* (g) in 200 cc. hot 5% H_2SO_4 on cooling seps. $C_{17}H_{15}N_3 \cdot H_2SO_4$, short olive-green needles m. 173° , more sol. in AcOH, EtOH and Me_2CO than the preceding sulfates, may also be obtained by treating (g) in $CHCl_3$ with a satd. $Et_2O \cdot H_2SO_4$ soln. (g) with HCl as above gives $C_{17}H_{15}N_3 \cdot O \cdot 2HCl$, coffee-colored crystals; $C_{17}H_{15}N_3 \cdot O \cdot HCl$, dark green metallic color, m. $194-5^\circ$. With HNO_3 as before (g) gives $C_{17}H_{15}N_3 \cdot O \cdot 2HNO_3$, dark green cryst. powder, unstable; gives $C_{17}H_{15}N_3 \cdot O \cdot HNO_3$ from EtOH as large emerald-green aggregates of prisms, m. 173° . 2 g. *4-o-phenethylazo-1-naphthylamine* (h), boiled in 200 cc. of 5% H_2SO_4 , seps. $C_{18}H_{17}N_3 \cdot O \cdot H_2SO_4$, grass-green prismatic crystals from EtOH, loses its luster at 155° , browns and m. 182° ; the same salt was obtained from the Et_2O solns. $C_{18}H_{17}N_3 \cdot O \cdot 2HCl$ was obtained as with the others; on decompn. it gives $C_{18}H_{17}N_3 \cdot O \cdot HCl$ but this salt is obtained by dissolving (h) in hot dil. HCl and seps. on cooling as bright green prismatic needles, m. 195° . $C_{18}H_{17}N_3 \cdot O \cdot 2HNO_3$ from (h) was similar to this deriv. of (g) and recrystd. from EtOH gave $C_{18}H_{17}N_3 \cdot O \cdot HNO_3$ (or from aq. HNO_3 + (h)), m. $158-9^\circ$. Powdered *4-naphthaleneazo-1-naphthylamine* (i), boiled with dil. H_2SO_4 or by mixing the Et_2O solns., gave $C_{20}H_{15}N_3 \cdot H_2SO_4$, green prismatic needles with a red reflex, m. 163° . (i) with HCl as above gave $C_{20}H_{15}N_3 \cdot 2HCl$ which was recrystd. unchanged from AcOH or EtOH containing 1% HCl as green prisms, browns 190° , m. $201-2^\circ$; the preceding seps. $C_{20}H_{15}N_3 \cdot HCl$ from AcOH or EtOH solns., green-black opaque needles, browns without melting above 230° . $C_{20}H_{15}N_3 \cdot 2HNO_3$ seps. as dark green crystals with a bronze reflex, is stable like the 2 HCl deriv., explodes $139-40^\circ$. *4-o-Nitrophenylazo-1-naphthylamine* (j), boiled with aq. H_2SO_4 (10%), gives $C_{18}H_{13}N_4 \cdot O_3 \cdot H_2SO_4$ which can only be recrystd. unchanged from AcOH or EtOH containing 1% H_2SO_4 as coffee-colored prisms with a green reflex, m. $217-8^\circ$. Recrystd. from AcOH or EtOH the preceding seps. $(C_{18}H_{13}N_4 \cdot O_3)_2 \cdot H_2SO_4$, the neutral sulfate, as brick-red needles, m. 200° . (j) in Et_2O with a satd. Et_2O soln. of HCl gives $C_{18}H_{13}N_4 \cdot O_3 \cdot HCl$, brown. The 2 HCl deriv. is apparently not formed. (j) in Et_2O treated with 8.6% HNO_3 in Et_2O seps. $C_{18}H_{13}N_4 \cdot O_3 \cdot HNO_3$, grass-green crystals, m. $165-6^\circ$.

E. J. WITZEMANN.

The crystalline form of some derivatives of benzene. VIII. E. E. ARTINI.
Rend. ist. Lombardo sci. lett. [2] 48, 779-89(1915).—For methods of prepn. cf. Körner

and Contardi (cf. *C. A.* 8, 1761). 1,4,2,6- $\text{C}_6\text{H}_2(\text{NO}_2)_2\text{Cl}_2$, m. 114° , belongs to the monoclinic system, prismatic class, $a:b:c = 1.9310:1:1.4097$, $\beta 88^\circ 49'$; distinct exfoliation was not observed; the planes of the optical axes are parallel to the plane of symmetry. 1,4,2,6- $\text{C}_6\text{H}_2(\text{NO}_2)_2\text{ClBr}$, m. 114.5° , belongs to the same system and class, $a:b:c = 1.9472:1:1.3996$, $\beta 87^\circ 48'$, no exfoliation; the planes of the optical axes are parallel to the plane of symmetry. 1,4,2,6- $\text{C}_6\text{H}_2(\text{NO}_2)_2\text{Br}_2$, m. 143° , same system and class, $a:b:c = 0.5017:1:0.6775$, $\beta 86^\circ 25'$; the habit of crystn. is quite different in different solvents. The exfoliation is perfect. The plane of the optical axes is parallel to the plane of symmetry. 1,4,2,6- $\text{C}_6\text{H}_2(\text{NO}_2)_2\text{BrI}$, m. 140° , same system and class, $a:b:c = 0.4934:1:0.6774$, $\beta 87^\circ 5'$; the faces are not plane and prevented perfect measurement. The laminae of exfoliation are curved. All attempts to obtain measurable crystals of 1,4,2,6- $\text{C}_6\text{H}_2(\text{NO}_2)_2\text{ClI}$, m. 100° , failed. Such results as were obtained were nearly identical with those of the di-Br deriv. 1,4,2,6- $\text{C}_6\text{H}_2(\text{NO}_2)_2\text{I}_2$, m. 155° , same system and class, $a:b:c = 0.6103, 1:0.7908$, $\beta 66^\circ 56'$; exfoliation is easy and perfect. A comparison of the various members of this series shows that the di-Cl and ClBr derivs. are perfectly isomorphous with each other. Similarly the di-Br and BrI derivs. are isomorphous. Likewise the last 2 are probably also isomorphous with the ClI deriv. (observations imperfect). The more complex but remarkable morphologic relations existing between the 2 isomorphous groups which appear from a comparison of the angular values and from the topic axes is discussed in the summary.

E. J. WITZEMANN.

Synthesis of diazines and some new derivatives of chloral and bromal. SR. MINOVICI AND V. TH. BENTR. Univ. Bucarest. *Bull. sect. sci. acad. roumaine* 4, 185-94(1915).—M. and B. have condensed halogen-substituted aliphatic aldehydes, especially chloral and bromal, with PhNHCH_2CN (A), with apparent formation of *p*-diazine. Previously they have shown that (A) condenses with aromatic aldehydes to form imidazoles, but does not react with unsubstituted aliphatic aldehydes. The cyanohydrin of anisaldehyde reacted equally as well, but cinnamic and salicylic aldehydes did not give enough product to analyze. The reaction is theoretically explained by intermediate formation of imidazole which loses HCl to form the diazine. M. and B. obtain (A) in 80% yield by keeping 50 g. mandelic nitrile in 50 cc. abs. alc. satd. with NH_3 for 24 hrs. at 0° in an hermetically sealed flask. After filtering the resulting cryst. mass, and drying in a desiccator, it is pptd. from cold CHCl_3 with ligroin. 2,3-Dichloro-6-phenyl-*p*-diazine, N:CCl.CCl:N.CH:Ph , obtained by vigorous interaction

of 5.1 g. (A) and 6.6 g. anhydrous chloral in 20 cc. abs. Et_2O and recrystn. from 90% alc. (Yield, 75%.) Long, thin, golden yellow crystals, m. 102° , easily sol. in EtOH , Et_2O , CHCl_3 , ligroin, C_6H_6 and AcOH , mol. wt. (in freezing C_6H_6) 225. With alc. KOH or NaOH it is colored green to violet, then brown; acidulating the colored alk. soln gives an intense red which can be extd. with Et_2O . 2,3-Dibromo-6-phenyl-*p*-diazine, $\text{N:CBr.CBr:N.CH:CPh}$, from 7 g. (A) and 7 g. bromal, yellow acicular crystals, m. 120° .

mol. wt. 315. 2,3-Dichloro-6-methoxyphenyl-*p*-diazine, $\text{N:CCl.CCl:N.CH:C(C}_6\text{H}_4\text{OMe)}$, from chloral and anisaldehyde cyanohydrin, yellow acicular crystals, m. 144° , mol. wt. 254. 2,3-Dibromo-6-methoxyphenyl-*p*-diazine, $\text{N:CBr.CBr:N.CH:CC}_6\text{H}_4\text{OMe}$, from bromal and anisaldehyde cyanohydrin, crystals, m. 160° , mol. wt. 345.

L. H. CHERNOFF.

Some new oxidation products of cholesterol. AND TH. ZENOVICI-EREMIE. Univ. Bucarest. *Bull. sect. sci. acad. roumaine* 5(1915).—By the action of 50 g. perhydrol in 100 cc. of 20% H_2O_2 solution (x) in 200 cc.

AcOH, 2 new compounds are obtained: (A) $C_{24}H_{40}O_4$, and (B) $C_8H_{10}O_4$, which cryst. from dil. acetone. (A) seps. first in 7% yield; it is easily sol. in Et_2O , C_6H_6 , $CHCl_3$, and ligroin, less sol. in EtOH and MeOH, insol. in H_2O and alkali hydroxides, $\alpha_D^{20} = 41.47$, mol. wt. (in AcOH) 382. In Salkowski's test the $CHCl_3$ remained colorless but the acid was colored yellow. The Liebermann-Burchard test gave only an intense red-violet. The Lifschutz reaction for oxycholesterol also failed. M. and Z.-E. therefore conclude that (A) does not contain hydroxyl, phenolic, or ketonic groups, neither is it an ozonide or peroxide. They have, however, established the presence of an Ac group. (A) does not add halogen, therefore the double bond in (x) had disappeared. With HCl and HBr, (A) gives the cryst. compds. $C_{12}H_{23}Cl$, m. 150° , and $C_{12}H_{23}Br$, m. 130° . Mol. wt. (in AcOH) 220. (B), from the mother liquor of (A), obtained as an oil which resinsified in contact with air, was purified by pptg. from aq. KOH, with HCl, dissolving in Et_2O , and evapg. *in vacuo*. (B) is easily sol. in EtOH, Et_2O , $CHCl_3$, acetone, and aq. alkali, insol. in H_2O and has an acid reaction. The AcOH soln. gives no color with H_2SO_4 , but the Ac_2O soln. gives with H_2SO_4 an intense red which changes to green. The same color is produced in the Liebermann-Burchard reaction. The Salkowski reaction gives a yellow color in the upper layer and a green fluorescence in the lower. Attempts to combine (B) with digitonin failed. M. and Z.-E. therefore conclude that (B) is not oxycholesterol, but a resin acid; acid no. 84.165, sapon. no. 134.2. Under slightly different conditions, from 10 g. (x) in 200 cc. of 20% H_2SO_4 and 150 cc. perhydrol, an oily substance (C) is formed which solidifies by addition of H_2O . (c) is sol. in Et_2O , EtOH and $CHCl_3$, but insol. in H_2O . Analyses—C 69.32–70.70%; H 10.50–10.61%. If to 10 g. (x) in 100 cc. AcOH is added 100 cc. of 20% H_2SO_4 and 50 cc. perhydrol, a cryst. substance (D) is formed, m. 200° , containing C 75.10, H 10.95%. Another cryst. substance designated by the authors as (E) was obtained by the action of 100 cc. of 20% H_2SO_4 on 10 g. (x) in 100 cc. AcOH; needles from acetone, m. $110-1^\circ$. Analysis agrees with that for cholestanol acetate previously obtained by Willstätter and Mayer (C. A. 3, 2807) but the compd. is not the same since it forms cryst. Cl and Br derivs., m. $95-7^\circ$ and $116-18^\circ$, resp.

L. H. CHERNOFF.

Chemical constituents of the fruits of *Evodia rutaecarpa*. Y. ASAHINA AND K. KASHIWAKI. *J. Pharm. Soc. Japan* 1915, No. 405, 1293; cf. C. A. 10, 250.—Upon treatment of the evapd. acetone ext. with NaOH, an oily layer, a dark-colored H_2O soln. and a suspended cryst. mass were obtained. The oily layer consisted of a terpene and polymerization products, from which the former was purified by means of distn. *in vacuo* and with steam. The pure terpene, $C_{10}H_{16}$, which was named "evodene," is a clear liquid, b. $67-8^\circ$, $[d]_D^{20}$ 0.7989, n_D^{19} 1.4843, unstable towards air and heat and absorbs O readily. With Na and alc. a dihydro deriv. is formed, which forms an unstable liquid tetra-Br compd. Upon hydrogenation, 3 mols. of H are absorbed with the formation of 2,6-dimethyloctane. A. and K. conclude that the terpene is identical with ocimene. Acidification of the alk. soln. yielded a dark amorphous ppt. containing some evodene and a phlobaphene-like substance. The cryst. mass was sepd. by fractional crystn. from alc. into 2 constituents, *evodiamine* and *rutaecarpine*. The former is the less sol. It crysts. in light yellow plates, m. 287° , of the compn. $C_{19}H_{17}ON_3$, reacts with concd. H_2SO_4 , giving an orange color changing to a red-brown and on long standing or on diln. with H_2O to blue. HCl reacts somewhat similarly. The blue color is destroyed by alkalis with the formation of a dirty blue ppt. It is hydrolyzed by boiling concd. alc. KOH into *N*-methylantranilic acid and a base, $C_{11}H_{10}N_2$, difficult to cryst. but forming easily crystallizable salts; e. g., the picrate, m. 242° . It does not respond to the pine shaving reaction. On boiling with alc. HCl *evodiamine* is an isomer, *isoevodiamine*, $C_{19}H_{17}ON_3 \cdot H_2O$, m. $155-6^\circ$; its hydrochloride in hexagonal or rhombic plates, from H_2O in fine prisms. The

hydrated salt m. 255-6° and the anhydrous salt 265-7°. Concd. H_2SO_4 colors it yellow. It is hydrolyzed by boiling concd. alc. KOH into methylanthranilic acid and a base, $\text{C}_{10}\text{H}_{13}\text{N}_2$, having a definite HCl salt, a picrate, m. 242-3°, and forming with Ac_2O an Ac deriv., m. 163°; it responds to the pine shaving reaction. Rutaecarpine, $\text{C}_{18}\text{H}_{17}\text{ON}_2$, crystg. in light yellow needles, m. 258°. Toward reagents it reacts in many ways like evodiamine. With concd. H_2SO_4 and warm concd. HCl it forms a yellow color. A. and K. conclude that evodiamine is methyl-dihydrotutaecarpine. An abstr. in German precedes the article.

H. W. DAUDT.

Synthesis of peonolglucoside. Y. ASAHINA AND G. SHIRABE. *J. Pharm. Soc. Japan* 1915, No. 405, 1293; cf. Péron, *C. A.* 5, 2494.— β -Peonolglucoside was prepd. from peonol and β -acetobromoglucose. The white crystals, $\text{C}_{20}\text{H}_{32}\text{O}_6$, $(\text{OMe})\text{Ac} \cdot 2\text{H}_2\text{O}$, lose their H_2O of crystn. at 59° and m. 118°, $[\alpha]_D -79^\circ$. Acids and emulsin hydrolyze it into glucose and peonol. Tetraacetopeonolglucoside, crystg. in needles or plates, m. 146°, $[\alpha]_D -44.1^\circ$, was prepd. An abstr. in German precedes the article.

H. W. DAUDT.

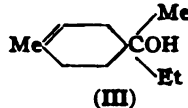
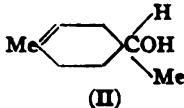
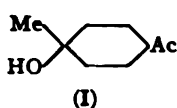
The mechanism of the action of trisodium phosphate on glycerol α -monochlorohydrin. O. BAILLY. *Compt. rend.* 161, 677-80(1915).—A mixt. of Na_3PO_4 and $\text{CH}_2\text{ClCH}(\text{OH})\text{CH}_2\text{OH}$ was allowed to stand at 18° and the amts. of NaCl , Na_3PO_4 , and $\text{Na}_2\text{C}_2\text{H}_4(\text{OH})_2\text{PO}_4$ detd. at various intervals. The alkalinity of the reaction was explained by assuming that the reaction took place in 2 stages whereby Na_2HPO_4 was formed which reacted with the glycerol deriv. to form the $\text{Na}_2\text{C}_2\text{H}_4(\text{OH})_2\text{PO}_4$. This process gives the α - or the β -compds. Cf. *C. A.* 8, 3023.

R. L. SIBLEY.

Crystallographic peculiarities of aniline nitrate. FRÉD. WALLERANT. *Compt. rend.* 161, 470-80(1915).—This is orthorhombic at ordinary temp. It crysts. from H_2O in very flat plates, conforming to the faces g^1 . The faces m and $b^{1/2}$ are very much reduced. Crystd. from alc., it shows only the faces $b^{1/2}$; the crystals are octahedra without any traces of the faces g^1 . At 97.6°, it goes over into monoclinic crystals. This transformation is reversible and indirect. On heating an orthorhombic plate of cleavage, it transforms into monoclinic fibers of indefinite orientation; but on cooling again, it forms again an orthorhombic plate with its original orientation. The transformation shows no supercooling or superfusion, but a notable latent heat.

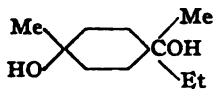
P. M. GIESY.

Synthesis of some terpeneols and terpins. O. WALLACH. Univ. Göttingen. *Nachr. kgl. Ges. Göttingen* 1915, 1-27; through *Chem. Zentr.* 1915, II, 824-9.—I. With HANS BERTHOLD. The satd. *hydroxyketone* (I), which is an intermediate product

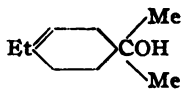


in the oxidation of β -terpineol to Δ^1 -tetrahydro-*p*-acetyl-toluene (a), is also obtained by shaking (a) 6-8 weeks with 4% H_2SO_4 . *Semicarbazone*, m. 197-8°. *Dibromide* of (a), obtained by bromination in AcOH, m. 61°; the Br cannot be split off with aq. KOH; boiling in AcOH produces strong resinification and only a little $\text{AcC}_6\text{H}_4\text{Me}$ is formed. Nascent H reduces (a) to the lower homologous terpeneol (II) (*Ann.* 324, 93) which, shaken with dil. H_2SO_4 , yields 1,8-dihydroxy-1-methyl-4-ethylcyclohexane, m. 94-5°, while with Pd-H (a) gives 8-hydroxy-1-methyl-4-ethylcyclohexane, b. 203-5°, $d_{17} 0.9110$, $n_D 1.46405$, mol. refraction 43.01. (a), obtained from β -terpineol, when treated with MeMgI , yields α -terpineol. *Homo- α -terpineol* (III), similarly obtained from (a) and EtMgI , b. 235-7°, $d_{20} 0.9390$, $n_D 1.4850$, mol. refraction 51.28. *Dibromide*, oil; warming with NaOMe produces a homologous pineol, which, however,

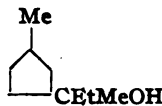
goes over into *p*-methylisobutylbenzene. (III) and KMnO_4 yield a glycerol $\text{C}_{11}\text{H}_{19}(\text{OH})_3$, b. 140–50°. Homologous 1,8-terpin (IV), from (III) shaken with dil. H_2SO_4 , m. 65–7°.



(IV)



(V)



(VI)

Homologous menthanol, $\text{MeC}_8\text{H}_{16}\text{CMeEtOH}$, from (III) and Pd-H , b. 106–8°, b. 223–5°, d_{15} 0.9115, n_D 1.4683, mol. refraction 51.88. Phenylurethan, m. 115–20°. It is apparently a mixt. The homo- α -terpineol (V) obtained from ethylnopinol (C. A. 2, 2085), b. 226–7°, d_{15} 0.943, n_D 1.4811, m. 92–4°, is isomeric with (III); several days' shaking with 5% H_2SO_4 yields 1,8-dihydroxy-1-ethyl-4-isopropylcyclohexane, m. (with H_2O of crystn.) 75–6°. II. Preparation of homologous benzene hydrocarbons from α -terpineols (menthenols). With HANS BERTHOLD. The unsatd. alcs. and 1 mol. Br_2 in AcOH are boiled until the evolution of HBr ceases, distd. with steam, shaken with KMnO_4 and distd. over Na . Cymene, obtained in 86% yield from α -terpineol dibromide, b. 174–5°, d_{20} 0.8575, n_D 1.4909. 1,4-Methylethylbenzene, from Δ^1 -1-methyl-7-hydroxy-4-ethylcyclohexene, b. 161–2°, d_{22} 0.862, n_D 1.4918, mol. refraction 40.37. 1,4-Methylisobutylbenzene, from (III) or the homologous pinol, b. 196–7°, d_{15} 0.8640, n_D 1.4917, mol. refraction 49.67. 1,4-Ethylisopropylbenzene, from (V), b. 197–8°, d_{20} 0.864, n_D 1.4846, mol. refraction 49.06. III. 1-Methyl-4-propyl-3-cyclohexenone and -3-cyclohexanone. With LOUIS AUGSBURGER. Δ^1 -1-Methyl-4-propylcyclohexene, obtained by warming 4,4-Pr(HO) $\text{C}_6\text{H}_4\text{Me}$ with dil. H_2SO_4 , b. 173–6°; nitrosochloride, m. 134–5°; nitrosate, m. 119°; nitrolpiperidide, m. 150–2°. The nitrosochloride by loss of HCl yields the oxime, liquid, of Δ^1 -1-methyl-4-propyl-3-cyclohexenone, b. 220–3° (darkening), b. 95–8°, d_{20} 0.9225, n_D 1.4732, mol. refraction 46.24; semicarbazone, m. 153–4°. Reduction of the unsatd. ketone by Skita's method gives the hexanone (normal menthone) (c), b. 215–7°, d_{15} 0.8960, n_D 1.4511, does not smell like menthone, mol. refraction 46.29. Semicarbazone, m. 149–52°. Oxime, m. 87–8°. Oxidation with CrO_3 yields a keto acid with the same C content, whose semicarbazone, $\text{C}_{11}\text{H}_{21}\text{O}_2\text{N}_3$, m. 156–8°. 1,4-Methylcyclohexene propane, $\text{MeC}_8\text{H}_{15}\text{CH}_2\text{Et}$, from the condensation product of bromobutyric ester and *p*-methylcyclohexanone (C. A. 2, 2083), b. 173–4°, d_{20} 0.8110, n_D 1.4571, mol. refraction 46.41. Nitrosochloride, m. 138–40°. Nitrolpiperidide, m. 148–9°. The nitrosochloride yields the oxime, m. 105–6°, of the unsatd. ketone, b. 230–1°, which by the Skita method yields the satd. ketone, b. 210–1°, d_{15} 0.9090, n_D 1.4541, mol. refraction 45.89; semicarbazone, m. 182–3°; oxime, m. 95–6°. (c) is also obtained by the Skita method from 1,1-methyl-4-allyl-3-cyclohexanone, smells like isonitriles; oxime, m. 99–100°; semicarbazone, m. 125–8°. IV. Conversion of the thujaketo acids into tanacetophorone, and 1,3-isopropylcyclopentanone. With HANS WOERLITZER. A new method for effecting the above conversion (cf. C. A. 6, 1595) consists in esterifying the acids with alc. HCl and treating the resulting product with Na alcoholate. $\Delta^{2,6}$ -1-Methyl-3-isopropylcyclopentadiene, from tanacetophorone and MeMgI , unstable in the air, b. 166–7°, d_{21} 0.845, n_D 1.4913, mol. refraction 41.84. Bicycloisopropylpenteneisopropylpentanone (d), from 5 g. isopropylcyclopentanone allowed to stand 2 days with 0.4 g. Na in 10 cc. cold alc., m. 77–8°; oxime, $\text{C}_{16}\text{H}_{29}\text{NOH}$, begins to m. 125°, m. completely 149°; semicarbazone, m. 192.5°. Reduction with Pd-H in MeOH gives the satd. ketone, b. 157–65°, solidifies in a freezing mixt.; oxime, m. 136° (decompn. begins at 120°). Reduction of the satd. or unsatd. ketone with Na and alc. gives bicycloisopropylpentylisopropylpentanol, b. 160–4°, solidifies in the cold. Phenylurethan, m. 115–20°. the cold soln. of the Na deriv. of isopropylcyclopentanonecarboxylic reduction of the tanacetophoronecarboxylic

ester) is treated with 1 mol. PhN_2Cl , NaOAc ppts. from the resulting clear yellow soln. a light yellow *1,3-isopropylcyclopentanone phenylhydrazone*, yellow crystals with metallic luster from AcOEt , m. 233° , deep red crystals of somewhat lower m. p. from hot AcOH . Treatment of the ketone with $\text{BrCH}_2\text{CO}_2\text{Et}$ and Zn in C_6H_6 gives, besides the HO ester, the compd. (d). The HO acid $\text{C}_{10}\text{H}_{18}\text{O}_2$ was obtained only as an oil which, boiled several hrs. with 2 parts Ac_2O and distd. with steam, gave *1,3-isopropylcyclopentene-acetic acid*, $\text{Me}_2\text{CHCH}_2\text{H}:\text{CHCO}_2\text{H}$. V. *Dihydrofencholene alcohol*. With FRIEDRICH POHL. Treatment of fencholeneamine with HNO_2 yields, besides hydrocarbon, not the expected primary unsatd. alc. but a tertiary alc. (probably VI), $b_{12} 90-3^\circ$, reduced in Me_2CO by Paal's method to *dihydrofencholene alcohol*, b. $204-7^\circ$, $b_{17} 95-6^\circ$, $d_{15} 0.898$, $n_D 1.4571$, oil of a pleasant odor, very easily volatile with steam, stable towards CrO_2 ; heated 20 min. at $185-95^\circ$ with ZnCl_2 , it loses H_2O to form the hydrocarbon, $\text{C}_{10}\text{H}_{16}$, b. $165-7^\circ$, $d_{20} 0.8035$, $n_D 1.4479$, mol. refraction 45.97. *Fencholeneamine hydrate*, $\text{C}_{10}\text{H}_{18}(\text{OH})\text{CH}_2\text{NH}_2$, $b_{18} 134^\circ$, $b_{1-2} 112-3^\circ$; on standing with NaNO_2 in cold AcOH it gives a small amt. of *dihydroxyfencholane*, needles from C_6H_6 , m. $103-4^\circ$, isolated by extg. with CHCl_3 the reaction mixt. freed from fencholene alc. with Et_2O . VI. *Behavior of cyclomethylamines*. The cyclomethylamines with HNO_2 give, not only the corresponding alcs., but also alcs. of higher ring systems (*Terpene u. Campher*, 2nd ed., p. 154). To det. whether an unsubstituted CH_2NH_2 group is necessary for this peculiar reaction, the base *p*- $\text{MeC}_6\text{H}_{10}\text{HMeNH}_2$, b. $193-4^\circ$, was prepd. by reduction of the oxime, m. $58-9^\circ$, of *p*- $\text{MeC}_6\text{H}_{10}\text{Ac}$; *urea*, m. $180-1^\circ$; *phenylurea*, m. 98° . With HNO_2 it gives the corresponding sec. alc. The unsatd. acid, m. 153° , obtained in the usual way from 1,5-dimethyl-3-cyclohexenone, is reduced by the Skita method to *1,5-dimethylcyclohexane-3-acetic acid*, b. $256-8^\circ$, $b_{18} 137-9^\circ$, $d_{20} 0.962$, $n_D 1.4611$. *Methyl ester*, b. $230-1^\circ$, $b_{14} 116-8^\circ$, $d_{18} 0.9215$, $n_D 1.4476$, mol. refraction 57.48. *Amide*, m. $141-3^\circ$ or $146-8^\circ$ (according to the manner of heating), obtained from the chloride, together with some *nitrile*, b. 225° . With Br and alkali the amide gives the base *3,5-Me_2C_6H_3CH_2NH_2*; *hydrochloride*, m. 240° ; *urea*, m. 154° ; *acetyl derivative*, m. 79° . The HCl salt with NaNO_2 yields an oil, b. $195-205^\circ$, giving with CrO_3 a cyclic ketone-like compd.; *semicarbazone*, $\text{C}_{10}\text{H}_{19}\text{ON}_3$, whether the ketone has the structure $2,4,6\text{-Me}_3\text{C}_6\text{H}_3\text{O}$ or $\text{MeCH.CH}_2\text{CHMe.CH}_2\text{CH}_2\text{CH}_2\text{CO}$ is uncertain.

CHAS. A. ROUILLER.

Oxidation of ethyl alcohol by means of potassium permanganate. WILLIAM L. EVANS and JESSE E. DAY. *J. Am. Chem. Soc.* 38, 375-81(1916).—Into 30 g. KMnO_4 in 1000 cc. H_2O and varying amts. of KOH at 50° , kept vigorously stirred, was slowly dropped 9.21% aq. alc. until the reduction of the KMnO_4 was complete and the reaction mixt. was then analyzed for CO_2 , $(\text{CO}_2\text{H})_2$ and AcOH . Recalcg. the data on the basis of 5 g. EtOH completely oxidized, the yield in g. of the above 3 products ranges from 0.071, 0.6000 g., resp., for the soln. with no KOH to 1.716, 3.049, 3.139 g. with 579.3 g. KOH . Plotting the yields of the 3 products against the amt. of KOH , it is found that the $(\text{CO}_2\text{H})_2$ curve becomes practically parallel to the KOH axis from about 150 g. up, that for CO_2 from about 175 g. and that for AcOH from about 225 g. Discussion of the results is reserved for a later paper in which will be reported measurements at 25° and 75° .

CHAS. A. ROUILLER.

Amines. V. Formation of Schiff bases from β -phenylethylamine and their reduction to alkyl derivatives of this amine. NORMAN A. SHEPARD and ARTHUR A. TICKNOR. *J. Am. Chem. Soc.* 38, 381-7(1916); cf. Johnson, *C. A.* 8, 1279.—The following amines have been prepd. to compare their pharmacological activity with that of $\text{PhCH}_2\text{CH}_2\text{NH}_2$ (a) and *p*- $\text{HOC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{NH}_2$. $\text{PhCH}_2\text{CH}_2\text{N}:\text{CHPh}$, from (a) and BzH (Barger and Walpole, *C. A.* 4, 1018), has been obtained in 91% yield of purified material (found, 6.8% N); it b_{17-9} , $188-9^\circ$, and solidifies to stout prisms, m. $41-2^\circ$

(B. and W., about 70°); 15 g. in 300 g. alc., slowly treated with 40 g. Na, carefully dild. with H₂O, strongly acidified with HCl and concd., gives 18 g. of PhCH₂CH₂NHCH₂Ph.HCl, plates from H₂O, m. 265-6° (Fischer, *Ber.* 29, 211 (1896)). *p*-Methoxybenzal- β -phenylethylamine, in 13 g. yield from 8.1 g. (a) condensed with MeOC₆H₄CHO, b₁₁ 224-5°, m. 34-5°, reduced by Na and alc., with good yield, to the *bensyl compound* (b), oil; *hydrochloride*, plates from H₂O, m. 266-7°. *p*-Hydroxybenzal compound, in 83.0% yield from (b) and HOC₆H₄CHO at 100°, yellow prisms from 95% alc. or C₆H₆, m. 188-90°; *bensyl compound*, hexagonal tables from alc., m. 135-6°, isolated in 64.5% yield as the *hydrochloride*, leaflets from dil. HCl, prisms from 50% alc., m. 225-6°; the base is also obtained as the HI salt by boiling 4 g. (b) 1 hr. with 35 cc. HI. *o*-Hydroxybenzal- β -phenylethylamine, in practically quant. yield from (a) and HOC₆H₄CHO 1 hr. at 100°, yellow prisms from alc., m. 45.5°; 15 g. in 20 parts boiling alc. treated with 2.5 parts Na, cooled, dild. with H₂O, treated with 300 cc. of 1:1 HCl, evapd. to dryness at 100°, filtered from the oil, the cryst. residue (2.7 g.) freed from NaCl by trituration with cold H₂O, treated with NH₄OH, extd. with Et₂O and satd. with HCl gas, gives the *bensylamine hydrochloride*, stout prisms or blocks, m. 130°, easily dissociated by heating and by warming with H₂O; the aq. soln. yields 2.5 g. (b), resulting from the hydrolysis of the unreduced Schiff base. In alc. with 1-2% H₂O there is practically no reduction. *3*-Methoxy-4-hydroxybenzal compound, from vanillin and (a) (cf. Decker and Becker, *C. A.* 7, 1513), yellow columns or prisms from alc., m. 112-3° (D. and B. describe it as colorless plates, m. 108-9°); the alc. mother liquors yield 0.3 g. of a dark red substance sepg. from alc. in rectangular plates, m. 220-1°, insol. in NaOH and HCl, with 8.57% N, also formed in 0.5 g. yield in the condensation of *p*-HOC₆H₄CHO with (a). *Bensyl compound*, needles from 95% alc., m. 99-100°, isolated as the *hydrochloride*, needles from dil. HCl, m. 180°, in 47% yield.

CHAS. A. ROULLER.

New case of tautomerism: 1,4,5,6-tetrahydroxynaphthalene. A. S. WHEELER AND V. C. EDWARDS. *J. Am. Chem. Soc.* 38, 387-93 (1916); cf. *C. A.* 9, 308; Zincke and Schmidt, *Ann.* 286, 27 (1895).—Zincke and Schmidt found that solns. of their yellow 1,4,5,6-C₁₀H₄(OH)₄ (a), m. 154°, soon turn red in the air and deposit red crystals of the same m. p. and yielding the same derivs. as the yellow form. By means of not too strongly basic ketone reagents, W. and E. have now obtained mono- and diketone derivs., indicating the existence of 2 tautomeric forms, but, unlike the hydrojuglones, the keto and enol forms cannot be obtained pure and all efforts to distinguish differences in behavior of the yellow and red forms proved unavailing. The development of the red color is largely prevented by substituting N for air, or by the addition of a little SnCl₄. Single red crystals appear yellow under the microscope, but a mass of crystals, viewed directly, as well as the solns., are dark red. The com. naphthazarin (Badische) used as starting point was purified by sublimation under 2-10 mm., in an electrically heated app.; yield, 70%. From 20 g. of the purified product boiled 20 min. with 5 l. of 12% HCl and 100 g. SnCl₄ is obtained 18 g. (a), m. 153-4° without recrystn. Attempts to prep. an oxime by heating 0.2 g. (a) with 0.075 g. NH₂OH.HCl and 0.10 g. BaCO₃ in 15 cc. alc. for 4 hrs. and letting stand 4 days gave only a black amorphous ppt. When, however, 1 g. (a) in 100 cc. alc. is treated with 0.57 g. H₂NCONHNH₂.HCl and 0.51 g. KOAc in 3 cc. H₂O, crystn. begins in 4 hrs. and is complete in 1 day, 1.05 g. of the *semicarbazone*, C₁₀H₁₁O₄N₃, sepg. in yellow prisms, evolving violet vapors about 170-200°; softening and blackening; for analysis, it is freed as completely as possible of the small amt. of accompanying amorphous impurities by extg. with large amts. of solvents. *Phenylsemicarbazone*, obtained in 2.7 g. yield after 24 hrs. from 2 g. (a) and 1.6 g. PhNHCONHNH₂ in 250 cc. alc., needles, m. 218° (decompn.), evolving violet vapors; the red and yellow forms react with the same rapidity and give the same

amt. of product, both in alc. and in CHCl_3 . *Diphenylsemicarbazone*, $\text{C}_{20}\text{H}_{16}\text{O}_2\text{N}_4$ (not quite pure; found, 17.04% N), hexagonal plates, darkens 280° , condenses $285-7^\circ$ as a dark liquid on the upper walls of the capillary, is obtained in 1.17 g. yield in 3 days from 0.5 g. (a) and 0.8 g. PhNHCONHNH_2 in 70 cc. alc.; Me_2CO exts. from the product a small amt. of substance sepg. in scales, m. $120-1^\circ$. *p-Bromophenylsemicarbazone*, in 1.47 g. yield after 8 days from 2 g. (a) and 2.4 g. $\text{BrC}_6\text{H}_4\text{NHCONHNH}_2$ in 450 cc. alc., yellow needles from Me_2CO , decomp. $220-3^\circ$. *p-Nitrophenylsemicarbazone*, in 1.23 g. yield after 40 hrs. from 1.5 g. (a) and 1.2 g. $\text{O}_2\text{NC}_6\text{H}_4\text{NHCONHNH}_2$ in 200 cc. alc., yellow needles or prisms from Me_2CO , begins to decomp. 234° , gives violet vapors about 234° . *Benzoylhydrazone*, in 0.51 g. yield after 4 days from 0.5 g. (a) and 0.4 g. BzNHNH_2 in 60 cc. alc., yellow needles from $\text{Me}_2\text{CO}-\text{H}_2\text{O}$, decomp. $170-85^\circ$. *p-Nitrobenzoylhydrazone*, in 0.2 g. yield from 0.5 g. (a) and 0.5 g. $\text{O}_2\text{NC}_6\text{H}_4\text{CONHNH}_2$ in 100 cc. alc., warmed 4 hrs. and allowed to stand 2 days, yellow needles from Me_2CO , m. $220-4^\circ$ (decompn.). Me_2SO_4 in 10% NaOH and CH_3N_3 in Et_2O give amorphous products but 0.2 g. (a) and 0.2 g. CH_3N_3 allowed to stand 1 week in CHCl_3 and evapd. yield 0.18 g. of a cryst. material. From 1.5 g. (a) boiled 75 min. under 0.5 atm. excess pressure with 500 cc. MeOH and 15 cc. of concd. H_2SO_4 and poured into hot H_2O is obtained a large crop of reddish yellow needles, m. $115-40^\circ$; analysis indicates that it is a monomethyl ether (found, 64.05%; C, 5.32% H). No Ba, Pb or Ag salt of (a) could be obtained in H_2O or alc.

CHAS. A. ROUILLER.

II. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

FRANK P. UNDERHILL.

Enzymic adaptation. I. The saccharases. UGO LOMBROSO. *Lo sperimentale* 69, 425-45 (1915).—Defibrinated normal blood of the ox or dog possesses no hydrolyzing power upon sucrose *in vitro*. In equal time, the serum of animals treated with intravenous injections of sucrose showed a slight power of inversion. The pancreatic secretion of the dog possesses no power of inversion; this is acquired to a slight degree after injections of sucrose made subcutaneously or directly into the circulation and also after the ingestion of concd. sucrose or lactose solns. With pancreatic ext. the same results are obtained as with the secretion. An increase in hydrolyzing power, however, is not obtained by introducing sucrose into the intestinal lumen in large quantities and great concn. From the complexity of the results obtained it appears well founded that in the mechanism of modification of these enzymes it is not possible to postulate the intervention of a nervous reflex in the sense of Pawlow, Weiland and Bainbridge.

H. W. BANKS, 3d.

Enzyme of saliva which separates hydrogen sulfide from horse-radish. M. H. P. P. VAN HAEFF. *Arch. Neerland (III B)* 2, 377-84 (1915); *J. Chem. Soc.* 108, I, 914.—It was found that H_2S is produced when horse-radish is mixed with saliva, and that more is produced in a mixt. of a given wt. of horse-radish and saliva obtained by masticating, than with horse-radish finely ground with sand and mixed with saliva, indicating that the enzyme of saliva becomes adapted. The activity of the enzyme is increased by masticating horse-radish every day for a month. The enzyme, which is not identical with ptyalin, is not always present in saliva. Pure oil of mustard does not give the same action as horse-radish when mixed with saliva. E. J. C.

The mechanism of the adaptation of homotherm- to -adapted temperatures. A. MONTUORI AND R. POLLITZER. *Univ. Rome. A* 20, 344-60 (1915).
—Defibrinated blood, taken from an overheated d intravenously

or intraperitoneally into another animal of the same species maintained at a high enough temp. to produce hyperthermia, diminishes this hyperthermia and renders the animal more resistant to the temp. to which it is exposed. This effect begins to manifest itself in a very short time after the injection and reaches its max. in 30-40 min. The protective action of the supposed thermo-inhibitory substances injected diminishes gradually, when the temp. at which the animal is maintained is not excessive; otherwise hyperthermia increases rapidly. During the warm months (av. temp. 27°) the injection of defibrinated blood taken from normal animals has the same effect as blood taken from artificially overheated animals, though in less degree. Defibrinated blood from animals kept for a long time at 15° is without any effect whatever upon the injected animal.

A. W. DOX.

Chemical histology. A. B. D. FORTUYN. *Chem. Weekblad* 12, 1120-9(1915).—A report of a lecture, dealing with the importance of the chemistry of the cell and cell products in the animal tissue.

J. T. FLOHIL.

Pyrrole black. A. ANGELI. *Rend. accad. Lincei* 24, 1-6(1915); through *Ann. chim. applicata* 4, 288.—A. compares the formation of pyrrole black (by action of H_2O_2 on pyrrole in AcOH soln.) with that of the melanins. There is a marked resemblance between pyrrole black and the melanins. The latter do not show albuminoid reactions, but produce pyrrole, indole, skatole, nitriles, and pyridine. Pyrrole black by fusion with KOH or by heat, not only gives pyridine bases, but evolves vapors which give the reaction of pyrroles and of indoles, i. e., a chip of fir wood moistened with HCl turns red. H_2O_2 finally acts upon pyrrole black, which passes into soln., the liquid 1st becoming orange, and then yellow, with a light green fluorescence, suggesting the fact that the melanin of the hair loses its color by the action of H_2O_2 .

S. LEVY.

Contribution to the biochemistry of iodine. II. The distribution of iodine in plant and animal tissues. A. T. CAMERON. Univ. Manitoba. *J. Biol. Chem.* 23, 1-39(1915); cf. *C. A.* 8, 3307.—C. has made a large number of analyses using Kendall's method (*C. A.* 8, 3665) to throw further light on the distribution of I in algae, the presence of I in such tissues as the ascidian test, the annelid worm-tube and the dermis of the foot of the horse-clam and the variation in the I content of fish thyroids. The results outlined in the first paper have been verified. The I content of the thyroid of *Squalus* is remarkably const. both at different seasons of the year and from different localities. Variations in the I content of thyroid tissue can all be traced to differences in diet. In elasmobranch fish the thyroid tissue of females does not contain more I than that of males as is the case in mammals.

A. P. LOTHROP.

The influence of electrolytes upon the diffusion of potassium out of the cell and into the cell. JACQUES LOEB AND MCKERN CATTELL. Rockefeller Inst. *J. Biol. Chem.* 23, 41-66(1915).—Expts. were made on the embryo of *Fundulus* instead of the adult fish; the embryo is surrounded by a thick egg membrane through which any salt must diffuse before it reaches the embryo. The standstill of the heart and the resumption of the heart beat were taken as indicators of poisoning and recovery, resp. Eggs poisoned with KCl will not recover in distd. H_2O or saccharose soln., but will recover in a soln. of a salt or in H_2O containing a trace of acid. The relative efficiency of salts increases with the concn. of the salt and with the valency of the anion, the valency effect apparently following Hardy's rule. Eggs stained with neutral red do not lose the stain in distd. H_2O , but are readily decolorized when a trace of acid or salt is added to the H_2O . "The behavior of both the basic dye and the K can be understood on the as- their diffusion presupposes their combination with the colloidal anion. This combination is counteracted by the presence of an excess of ar- and trivalent ones, in the outside soln., and by the

presence of a trace of acid. This action of the acid may be explained on the assumption that the colloid of the membrane which binds the K and the neutral red is an amphoteric electrolyte which, through the addition of the acid is transformed into a salt, in the dissociation of which the colloid forms a cation which is no longer able to bind other cations." Poisoning with KCl is much retarded if the eggs are previously treated with distd. H_2O , the diffusion of the K being blocked by the layer of H_2O which has penetrated into the network of fibrils constituting the membrane. A. P. LOTHROP.

The role of electrolytes in the diffusion of acid into the egg of *Fundulus*. JACQUES LOEB. Rockefeller Inst. *J. Biol. Chem.* 23, 139-44(1915).—The effect of electrolytes on the diffusion of 0.002 *M* AcOH into the *Fundulus* embryo was studied. Salts inhibit the toxic action of the acid, the inhibiting action being a function of the anion as well as of the cation. Strong inhibiting action is shown by thiocyanates, acetates, sulfates and tartrates, less strong by chlorides, bromides and nitrates and little action by iodides. Ca and Sr and to a smaller degree Mg inhibit more strongly than univalent cations. As thiocyanates and tartrates are in themselves very toxic to the adult fish, the antagonistic action of the anions in these expts. consists in retarding the rate of diffusion of the acid through the membrane. It is possible that the diffusion is facilitated by the swelling effect of the acid and that the influence of the salt may be due to the antagonization of the swelling of the membrane. A. P. LOTHROP.

The apparent change of the osmotic pressure of cell contents with the osmotic pressure of the surrounding solution. JACQUES LOEB and HARDOLPH WASTENEYS. Rockefeller Inst. *J. Biol. Chem.* 23, 157-62(1915).—The osmotic pressure of the contents of fertilized and unfertilized eggs of *Fundulus* corresponds to a f. p. depression of 0.76°. If the egg is washed or kept in solns. of different concns., the osmotic pressure of the expressed juice varies somewhat with the concns. of the solns. in which it has been kept. "This is explained on the assumption that the membrane consists of fibrils and that some of the outside soln. adheres to the meshes of the outer part of the membrane, without, however, entering into the egg." The membrane is practically impermeable for H_2O and salt as long as the eggs are in physiologically balanced solns. and the outside soln. does not diffuse into the cell as the osmotic pressure of the eggs does not decrease the longer they remain in distd. H_2O . Apparently the osmotic pressure of the egg contents remains unchanged and the observed variations are due to the traces of solns. adhering in the meshes of the fibrils forming the outer part of the membrane. A. P. LOTHROP.

The total nitrogen and α -amino nitrogen content of pepsins of different strengths. T. B. ALDRICH. Detroit. *J. Biol. Chem.* 23, 339-43(1915).—Pepsins varying in proteolytic activity from 1:6,000 to 1:15,000 were analyzed for total and α -amino N. There is a gradual decrease in α -amino N in samples in the order of their strength indicating that during purification the simpler α -amino N compds. are gradually eliminated and that the stronger pepsins approach the native proteins in complexity. "The higher pepsins having a strength of 1:8,500 to 1:15,000 contain from 3.08 to 2.06% of α -amino N, equal to 13-20% of the total N, which compares with the α -amino N obtained by Van Slyke for deuto-albumose. The pepsins may therefore have been either mixtures of native proteins and their hydrolytic products, or may have consisted entirely of such products of partial hydrolysis as the lower albumoses." The % of total N shows little variation (14.14-14.94%). A. P. LOTHROP.

A study of the effects of certain electrolytes and lipid solvents upon the osmotic pressures and viscosities of lecithin suspensions. ADRIAN THOMAS. Clark Univ. *J. Biol. Chem.* 23, 359-76(1915).—The osmotic pressure of the lecithin suspension was measured with an osmometer consisting of a flask-shaped membrane of celloidin, into the neck of which was fitted a single-hole rubber stopper carrying an osmometer

tube of 3 mm. bore; the stopper was held in place by an elastic band. The membranes were suspended in small battery jars and the external medium in each case was of the same concn. of electrolyte or lipid solvent as the internal medium. Any change in pressure then was due to the effect of the electrolyte on the lecithin. The lecithin suspensions were prepared either by macerating the lecithin in warm H_2O or by dissolving it in Et_2O , adding H_2O and removing the Et_2O by warming and passing an air current through the soln. The suspensions tested contained 1% of lecithin. The osmotic pressures were decreased in the order HCl , NaI , $NaBr$, $NaCl$ and $NaOH$, the greatest depression occurring with the HCl . In general the lipid solvents increased the osmotic pressure from 15 to 33%. A Bingham-White viscosimeter (*C. A.* 6, 498) was used in measuring the viscosities. In general electrolytes lowered the viscosities but in the more concd. solns. of $NaOH$ and HCl increases were noted, due probably to direct combination with the lecithin, which is amphoteric. The lipid solvents, with one exception (isopropyl alc.), increased the viscosity. The changes observed may be regarded as due either to a mechanical or a chem. alteration of the suspensions or to both and should be considered in the theoretical explanation of anesthesia from a physico-chem. point of view.

A. P. LOTHROP.

Cephalin. II. Brain cephalin. P. A. LEVENE AND C. J. WEST. Rockefeller Inst. *J. Biol. Chem.* 24, 41-53 (1916).—Brain cephalin has been investigated to det. whether the compn. is const. and whether the amts. of the components obtained on hydrolysis agree with those required by the hypothesis that the mol. contains equimol. proportions of cephalinic acid, stearic acid, aminoethyl alc., glycerol and H_2PO_4 . The compn. was not changed by varying the nature of the solvent or the temp. at which pptn. or extn. took place. The Pb salt was prepared and gave, on analysis, values identical with the original substance. The liberation of free cephalin from the Pb salt and the reconversion of the free phosphatide thus obtained back into the Pb salt did not alter the compn. of the resulting substance. On quant. hydrolysis the sum of the components found averaged only 90% of the original wt., and it is evident that the so-called cephalin contains some other substance besides the components already mentioned. The portion unaccounted for may be an impurity. The authors are continuing the investigation of the compn. of cephalin through the prepn. and thorough purification of the hydro deriv. obtained by the reduction of cephalin with H (*cf. C. A.* 8, 713).

A. P. LOTHROP.

Experimental researches on exhaustion. G. W. CRILE. *Compt. rend. soc. biol.* 78, 52-4 (1915).—Exhaustion is that condition of the organism in which it has completely lost the power to transform potential into kinetic energy; this condition results from an alteration of one of the organs of the "kinetic system" (brain, thyroid, liver and muscles) or, as is more often the case, from simultaneous lesions of the brain, suprarenals and liver. Acute exhaustion is hastened by acute acidosis (increase in H^+ ion content of the blood), this latter condition being present after excessive muscular activity, traumatic shock, intense emotion (especially anger and fear) or anesthesia by Et_2O , $CHCl_3$, or N_2O . This acidity causes general inhibition of the motor centers, but excites the respiratory center with the result that the acidity is decreased (teleological protective measure). When the acidity of the blood too far exceeds the limits of equil., death ensues as in prolonged anesthesia.

H. S. PAINE.

Hydrolysis of albumins by the action of papain and papayotin. N. T. DELEANO. *Ann. sci. univ. Jassy* 3, 252-9; *Chem. Zentr.* 1915, II, 156.—Expts. were made to det. the hydrolysis of the ground seeds of *Lupinus luteus*. It was found that under the influence of papain the conglutin of these seeds is split into NH_3 and amino acids, the change taking place independently of the temp. Coagulated vegetable albumin is attacked with more difficulty than non-coagulated; both kinds yield the same

hydrolytic products. Coagulated or dried animal albumin is not attacked by papain. On splitting the albumin of lupine seeds by means of papain no arginine is produced; this shows that the course of the reaction is neither autolysis nor germination. Papayotin loses its enzymic activity in less time than papain. L. W. RIGGS.

Some refractories used in dentistry. GUY S. MILLBERRY. *Dental Items of Interest* 38, 49-56(1916).—A discussion of the refractory oxides, carbonates, and silicates and their properties. JOSEPH S. HEPBURN.

Explosions-in-Mines Committee VII: Effects of inhaling dusts applicable for stone dusting in mines (HALDANE) 24.

B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

Rapid methods for the quantitative determination of albumin and sugar in urine. E. LENK. *Deut. med. Wochschr.* 41, 1281(1915).—On adding a little powdered pumice stone in the Esbach method sedimentation is completed after 10 minutes. In sugar detn. the urine is dild. and added to Fehling soln. and the end point is detd. by means of an acidulated $K_4Fe(CN)_6$ soln. S. AMBERG.

The chemical diagnosis of acute benzene intoxication. E. SCHMITZ. *Deut. med. Wochschr.* 41, 1250-1(1915).—A man died after taking, *per os*, some mixt. containing C_6H_6 . The autopsy was performed 11 days after death, the cadaver having been kept in a cool room. Three days after the autopsy the brain was examd. for C_6H_6 according to the method of Joachimoglu. The distillate obtained by heating 250 g. finely divided brain with 500 cc. water and 50 cc. 25% H_2SO_4 was caught in CCl_4 . The lower layer was nitrated. A mixt. of isomeric dinitrobenzenes was obtained and by recrystn. from 75% alc. a small amt. of nearly pure *m*-(NO_2) $_2C_6H_4$ was obtained. The mixt. of dinitrobenzenes gave the reaction of Chavassieu and Morel, that is, a transitory but intense color of violet on treating an alk. alc. soln. with reducing sugars. The color can be extd. from its watery soln. with $AmOH$ and shows an absorption band between 595 and 600 with the comparison spectroscop of Schmidt and Haensch. The amt. of C_6H_6 calcd. to be present in 1350 g. brain was 0.0745 g. But the process yields only 55-60% of the C_6H_6 . The method of Joachimoglu is well suited for the detn. of C_6H_6 in the cadaver. S. AMBERG.

Colorimetric determinations: the quantitative determination of albumin in urine. W. AUTENRIETH AND F. MINK. *Munch. med. Wochschr.* 62, 1417-20(1915).—Utilizing the biuret reaction for colorimetric comparison albumin in the urine could be detd. with about the same degree of accuracy as with the gravimetric method. Measure 10 cc. of urine, containing 1-4 per mille albumin, into a test tube. Put the tube in boiling water a few min., add dil. $AcOH$ and, if necessary, a few cc. satd. $NaCl$ soln. Collect the ppt. on a filter and wash with hot water, dissolve in 3% $NaOH$, add 4-5 drops of 20% $CuSO_4$ soln. and make up the volume to 10 cc. with 3% $NaOH$. Shake the mixt. thoroughly 2-3 min. and let stand about 10 min.; filter if necessary. The filtrate is ready for colorimetric comparison in the Autenrieth-Königsberger colorimeter against a standard which has been prepd. by comparison with albumin obtained from human urine. The compn. of the standard soln. is not given. If the urine to be tested contains more or less than 1-4% albumin less or more of it is used. S. AMBERG.

A new optical method for the detection of traces of spermatozoa. R. HELLER. *Vierteljahr. ger. Med. öffent. Sanitätsw.* 50, 37-42(1915).—The method is based on the fact that albuminous substances when subjected to ultraviolet light become fluorescent. The rays of light are filtered in practice. During the illumination cotton shows or maintains a weak bluish color, while spermatozoa give intense blue-white

rays in the dark blue background. Similar phenomena are observed even in the presence of other substances like metals, etc.

E. J. KELLEY.

Microtitration with formaldehyde and its application to physiology. I. General review of microtitration with formaldehyde. A. CLEMENTI. *Rend. accad. Lincei* 24 51-5(1915); through *Ann. chim. applicata* 4, 288-9.—C. discusses the importance of microanalysis in the biologic sciences. His purpose was to change the Schiff-Sørensen method of titration of amino acids into a micro method. Good results, differing little from theoretical values, were obtained on chem. pure solns. of glycocoll, leucine, *dl*-leucylglycinedipeptide and guanylpolypeptide. The essentials for the analysis are a 0.02 *N* soln. of NaOH, 0.001 *N* solns. of amino acids or polypeptides in CO₂-free H₂O, and burets of 1 cc. divided into 200 parts. Microtitration is practically possible, and in the case of pure solns. of amino acids, gives results conforming to theoretical. The author's results are obtained either with solns. of pure amino acids or of polypeptides. Less than 1 mg. of amino acid is sufficient to complete an analysis.

S. LEVY.

Microtitration with formaldehyde and its application to physiology. II. A. CLEMENTI. *Rend. accad. Lincei* 24, 102-7(1915); through *Ann. chim. applicata* 4, 289.—The micro-method described in the preceding abstract was applied to polypeptide enzymes, using still smaller quantities than before. Concordant results were obtained with intestinal erepsins, and with hepatic peptidases. C. proposes to apply the micro-method to the detn. of the action of arginases, for the quantitative research of amino acids in blood and in other liquids of the organism.

S. LEVY.

A new reaction for the investigation of the cerebrospinal fluid. GUSTAV EMANUEL. Charlottenberg. *Berl. klin. Wochschr.* 52, 702-4(1915).—On account of the difficulty in the prepn. and lability of the colloidal gold soln. used in the Lange test, this reaction is very much limited in its application. For this reason E. advocates the substitution of an emulsion of gum mastic for the colloidal gold soln. Neisser and Friedmann showed that it behaved in the same way. The technic for prepg. the emulsion and making the test is given. A table of results with 32 cases is given.

JULIAN H. LEWIS.

Clinical application of the Frommer-Engfeldt acetone test. N. O. ENGFELDT. Stockholm. *Berl. klin. Wochschr.* 52, 796(1915).—The technic described for the estn. of the amt. of acetone in urine is as follows: 100 cc. of the urine is dild. with an equal amt. of H₂O and acidified with 1 cc. of HOAc. The mixt. is distd. through a condenser that is well cooled and the distillate is received in a vessel kept cool and containing 20-25 cc. of cold H₂O. The distn. is carried on for 15 mins. after the first drop comes over. The distillate is dild. to 100 cc. with H₂O, 10 cc. of which is taken for analysis. To this sample 1 g. of solid KOH is added and before soln. takes place 10-12 drops of a salicylic aldehyde soln. (1 part in 10 parts abs. alc.). As the KOH goes into soln. the mixture turns from a yellow to a dark red. This color is compared with that produced by a known amt. of acetone. Cf. *C. A.* 9, 2548. J. H. L.

The measurement of toxicity. W. J. V. OSTERHOUT. Harvard Univ. *J. Biol. Chem.* 23, 67-70(1915).—In the case of a number of toxic substances, the toxicity of which is measured by their effect on the elec. cond. of living tissues, the action follows the course of a monomol. reaction and the consts. which express the reaction velocities of the two reactions afford the best measure of their relative toxicities. In cases in which such consts. cannot be used but in which a complete curve can be obtained, O. suggests the adoption, as an arbitrary standard, of the time necessary for the reaction to proceed half way to the maximum. Other criteria must sometimes be employed but it is undesirable to do so. The use of unlike criteria. The detns. should be made at 18°.

A. P. LOTHEOP.

The salicylates. II. Methods for the quantitative recovery of salicyl from urine and other body fluids. T. W. THOBURN AND PAUL J. HANZLIK. Western Reserve Univ. *J. Biol. Chem.* 23, 163-80(1915); cf. *C. A.* 10, 643.—A method is described for the detn. of salicyl (salicyl group in whatever form of combination) in urine, feces, joint fluid and blood. *Recovery from urine.* Collect the urine until salicyl-free (4-5 days) when extd. with Et_2O and tested with a 2% soln. of Fe and $(\text{NH}_4)_2\text{SO}_4$. Combine the urines into a composite sample. Measure 100 cc. of urine and 20 cc. of 85% H_3PO_4 into a 500 cc. Jena Erlenmeyer flask and boil gently while conducting steam through the mixt. Connect the flask with a condenser by means of a distg. bulb and conduct the distillate into a graduated flask. Continue the distn. over a gentle flame until the concd. residue begins to foam. Add more H_2O and continue the distn. until 2 drops of the distillate give no pink color with 2 drops of Fe and $(\text{NH}_4)_2\text{SO}_4$. Distil 25 cc. after the test becomes negative. The distillate should be perfectly clear, practically colorless and possess a neutral or very slightly acid reaction to litmus. Dilute with distd. H_2O to a definite vol. Prepare a standard by dissolving 0.115 g. of dry Na salicylate in 1 l. of distd. H_2O ; 1 cc. = 0.1 mg. of salicylic acid (the soln. remains unchanged for about a week). Add to a definite vol. (5-10 cc.) of the distillate 0.1-0.5 cc. of the 2% Fe and $(\text{NH}_4)_2\text{SO}_4$ soln., dil. to 50 cc. and compare the pink to violet color with that produced by a definite quantity of the standard dild. to 50 cc. and containing an equal amt. of the Fe soln. until the colors match. Make a rough trial at first and repeat the detn. at least twice to get the exact quantities of distillate and standard which match. Compare the colors in standard Nessler tubes as these give more accurate results than the small Duboscq colorimeter cups. Less than 0.02 mg. and more than 5 mg. cannot be detd. *Recovery from joint fluid and blood.* Dil. 15 cc. of blood or fluid with 98% EtOH to 150 cc. and shake vigorously. Allow to stand 1 hr. and filter. Transfer 100 cc. of the filtrate to a beaker and add 5-6 drops of a satd. ZnCl_2 soln. Boil gently on an elec. stove until most of the EtOH is removed. Add 25 cc. of distd. H_2O and conc. to $1/2$ by boiling. Filter and wash the paper with hot H_2O (3-4 times) until salicyl-free. The filtrate should be refiltered if not clear. Add a little H_2O and 20 cc. of H_3PO_4 , distil and estimate the salicyl in the distillate as described under urine. 95% of the salicyl in blood is removed by this procedure. *Recovery from feces.* Recovery from feces is unimportant for all practical biological purposes owing to the presence of only extremely small amts. due to rapid absorption. A method of procedure is outlined. *Recovery of free salicylic acid from blood and joint fluid.* Ext. an aliquot portion (25-100 cc.) or the entire quantity of unclotted blood or fluid with small amts. of Et_2O (15-25 cc.) by gently rotating the separatory funnel, until 2-3 drops of the Et_2O ext. evapd. on a watch glass give no color with a drop of the Fe and $(\text{NH}_4)_2\text{SO}_4$ soln. Place the Et_2O exts. in a glass evapg. dish and allow the Et_2O to evap. spontaneously. Treat the residue with hot distd. H_2O until dissolved and rub down the sides of the dish. Filter and wash the paper until the washings give no color with the Fe soln. Make up the filtrate to a definite vol. (50 cc.) and est. as directed under urine. The residual portion from the separatory funnel may be analyzed for combined salicyl as described under blood if the material is limited.

A. P. LOTNROP.

An effective apparatus for evaporating aqueous extracts by means of a current of air. T. B. ALDRICH. Detroit. *J. Biol. Chem.* 23, 255-9(1915).—An app. is described for evapg. large vols. of liquids, containing substances not sensitive to oxidation but sensitive to heat, by means of a warm blast of air. Using 2 flat dishes having a combined surface area of 180 sq. in., a liter of liquid can be evapd. in about 3 hr. at 28-30° at a cost of about 4 cents.

A. P. LOTNROP.

The determination of ammonia nitrogen in
Penn. State College. *J. Biol. Chem.* 23, 311-

C. COCHRAN
of $(\text{NH}_4)_2\text{CO}_3$

makes the figures for N as free NH_3 unreliable and those for total ammonia N are worthless unless the rapid NH_3 decompn. is prevented. CHCl_3 and toluene are ineffective in preventing decompn. H_2SO_4 in slight excess of the amt. sufficient to fix the NH_3 present as carbonate retards decompn. to such an extent as to allow time for analysis. All NH_3 detns. must be made on daily samples because H_2SO_4 does not completely stop decompn. in a composite sample. The results cast doubt on the accuracy of NH_3 detns. in the urine of herbivora reported in the literature. The N as NH_3 compds. was detd. by Steel's modification of Folin's method (*C. A.* 5, 302) on account of the large amt. of phosphates in steer urine. A. P. LOTHROP.

The Abderhalden reaction. DONALD D. VAN SLYKE, MARIAM VINOGRAD-VILCHUR AND J. R. LOSER. Rockefeller Inst. *J. Biol. Chem.* 23, 377-406(1915).—A simple and quant. method has been devised for measuring by amino-N detn. the extent of the proteolysis occurring when substrate and serum are incubated as in the Abderhalden reaction. The method is sufficiently simple, accurate, free from subjective influence and specific for proteolysis to afford definite conclusions concerning the facts of the reaction. Extreme care was taken in the prepn. of the placenta substrate, the precautions prescribed by Abderhalden being strictly observed. Colloidal $\text{Fe}(\text{OH})_3$ was used to free the mixt. from protein after incubation, and, after evapn., the free amino-N in the filtrate was detd. with the micro-amino app. Only normal sera were used as controls. "Practically every serum, whether from pregnant or a non-pregnant individual, showed protein digestion when incubated with placenta tissue. The range of individual variation in proteolytic activity was wide. The range covered by most of the normal sera was, however, identical with that covered by the majority of the pregnant sera. There is a tendency for the results from the pregnant sera to average somewhat higher than those from non-pregnant. The difference, even in the averages, is not great, however; and the individual variations of both pregnant and non-pregnant sera make the results from both overlap so completely as to render the reaction, even with quant. technic, absolutely indecisive for either positive or negative diagnosis of pregnancy. Further evidence of non-specificity is seen in the fact that carcinoma tissue was digested to about the same extent as was placenta. It appears that nearly all human sera can digest certain coagulated tissue proteins to some extent, but that the source and significance of the proteolytic agents, and the influences that cause their fluctuation remain as yet undetd." A. P. LOTHROP.

The micro-method for gasometric determination of aliphatic amino nitrogen. DONALD D. VAN SLYKE. Rockefeller Inst. *J. Biol. Chem.* 23, 407-9(1915).—A modified gas buret has been devised which increases the accuracy of the readings to such an extent that only 1 cc. of soln. is required for analysis with consequent reduction of the amt. of material required to obtain results of the same % accuracy. Soft, flexible "stethoscope" tubing which has a wall 3-4 mm. thick is best adapted for the rubber connections. A. P. LOTHROP.

Analysis of proteins by determination of the chemical groups characteristic of the different amino acids. DONALD D. VAN SLYKE. Rockefeller Inst. *J. Biol. Chem.* 23, 411(1915).—The formula for calcg. histidine in the original article (*J. Biol. Chem.* 10, 29) is incorrect. It should read: Histidine N = 1.5 D.—1.125 Arg. A. P. L.

Can carbon dioxide in sea water be directly determined by titration? S. MORGULIS AND E. W. FULLER. U. S. Fisheries Biol. Station, Woods Hole. *J. Biol. Chem.* 24, 31-5(1916).—M. and W. criticize the conclusions of Moore, *et al.* (*C. A.* 7, 523) regarding the method of detg. CO_2 in marine organisms. In their expts. on several species of fish, respiratory CO_2 was obtained as compared with 0.95-2.76 as reported by Moore. When known quantities of CO_2 are added to alkali with phenol.

H₂O, on an average not more than 33% can be recovered by titration and with sea water factors, such as amt. of indicator, excessive agitation, etc., cause appreciable differences in the titration. "No results obtained by a method of such questionable value are of importance nor can general conclusions derived from them receive serious consideration."

A. P. LOTHROP.

Detection of alcohol in cadavers. M. CARRARA. Turin. *Liguria med.* 7, 187; *Zentr. Biochem. Biophys.* 18, 130(1915).—The Nicloux method of detection of alc. in the cerebrospinal fluid was used for the purpose of throwing light on the question of whether death was caused by accident or by excessive intoxication. This method (which depends on the production of the green coloration of Cr₂(SO₄)₃) gave satisfactory results.

H. S. PAINE.

Investigation of milk with relation to legal medicine. A. CEVIDALLI AND E. MURGIA. Cagliari. *Liguria med.* 7, 198; *Zentr. Biochem. Biophys.* 18, 115(1915).—These investigations relate to the detection of milk spots. The milk spots should be dissolved in H₂O and the milk globules should be stained scarlet-red with Sudan III. Maceration of short duration in 10% soda soln. may occasionally be necessary, but this should be followed immediately by washing with distd. H₂O. Detection of colostrum corpuscles may be accomplished by the same method. The Tugendreich reaction (which is adapted to microscopic observation) is recommended for sp. diagnosis.

H. S. PAINE.

Determination of the reaction of urine. H. F. HÖST. Christiania. *Z. klin. Med.* 81, 266-71(1915); *Zentr. Biochem. Biophys.* 18, 119(1915).—The Friedenthal and Salm colorimetric method (more thoroughly studied by Sørensen) is recommended for the detn. of the reaction of the urine. The principle employed depends upon a comparison of the color of the urine in question with that of solns. of various definite H⁺ concns. after the addition of an indicator. Sørensen's phosphate and borate mixts. and Michaelis' NH₄Cl-NH₄OH solns. are used as reagents. The "primary" phosphate is a 0.2 M soln. which contains 9.078 g. KH₂PO₄ per l., while the "secondary" phosphate is a 0.2 M soln. with 11.876 g. Na₂HPO₄ per l. NHCl, NH₄Cl and NH₄OH solns. are also used. The indicators are methyl red (satd. soln. in 50% alc.), neutral red (0.1% soln. in 50% alc.) and phenolphthalein (1% soln. in 96% alc.). The temp. employed throughout is 18°. The phosphate and borate mixts. are first prepd. and brought to the color of the urine with Bismarck-brown; color comparison is then made after addition of the indicators. Good results were obtained with the method, which is not complicated and may be operated with relative rapidity in the examn. of numerous samples of urine.

H. S. PAINE.

Acetone in milk. N. O. ENGFELDT. *Svensk Farm. Tidskrift* 19, 610-20(1915).—100 cc. of the sample of milk are mixed with 260 cc. water and 40 cc. 10% tannic acid added to remove the proteins. After filtering and washing, the filtrate is distd. just 15 min. and the acetone in the distillate detd. by 2 methods. These methods are the well known iodometric titration and a colorimetric method described in C. A. 9, 2100, 2548. The samples were tested for phenols, reducing substances, nitrates and nitrites, which interfere with the former method. Reducing substances develop in the milk on standing. This can be largely prevented by adding boric acid to the sample. Where the detn. was to be made some time after the drawing of the milk the distillate was treated with KOH and H₂O₂ and redistd. In the second distn. the heat is raised to boiling very slowly, to complete the oxidation. The amt. of acetone in the milk seems to vary with the yield but not with the time of milking, period of lactation, nor the age of the animal. The colostrum has an acetone content within the same range as that of normal milk. Human milk contains from 0.48 to 1.16 mg. acetone per liter.

that of the cow from 1.45 to 2.42 mg. and that of sheep and goats from 0.48 to 1.45 mg. per liter.

A. R. ROSE.

Characterization of picric acid in urine. P. GRÉLOT. *J. pharm. chim.* 12, 209-15 (1915).—The direct test for picric acid in neutralized urine by means of KCN soln. is uncertain, also when KCN is applied to the Et_2O ext., owing to presence of picramic acid, or of uroerythrin. The wool test is reliable, and is not interfered with by biliary pigments or pathological coloring matter of the urine. Defecate 100 cc. of urine with 0.1 of its vol. of $\text{Pb}(\text{OAc})_2$, filter, remove Pb by H_2SO_4 , again filter, ext. the liquid with 0.2 of its vol. of Et_2O and sep. The yellow Et_2O soln. containing picric and picramic acids stains wool more or less orange, permanent towards soap. Its change to red by means of $(\text{NH}_4)_2\text{S}$ is not a very sharp test. Check tests may be carried out with the Et_2O residue, either by transforming picramic into picric acid by means of HNO_3 or H_2SO_4 , or by reducing these acids to $\text{C}_6\text{H}_5(\text{OH})(\text{NH}_2)_2$ by means of Sn in HCl soln. The HCl soln. dild. with 10-20 vols. of H_2O turns blue, then lilac, then colorless upon exposure to air, or more rapidly by the addition of 1-2 drops of FeCl_3 soln. (1:10).

S. WALDBOTT.

Detection of iodine in urine. LOSSER. *Pharmazeutisches Journal* 54, 265 (1915); *J. pharm. chim.* 12, 229-30 (1915).—A few drops of urine are well mixed on a watch crystal with a particle of HgCl_2 . After a few seconds, a distinct yellow color develops, due to HgI_2 . The reaction is sensitive to as little as 0.01% of I. The presence of sugar or albumin does not disturb.

S. WALDBOTT.

Apparatus for the determination of urea and sugar in urine. RICHARD WEISS. *Schweiz. Apoth. Ztg.* 53, 646, 689-90 (1915).—From the vol. of N produced with NaBrO , or of CO_2 with yeast, the % of urea, or of sugar, may be read from the instrument. The gas is generated in a small wide-mouthed bottle and, if CO_2 , displaces glycerol; if N it displaces H_2O in a graduated cylinder open at the bottom and closed on top by a pinch cock. The cylinder is surrounded by a wider glass into which the measuring liquid is put. By opening the pinch cock, the liquid is brought to the zero mark. In the case of urea, a definite vol. of dild. urine is put into the bottle, and the NaBrO soln., placed into a small cup within the bottle, is kept sepd. from the urine until zero adjustment in the cylinder is made; then the cup is upset by shaking.

S. W.

Quantitative method for the determination of pus in urine of "pyelitic" children by means of hydrogen peroxide. A. NORGAARD. Copenhagen. *Z. Kinderheilk.* 13, 244-7 (1915).—The pus cell contains a catalase, which decomps. H_2O_2 . The amt. of this decompn. produced by a urine is taken as a measure of the pus content. The time of the reaction is about 3 hrs.

C. J. WEST.

Determination of reducing sugars—of cuprous oxide (SCALES) 7. A biochemical reaction for rancid fats (VINTILESCU) 12.

C. BACTERIOLOGY.

ERNEST D. CLARK.

Contribution to the study of experimental sporotrichosis. G. D'AGATA. *Lo sperimentale* 69, 697-721 (1915).—Rats and mice were inoculated with *Sporotrichum Beurmani* isolated from a case of osteoperiostitis of the superior maxillary. The morphological characteristics, virulence, culture media, and reaction to stains, are described.

H. W. BANKS, 3d.

A new culture medium. M. FEILER. *Berl. klin. Wochschr.* 52, 767-8 (1915).—"Ragit" agar is a powder composed of agar, granulated bouillon, and peptone; from it culture media can be quickly prepd. by mixing with H_2O in the right proportion. The prepn. can be put up in tablets with other substances from which the special media can be prepd.

JULIAN H. LEWIS.

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was completely liquefied by the 8th day. The bacillus is aerobic and its optimum temp. of growth is 28–35°. Subcutaneous inoculation of guinea pigs and rabbits with this bacillus resulted in putrid abscesses with symptoms of general intoxication; the same effects, with more rapid occurrence, were produced by intravenous injections. This organism is considered to be a new form of pyogenic bacillus. H. S. PAINE.

The relation between vegetative vigor and reproduction in some Saprolegniaceae. A. J. PIETERS. *Am. J. Botany* 2, 529–77(1915).—With several species of Saprolegniaceae no necessary relation exists between the vegetative growth and the reproductive capacity. Expts. with *Achlya racemosa*, *A. prolifera*, *Saprolegnia ferax* and *S. monoica* all agree in showing that a mycelium out of a relatively poor soln., measured by vegetative growth, may produce more or larger oogonia than are produced on a mycelium from a soln. that is much better for vegetative growth. Levulose is used more readily by *Saprolegnia ferax* and *S. monoica* than other sugars except maltose, and it has a greater effect in developing the production of oogonia than maltose has. Sucrose is probably not used by species of *Saprolegnia* or of *Achlya* unless it is first inverted by some other agency. P in the culture soln. tends to increase the reproductive capacity of the fungus. The minimum concn. of food necessary varies with the species but lies in general at about 0.1% peptone for the production of both sporangia and oogonia. While growing vegetatively a mycelium may develop tendencies that may affect the number and character of reproductive organs under subsequent and different conditions. J. J. SKINNER.

Bákhar: The Indian rice beer ferment. C. M. HUTCHINSON AND C. S. RAM-AYYAR. *Mem. Dept. Agri. India (Bact. Ser.)* 1, 137–68(1915).—This investigation was conducted to ascertain whether the manufacture of bákhar, an artificially prepd. ferment, can be advantageously controlled by the government, and if so, in what manner. The kind of microorganisms and their relative physiological activities, with reference to their saccharifying power and alc. production, in the various samples of bákhar were detd. The expts. show that variations in quality of bákhar accompanied by fermentation failures are not so much to be attributed to absence of efficient amyliferments as to that of good types of *Saccharomyces*. Better results were obtained when the diastase secreted by *Aspergillus* was destroyed by heating before the addition of yeast, the action of which is seriously interfered with by the presence of any considerable amount of this enzyme in the sugar soln. to be fermented. The activity of the yeast is also increased by aeration of the liquid. J. J. SKINNER.

Possible sterilizing properties of dental cements. W. V.-B. AMES. *J. Ind. Eng. Chem.* 7, 723(1915).—Polemical. Answer to the criticism of Poetschke (*C. A.* 9, 3289). E. J. C.

The germicidal efficiency of some copper cements used in dental work. RAYMOND F. BACON. Univ. Pittsburg. *Dental Cosmos* 58, 40–9(1916).—The germicidal efficiency of Cu cements is due to the fact that they constantly give off minute traces of Cu, which pass into soln. and kill the organisms. A cement is satisfactory if it kills all the bacteria in a reasonable time, and exerts a sterilizing action as long as it remains in the tooth, preventing the development of bacteria in contact with the cement. Four commercial cements (a Cu cement, Cu oxyphosphate cement, and 2 brands of white Cu cement) were examined and found to satisfy these requirements. Dentine from badly decayed teeth was crushed and added to saliva from the mouth of a person with well preserved teeth; the mixt. was then filtered, there being obtained a filtrate a culture which contained both the normal and the abnormal oral flora as met in dental surgery. The cements were tested as hardened pellets of uniform size and shape. Ten pellets of a given cement and 5 cc. of the prepared saliva were incubated at 37.5°;

tube (bouillon) and plate (agar) cultures were made at intervals. The saliva invariably became sterile after the cement had acted on it for 6 hrs. JOSEPH S. HEPBURN.

D. BOTANY.

CARL L. ALSBERG.

Influence of the pyrrole nucleus upon the formation of chlorophyll. G. POLLACCI AND B. ODDO. *Rend. accad. Lincei* 24, 37-9(1915); through *Ann. chim. applicata* 4, 288.—Mg pyrrole carbonate has a harmful action upon *Zea mays*, at concns. above 50% in aq. soln.; in plants sprung from seeds sprouted in aq. soln. of Mg pyrrole carbonate of less than 0.5% strength, the tissues were found to be normal. Care was taken that this salt as well as the H₂O be free of Fe. According to the authors, the formation of chlorophyll in plants grown in Fe-free soil is a new observation.

S. LEVY.

A pathological and physiological study of the black heart of the potato tuber. E. T. BARTHOLOMEW. Madison, Wis. *Centr. Bakt. Parasitenk., Abt. II* 43, 609-41 (1915).—Shippers in various parts of the U. S. have suffered considerable loss in their shipments of potatoes in carload lots due to an internal blackening of the potatoes. This paper is a report of an investigation into the cause of this condition. It is found that the black heart is produced by abnormal physiological changes and not by a parasitic organism. The abnormalities may be produced artificially by subjecting the potatoes to a temp. of 38-48°, 42-4° being the optimum. The optimum length of time of exposure is 15-20 hrs. Sixteen varieties of potatoes were experimented with and since all these responded to the test, it is assumed that all other varieties will behave in a similar manner. By supplying sufficient O during the heating period the abnormality may be prevented. The demand for O during this period is greater than before and can be supplied by bathing the potatoes with a constant stream of air. If after removing from the oven, the potatoes are kept in an atm. devoid of O, the tissues will not blacken. Usually the abnormality cannot be detected before the potato is cut open. If the affected tubers are allowed to remain a wk. or 10 days before cutting open, a hollow is formed in the interior, due to the shrinking of the abnormal tissues. An oxidizing enzyme (tyrosinase) and a chromogen (tyrosine), which readily interact in the presence of free O, are present in both normal and abnormal tissues. As a result of the interaction of these 2 substances, the affected tissues undergo a series of color changes which range from light pink to coal black. The increase in amt. of the chromogen present in free form, the access of an unusual amt. of free O₂ due to the killing of the cells, and the accelerated action of the oxidizing enzyme, all work together to make possible the rapid discoloration of the tissues. Tests for homogentisic acid in the abnormal tissues were negative. The amino acid content of the potato tissues during the heating period was greatly increased. The substance causing the discoloration of the abnormal tissues is melanin or humin. From these expts. it is concluded that the formation of black heart potatoes can be prevented in shipping by proper ventilation and by keeping the potatoes in a temp. which does not exceed 35°.

JULIAN H. LEWIS.

The action of illuminating gas on plants. P. SORAUER. *Landw. Jahrb.* 48, 137-69(1915); *Chem. Zentr.* 1915, II, 715.—The results of S.'s expts. to det. the influence of illuminating gas on vegetation, are summed up as follows: The blue coloration of the roots can be looked upon only as a usual and not as an invariable symptom of illuminating-gas poisoning since this coloration also occurs during the decay of dead roots. As a result of the exclusion of O from the roots in a soil satd. with gas, intramol. respiration takes place at the expense of the cell contents. The reserve starch of the roots disappears and, as a rule, the entire cell content of the root rind. During slower action of illuminating gas upon the roots, the resulting intramolecular respiration also

manifests itself in the upper parts of the plant; the chlorophyll is disturbed, etc. With the drying of the green parts of the plant and the decrease in evapn., a consequent excess of H_2O accumulates in the lower parts. Finally attention is called to a mucid obstruction of the fleshy roots which with the exception of O exclusion was only found accompanying the action of illuminating gas. These symptoms together with the quick withering of cut twigs placed in water, when taken as a whole, are characteristic of illuminating-gas poisoning.

C. F. MILLER.

Phenomena of slow combustion in dead plants. M. P. MAZÉ. *Compt. rend. soc. biol.* 78, 30-2(1915).—Expts. in which precautions were taken to exclude fermentation, etc., showed that slow combustion in dead plants is characterized by values of the coeff. CO_2/O_2 which are widely different from those furnished by the respiration of living plants; it is, therefore, concluded that the slow combustion which ensues in dead plant material is not analogous in its nature to respiratory combustion. Plant tissues possess a structure and compn. which, after the death of the plant, favor a form of slow combustion, the external indications of which have some points in common with those of respiration.

H. S. PAINÉ.

Experiments on the physiology of indigo-yielding glucosides. F. R. PARNELL. *Mem. Dept. Agr. India (Botanical Ser.)* 7, 195-212(1915).—An indigo-yielding glucoside is present in the roots and seeds of both *W. tinctoria* and *W. tomentosa*. It is absent from the leaves of the latter. The glucoside and its enzyme in *W. tinctoria* are distinct from those of *Indigofera arrecta* and *I. sumatrana* although *Wrightia* enzymes have some action on *Indigofera* glucoside and *vice versa*. *W. tinctoria* seeds, when germinated and grown without N, increase in glucoside content until it becomes about trebled in 40 days. When N starvation begins to show, the amount decreases, but is still considerable when the seedlings are on the point of death. *W. tomentosa* seedlings show no appreciable increase of glucoside under the same conditions. When cuttings of *Polygonum tinctorium* and *Strobilanthes flaccidifolius* are grown without N, part of the glucoside disappears, presumably being used up as a N reserve. In *W. tinctoria* and *I. Arrecta*, the max. % content occurs at an early stage in the development of the leaf. The actual amt. in any leaf increases during growth to a max. at maturity and remains constant until leaf-falls, when the whole is present in the fallen leaf. Indican is produced in the dark by etiolated shoots of *I. Arrecta*. There is no variation in indican content between night and day in *I. Arrecta* and *I. sumatrana*.

J. J. SKINNER.

E. NUTRITION.

PHILIP B. HAWK.

NORMAL.

Digestibility of some animal fats. C. F. LANGWORTHY AND A. D. HOLMES. Office of Home Economics. U. S. Dept. Agr., *Bull.* 310(1915).—The digestibility of butter and of rendered kidney fat of beef, mutton and pork was studied. The basal diet consisted of wheat biscuit, fruit, tea or coffee with a little sugar if desired; to this was added a blanc mange containing skim milk, caramel, sugar, corn starch, vanilla flavor, and the fat whose digestibility was to be tested. The av. quantity of fat consumed daily by each subject varied with the kind and was: pork fat 90, beef fat 100, mutton fat 53, butter fat 100 g. Each experimental period included 3 days, and was followed by a rest period. The subjects were men students between 20 and 30 yrs. of age. Several subjects were studied with each fat. The ingested fat and the feces fat were detd.; the difference was digested fat. The av. per cent digested was: pork fat 93.7, beef fat 88.9, mutton fat 80.5, butter fat 93.9. To allow for fecal metabolic fat, the basal ration plus blanc mange, to which no fat had been added, was fed; ingested and fecal fat were detd.; and the quantity of metabolic products in the ether

ext. of the feces was calcd. The coeffs. of digestibility were then found to be: butter fat 97, pork fat 97, beef fat 93, mutton fat 88%. The m. p. was detd.: butter fat 32.0°, pork fat 35.0°, beef fat 45.0°, mutton fat 50.0°. "It seems fair to conclude that of those tested the fats of low m. p. are capable of more complete assimilation than those which have a high m. p." A laxative effect was noted when 140 g. of beef fat were eaten in 1 day.

JOSEPH S. HEPBURN.

The metabolic relationship of the proteins to glucose. III. Glucose formation from human proteins. N. W. JANNEY AND N. R. BLATHERWICK. Montefiore Home, N. Y. *J. Biol. Chem.* 23, 77-80(1915).—Human muscle was fed to fasting phlorizinized dogs and the sugar formed from the proteins contained in the muscle was calcd. In 5 expts. an av. of 58% of the muscle protein was converted into glucose and a "ratio of 3.6:1 may be accepted as representing the relation between the N contained in human muscle protein and the glucose originating from the same in metabolism. The proteins of the human organism collectively may yield a max. of about 58% of glucose in diabetic metabolism. In the fasting human diabetic of the severest type, when glycogen and possible sources of glucose other than protein are exhausted, the urinary G:N ratio 3.4:1 may be accepted as an av. value." Higher ratios recorded in the literature can no longer be accepted.

A. P. LOTHROP.

The effect of ingested purines on the uric acid content of the blood. W. DENIS. Harvard Med. School. *J. Biol. Chem.* 23, 147-56(1915).—The subjects used in the expts. were adult hospital patients and were divided into three classes: "normal individuals" who were normal except for surgical conditions; nephritic and cardiorenal cases; and persons suffering from chronic diseases not associated with kidney insufficiency or fever. The purine-free diet consisted of eggs, bread, milk, cheese, butter and fruit and during the high-purine feeding the eggs and most of the bread were replaced by a daily ration of 150 g. of calves' liver, 200 g. of roast beef or chicken and 200 cc. of "concd. broth" (hospital soup boiled down to $\frac{1}{4}$ its original vol.). Detns. of uric acid and non-protein N in the blood were made at the end of each period, and uric acid in the urine was detd. daily. In the normal individuals the ingestion of large amts. of purine-containing food did not increase the uric acid content of the blood, the normal kidney excreting the excess of uric acid thereby maintaining the amt. of circulating uric acid at the same level as when only endogenous uric acid is to be excreted. A more or less marked increase in uric acid was observed in the blood in cases of renal insufficiency, even when the damage to the kidney had not progressed to the point where N retention was apparent. "When the detn. of uric acid in the blood is undertaken as a diagnostic test, the insistence on a preliminary period during which no purine-containing foods are consumed is unnecessary, except in cases in which kidney insufficiency exists, or perhaps in the case of persons who habitually consume extremely large quantities of purine-containing foods."

A. P. LOTHROP.

The nature of the dietary deficiencies of rice. E. V. MCCOLLUM AND MARGUERITE DAVIS. Univ. Wisconsin. *J. Biol. Chem.* 23, 181-230(1915).—"There are necessary for normal nutrition during growth 2 classes of unknown accessory substances, one sol. in fats and accompanying these in the process of isolation of fats from certain foodstuffs, and the other sol. in H_2O (and alc.), but apparently not in fats." The H_2O and alc.-sol. accessory is present in H_2O and alc. exts. of wheat embryo and of egg yolk; it is stable to heat and is not injured to any noticeable degree by prolonged boiling. The amts. of H_2O ext., freed from protein by coagulation, which supply enough of the H_2O -sol. accessory to induce normal growth, contain N equiv. to about 1% of the total N of the ration and amts. of alc. ext. of wheat embryo containing only 0.6 g. of solids and N equiv. to 0.33% of the total N of the ration suffice to induce normal growth. The H_2O -sol. accessory is not identical with that furnished by butter

fat for the addition of as much as 20% of butter fat does not induce growth unless the other accessory is supplied. "Purified proteins, fats having the growth-promoting property, and salt mixts. of appropriate compn. cannot adequately supplement polished rice so as to produce a diet which will support growth." The deficient mineral salt content of the polished rice is not the cause of the deficiency as the addition of salts and free mineral acids closely imitating the inorganic content of the polished rice to rations of milk powder and dextrin and of dried egg and dextrin does not cause any loss of growth-promoting power. Mixts. of rice and egg, rice and milk powder, and rice and wheat embryo containing as much as 80-90% of rice are satisfactory for growth and prolonged well-being, indicating that polished rice is in no way toxic to animals. Enough of the H_2O -sol. accessory which is essential to induce growth is furnished by the addition of amts. of wheat embryo or milk powder as small as 2% of a ration consisting of polished rice, casein, salts and butter fat. On the other hand the fat-sol. accessory must also be supplied as no growth occurs on the above diet if the butter fat is eliminated. Rice does not contain much, if any, of the fat-sol. accessory, but rice polishings carry the H_2O -sol. accessory.

A. P. LOTHROP.

The essential factors in the diet during growth. E. V. McCOLLUM AND MARGUERITE DAVIS. Univ. Wisconsin. *J. Biol. Chem.* 23, 231-46(1915).—The employment of lactose and casein of relatively high purity in rations made up of food-stuffs otherwise carefully purified is open to serious objection and their use in such rations has led to erroneous conclusions, since they must be of exceptional purity to be free from both the H_2O -sol. and fat-sol. accessories (cf. preceding abstract). The authors have purified casein after 2 reprecipitations by washing in H_2O acidified with $AcOH$ for 6-7 days and with distd. H_2O for 24 hrs. The product was very poor in ash and all the H_2O -sol. constituents were dialyzed out of the granules. With this specially purified casein combined with dextrin, butter fat and salts no appreciable growth in rats was obtained, even during the first month. In a study of the relative values of isolated proteins fed with mixts. of purified food substances, comparable amts. of these 2 classes must be supplied. Otherwise no safe interpretations can be put upon the results. While the amt. of accessory substances of either of these classes which is required to induce growth is small, the evidence points to the belief that a certain quantity must be present before any growth can take place, and that above this amt., growth seems to be in some measure proportional to the amt. of accessories present. A. P. L.

The cause of the loss of nutritive efficiency of heated milk. E. V. McCOLLUM AND MARGUERITE DAVIS. Univ. Wisconsin. *J. Biol. Chem.* 23, 247-54(1915).—Moist skim-milk powder that has been heated for a long time in a double boiler, or for 1 hr. in an autoclave at 15 lbs. pressure, no longer supports growth, and loses its property of supplanting rations which require both protein and H_2O -sol. accessory to make them support growth. Wheat embryo can be heated under the same conditions without losing this property. Whey and lactose can be heated in an autoclave for 1 hr., and whey from which the albumin has been removed by coagulation, can be kept at the boiling temp. for 6 hrs. and still supply the H_2O -sol. accessory in active form. Heating moist casein for 1 hr. in an autoclave destroys its biological value as a complete protein, and the loss of nutritive efficiency of heated milk is due to a loss of value of the protein fraction of the ration through changes in the casein. Heated casein or milk powder have little, if any, toxicity.

A. P. LOTHROP.

Xanthophyll, the principal natural yellow pigment of the egg yolk, body fat, and blood serum of the hen. The physiological relation of the pigment to the xanthophyll of plants. LEROY S. PALMER. Univ. Missouri. *J. Biol. Chem.* 23, 261-79(1915).—The hen utilizes relatively little carotin in the pigmentation of the egg yolk and body fat, the principal pigment belonging to the xanthophyll group of plant pigments. The

natural pigment of the egg yolk, body fat and blood serum, is physiologically identical with the carotin and xanthophyll pigments of plants, but the latter class is present in by far the greater proportion. "Feeding tests with laying hens, in which the pigment of the feed was carotin to the relative exclusion of xanthophyll, were without appreciable influence upon the amt. of pigment carried by the blood serum and deposited in the egg yolk. The feeding of rations relatively free from both carotin and xanthophyll to laying hens resulted in a marked reduction of the amt. of this pigment." The color of the flesh of fattening poultry and the amt. of natural pigment in the egg yolk can be controlled by selecting rations containing little xanthophyll in the first case, and feeds rich in that pigment when yellow yolks are desired. A. P. L.

The behavior of some hydantoin derivatives in metabolism. III. Parabanic acid. HOWARD B. LEWIS. Univ. Penn. *J. Biol. Chem.* 23, 281-6(1915).—Parabanic acid was fed to rabbits and to a dog, and the urine was analyzed for total N and for urea by the urease method of Van Slyke and Cullen. No evidence of the conversion of significant amts. of parabanic acid into urea was obtained in any of the expts. The increase in total N corresponded closely to the amt. of N administered as parabanic acid. In the dog the ingestion of the acid caused a stimulation of metabolism. In 2 perfusion expts. in which parabanic acid was added to blood which was perfused through the livers of a normal and of a phlorizinized dog, there was no destruction of the parabanic acid by the liver. A. P. LOTHEROP.

Experiments upon the fate of ingested sodium nucleate in the human subject. MAURICE H. GIVENS AND ANDREW HUNTER. Cornell Univ. Med. College. *J. Biol. Chem.* 23, 299-309(1915).—Na nucleate was ingested in 4 expts. after equil. had been established on a diet practically purine-free. In each case the administration of the nucleate was without effect on the purine bases of the urine. Only from 14 to 30% of the Na nucleate could be accounted for by the increase in uric acid excretion. In 2 cases there was a marked delay (3-4 days) in the elimination of the exogenous uric acid and it is evident that its elimination may normally take place much less promptly than is usually supposed. G. and H. are inclined to accept the view of Siven (*C. A.* 8, 2741) that "purines entering, or liberated in, the alimentary canal undergo, before absorption, a varying degree of bacterial destruction." A. P. LOTHEROP.

Studies on blood fat. II. Fat absorption and the blood lipoids. W. R. BLOOR. Harvard Med. School. *J. Biol. Chem.* 23, 317-26(1915).—Dogs which had fasted for 24 hrs. were given a feeding of fat and the blood lipoids were detd. in samples of blood drawn from the jugular vein at intervals over a period of about 8 hrs. The blood was analyzed for (a) total fat (fatty acid + cholesterol), (b) cholesterol and (c) lecithin. The fatty acids show the ordinary increase of alimentary lipemia but the increases vary in different animals and in the same animal at different periods. Cholesterol plays at most a minor part in fat absorption as in general there is only very slight variation in the amt. present. Lecithin increased in all the expts. from 10 to 35% with an av. of about 20%. "It is possible that the extra lecithin may represent that part of the absorbed fat which is intended for immediate use and which has been synthesized for that purpose from the material absorbed from the intestine." This synthesis may take place in the liver by the passage of the 30-40% of fat, which cannot be accounted for in the thoracic duct, through the intestinal capillaries and portal circulation to the liver, thus providing abundant material for the formation of the lecithin. On the other hand, the lecithin may be synthesized in the intestinal wall, just as the fatty acids and glycerol are converted into glycerides. "However, if fats and lecithin were formed simultaneously, the parallelism between the two in the blood would be more apparent." "The increases in lecithin come later and more gradually than the increases in fat, and the fat, in the blood, is the more abundant." "The increases in lecithin come later and more gradually than the increases in fat, and the fat, in the blood, is the more abundant."

crease in fat in the blood is the stimulus which starts the lecithin formation and that the intestine is not the seat of formation." A. P. LOTHROP.

Some features of purine metabolism. H. GIDRON WELLS. Univ. Chicago. *J. Lab. Clin. Med.* 1, 165-71 (1915).—Review of the literature, especially with reference to the work from the author's lab. H. G. W.

The influence of calcium supply on propagation. R. EMMERICH AND O. LOEW. *Landw. Jahrb.* 48, 313-30 (1915); *Chem. Zentr.* 1915, II, 717.—Expts. carried out with mice, rabbits and guinea pigs led to the following conclusions: A greater Ca supply increases the number of litters; the number of young is greater when their individual weight is less. CaCl_2 is more effective than KCl or MgCl_2 . NaCl was found to have a favorable action. The increased production brought about by NaCl results in a large decrease (12%) in the wt. of the mother animals (mice). C. F. M.

F. PHYSIOLOGY.

ANDREW HUNTER.

The coagulating power in vitro of the tissues most commonly used in hemostatic dressings. L. TORRACA. *Lo sperimentale* 69, 493 (1915).—In studying the coagulating power of the tissue exts., the method of Bürker (*Arch. ges. Physiol.* 149 (1912)) was followed. Exts. of aponeurotic, adipose, muscular, and epiploic tissues all possessed a certain coagulating power. This power is variable, depending on the tissue, the individual, and the locality from which the tissue was taken. The coagulating power is greatest in the epiploic ext., and least in the aponeurotic; the muscular and adipose tissues lie between these two extremes and are about equal. In even the most concd. exts. the differences are small, so that for the purposes of practical surgery these tissues may be regarded as equal in hemostatic power. H. W. BANKS, 3d.

Muscle chemistry. IX. Organic and inorganic phosphorus of the smooth and striated muscular tissue of birds; formation of phosphoric acid during the autolysis of muscular tissue of birds. A. COSTANTINO. Univ. Pisa. *Arch. farm. sper.* 20, 276-302 (1915); cf. *C. A.* 9, 1073.—Striated muscle of birds (chicken) is higher in total P, sol. P, and inorg. P, than smooth muscle. Both contain an appreciable amt. of sol. org. P. White muscle is richer in sol. P and inorg. P than red muscle. Phosphatide P and protein P occur in smaller amts. in white striated than in red striated or in smooth muscle. Total P and sol. P are higher in striated muscle of birds than in that of mammals. Total P, sol. P, inorg. P, phosphatide and protein P in smooth muscle of birds are higher than in that of mammals. The relative proportions of inorg. and org. P. are practically identical for the three kinds of muscle. During autolysis of striated and smooth muscular tissue of birds there is an increase in inorg. P. X. Chemistry of the phosphorus-containing substances of smooth muscular tissue of mammals. *Ibid* 361-70.—The phosphorylated proteins of the smooth muscular tissue of mammals belong to the nucleoproteins. Part of the nucleoproteins of smooth muscle can be extd. by physiological NaCl soln. A. W. DOX.

Anaphylactic shock produced by the blood of a woman in guinea pigs sensitized by placental proteins. F. D'HERELLE AND L. GÉRY. *Compt. rend. soc. biol.* 78, 55-8 (1915).—Guinea pigs which received 2 cc. of the ext. (prepd. with physiol. NaCl soln.) of a fresh placenta (free from blood) died with symptoms of cachexia. Guinea pigs which were sensitized by intraperitoneal injection of 1 cc. ext. (corresponding to 0.036 mg. of dried protein as detd. by comparisons with horse serum pptd. by alc.) survived; after 35 days these animals were used for the following expts.: Injection of 1 cc. of the serum of a man failed to produce anaphylactic crisis and the animals survived. Injection of 1 cc. of the serum of women (at various stages of pregnancy or non-pregnant and either virginal or non-virginal) invariably resulted in anaphylactic crisis

and death in 1-26 mins. Injection of 1 cc. of the centrifuged blood from the umbilical cord of a still-born, male infant failed to produce anaphylactic crisis. It is concluded that the blood of woman contains throughout life certain sp. proteins which are identical with those which are present in placental tissue. H. S. PAINE.

Formation of creatine in the animal organism. ALEXANDRE PALLADIN AND I. WALLENBURGER. Petrograd. *Compt. rend. soc. biol.* 78, 111-3(1915).—P. and W. have studied the possibility of the formation of creatine from glyco cyanamine in the animal organism in view of the contradictory data relating to the theory that creatine is produced from arginine with glyco cyanamine as an intermediate substance. Autolysis of the muscles of rabbits showed a content of 0.574-0.678% creatine, the period of autolysis being variable; when 1 g. glyco cyanamine was added, the corresponding amts. of creatine obtained varied between 0.806 and 1.426%. When 3.5-4.5 g. glyco cyanamine were injected subcutaneously (in 0.5 g. doses 3 times per day) in rabbits the creatine content of the muscles was found to be 21.5-35.6% greater than in normal rabbits; the creatine content of the muscles of the latter was nearly const., showing a variation between 0.517 and 0.545% (av. = 0.525%). Autolysis of the muscles of *Lotta vulgaris* with addition of glyco cyanamine also showed an increased content of creatine; the transformation of creatine was, however, considerably slower than in the case of rabbit muscles. The normal creatine content of the muscles of *L. vulgaris* was found to be 0.512-0.541% (very nearly the creatine content of rabbit muscles). It is concluded from the foregoing expts. that glyco cyanamine is transformed into creatine under physiol. conditions. H. S. PAINE.

Internal secretion of the testicles. RENZO ROVEDA. Modena. *Pensiero med.* 3, 803-7; *Zentr. Biochem. Biophys.* 18, 114(1915).—The testicles possess a true internal secretion which contains substances which play a part in the development of the secondary characteristics of male sex. H. S. PAINE.

Presence of skatole in the distillate from urine. P. BINDA. Pavia. *Gazz. med. ital.* 64, 301-2; *Zentr. Biochem. Biophys.* 18, 121(1915).—The distillate (also the CHCl_3 ext. of the distillate) from human and dog urine, when subjected to the Ehrlich test, assumed a wine red color which in the case of the CHCl_3 ext. became lighter in color after several days and finally assumed a bluish red color. This reaction must be attributed, not to indole, but to a substance which caused the color change of the indole reaction. This reaction is probably due to skatole, inasmuch as the latter was isolated from a 2nd distillate which had been acidified with HCl ; skatole was obtained as glistening red crystals after repeated extn. with Et_2O and soln. in satd. picric acid and C_6H_6 , etc. Detection of skatole in the urine is believed to possess clinical significance. H. S. PAINE.

Compounds of the benzene series which are present in sputum. P. BINDA AND CASSARINI. Pavia. *Gazz. med. ital.* 64, 461-3; *Zentr. Biochem. Biophys.* 18, 121(1915).—B. and C. have studied the compds. of the C_6H_5 series which have their origin in processes of putrid decompn. and are eliminated in the sputum and which sometimes accumulate in the bronchi and pulmonary cavities. Indole, either as such or as an indole-producing substance, is frequently present in the sputum, but this compd. does not necessarily originate from decompn. processes in the sputum itself. Indole may also, in such cases, be derived from the blood and may pass directly into sputum with effusions or by means of exudative and transudative processes. H. S. P.

Changes in the content of fatty substances of striated muscles during the first few hours after death. R. ROMANESI. Turin. *Liguria med.* 7, 200; *Zentr. Biochem. Biophys.* 18, 122(1915).—Detn. of the fat content of the same muscle immediately after death and 24, 48 and 72 hrs., resp., subsequent thereto indicated that the fat content first undergoes a decrease and then an increase. More exact study of the be-

havior of the satd. and non-satd. fatty acids showed that both participate in the decrease in the total fat content, but that the subsequent increase is due exclusively to the non-satd. fatty acids. The change during the 1st period is doubtless due to genuine fat consumption, while that in the 2nd period is probably caused by synthesis due to putrefactive bacteria.

H. S. PAINE.

Influence of alanine on bile secretion. FILIPPO LUSSANA. Bologna. *Bull. sci. med.* 84, 557-68; *Zentr. Biochem. Biophys.* 18, 125-6(1915).—Alanine, when administered *per os* in amts. of 5-20 g., caused a considerable increase in the bile secretion of dogs which had been fasting for 21 hrs. previously; sugar in similar amts. had not the slightest influence on the formation of bile. Stimulated secretion was first manifested by an increase in the H₂O content of the bile and subsequently by an increase in the free constituents thereof.

H. S. PAINE.

Viscosity of endolymph and perilymph. GILBERTO ROSSI. Florence. *Arch. fisiol.* 12, 415-28; *Zentr. Biochem. Biophys.* 18, 130(1915).—R. detd. the relative viscosity of the endolymph and perilymph of the pigeon. In view of the small amt. of liquid which is available for such expts. an especial method for detg. viscosity in instances such as the above is described. Measurements at 18-20° showed relative viscosity values of 2.9 and 1.7, resp., for endolymph and perilymph.

H. S. PAINE.

Blood sugar content of new-born and prematurely born children. FRITZ HELLER. Univ. Strassburg. *Z. Kinderheilk.* 13, 129-34(1915).—Values are given of the blood sugar content for 15 cases (3 prematurely born) during the 1st 9 days; they vary from about 0.066 to 0.12%. The age, the amt. or kind of food, and the time of feeding appear to have no influence upon the amt. of blood sugar.

C. J. WEST.

G. PATHOLOGY.

H. GIDEON WELLS.

Formation of immune bodies by means of different typhoid vaccines. O. LÖWY. *Deut. med. Wochschr.* 41, 1277-8(1915).—Rabbits received injections of typhoid bacilli killed by heating for 1 hr. at 56°, bacilli killed with EtOH and living bacilli sensitized according to Besredka using a great excess of highly agglutinating horse serum. The serum of rabbits having received bacilli killed by heat or by ether showed a high agglutinating titer; that of rabbits treated with sensitized bacilli did not possess any greater agglutinating power than serum of normal animals. The bactericidal power of the serum was the same in all the instances, while the treatment with sensitized bacilli yielded a serum of greater complement-fixing power.

S. AMBERG.

The irrationality of bacterial vaccines in the treatment of pyorrhea alveolaris. ARTHUR H. MERRITT. New York City. *Dental Cosmos* 58, 62-9(1916).—The use of bacterial vaccines in pyorrhea alveolaris is irrational because the bacterial flora is exceedingly complex, and there is no evidence that any of the organisms produces the disease. The antibodies in the blood and lymph are practically without effect on the organisms in the pyorrheal pockets. The difference between the bacteriology of the normal mouth and that of pyorrhea is merely quant., not qual. Vaccines liberate protein poison, a drawback to their use.

JOSEPH S. HEPBURN.

The biologic co-relation of the law of similars. RALPH R. MELLON. Ann Arbor, Mich. *J. Am. Inst. Homeopathy* 8, 784-91(1916).—M. points out certain phenomena in physical chemistry and in immunity which are in harmony with the law of similars.

JOSEPH S. HEPBURN.

Metabolism in the severe chronic anemias of man. E. GRAFF. Heidelberg. *Deut. Arch. klin. Med.* 118, 148-62(1915).—In an earlier work (*Münch. med. Wochschr.* 59, 2840(1912)), it was found that the metabolism of rabbits made anemic by bleeding was normal, or somewhat raised, while that of rabbits made anemic by poison-

ing with phenylhydrazine was lowered. The object of the present work, is to find whether the same holds true with man. Ten cases of severe chronic anemia, 3 produced by severe hemorrhages into the stomach and 7 being pernicious anemia, were studied as to the respiratory quotient, N output, and heat production. In all, the heat production per kg. body wt. varied from 25.1 to 34.7 cal.. These figures are the normal ones and in none was there found the subnormal values as in phenylhydrazine poisoning in rabbits.

JULIAN H. LEWIS.

The influence of bleeding on the rest nitrogen of the blood serum in uremia. S. GUTMANN AND L. WOLF. Berlin. *Deut. Arch. klin. Med.* 118, 174-8(1915).—Whether or not there is any improvement after bleeding, or whether the amt. of blood removed was small or large, the rest N content varied only within narrow limits. Of the 22 cases investigated, 14 showed an increase and 8 a decrease. There was an increase in 6 of the 9 that showed improvement and a decrease in 3. In all cases only 3 showed a variation over 20%.

JULIAN H. LEWIS.

Lipase and leucocytes. ALFRED RESCH. Zurich. *Deut. Arch. klin. Med.* 118, 179-89(1915).—It was found that the lymphocytes are the origin of the lipolytic enzyme found in an exudate produced by injecting lecithin into the pleural cavity. The optimum action of the enzyme was at the true neutral point and at the H-ion concn. of the blood. Morphologically, the mononuclear cells in the exudate are lymphocytes and are of hematogenous origin.

JULIAN H. LEWIS.

The influence of the extirpation of the liver on the temperature and respiratory quotient. E. GRAFE AND G. DENECKE. Heidelberg. *Deut. Arch. klin. Med.* 118, 249-66(1915).—The most marked results of the extirpation of the liver were a fall in the body temp. and a great increase in the respiratory quotient. It is believed that these changes do not indicate any change in the metabolism of the carbohydrates, even though there is an increase in the CO₂ output from the blood. With the rise of CO₂ in the expired air there is a decrease in the blood, while in the case of increased carbohydrate oxidation, the increase of CO₂ in the blood and expired air, are parallel.

JULIAN H. LEWIS.

The influence of muscular work on blood sugar. W. VON MORACZEWSKI. Carlsbad. *Berl. klin. Wochschr.* 52, 1038-9.—A series of expts. was conducted to show the effect of muscular work on the blood sugar after certain diets. It is shown that after work the sugar is increased, but much more after a carbohydrate meal or if the organism is well nourished than during starvation. A large amt. of sugar can be assimilated as the result of hard work provided the organism has a tolerance for sugar. A diabetic with just an inclination to glucosuria accumulates sugar in the blood much more easily and on a diet with which a normal man would hardly show any increase in the blood sugar; with a carbohydrate diet, the increase is still more marked. It is suggested that these methods be used in detecting slight inclinations to glucemia. Another difference between normal people and diabetics is that the latter excrete more uric acid after work.

JULIAN H. LEWIS.

The clinical advantage of bile analysis in disease. EMIL MEDAK AND BRUNO OSKAR PRIBRAM. Vienna. *Berl. klin. Wochschr.* 52, 706-9, 740-3(1915).—The quant. analysis of the pigment and cholesterol in bile removed from the duodenum by means of a tube can assist in making prognoses and in detg. the indications for treatment in many different diseases. The methods of detg. the pigments and cholesterol are given.

JULIAN H. LEWIS.

The influence of milk and its antibodies on the action of hemolytic toxins. H. SACHS. Frankfurt a/M. *Berl. klin. Wochschr.* 52, 764-7(1915).—In the toxin from the garden spider there is a hemolytic element called by S. "arachnolysin" and by others

"epiralyain." It lyses beef and rabbit blood but not guinea-pig or sheep blood. Cells of the guinea-pig tissues, however, possess binding receptors for the toxin, because an antitoxic serum can be obtained by immunizing guinea pigs with the arachnolysin. Toxins may have 2 sorts of antitoxins, one which unites specifically with the toxin, as does diphtheria antitoxin, and another which unites with the receptors of the cells, thus depriving these cells of the ability of anchoring the toxin. Cow milk can inhibit the hemolytic action of arachnolysin for both beef and rabbit blood. This antitoxic action is destroyed by heating to 65° for 1/2 hr. There is no quant. difference in its action if the milk is incubated for a long while before injection. It is believed that there are in milk the sort of antibodies which act by satg. the toxin binding cells of the body. The difference between heated and unheated milk in their action on arachnolysin can be used for their differentiation.

JULIAN H. LEWIS.

Comparison of the Wassermann and the Hermann-Perutz syphilis tests. J. ZADREK. *Neukölln. Berl. klin. Wochschr.* 52, 893-5(1915).—The technic of the Hermann-Perutz test for syphilis is as follows: To 0.4 cc. of the hemoglobin-free inactivated serum is added 0.2 cc. of a 2% aq. soln. of Na glycocholate and 0.2 cc. of a soln. composed of 2 g. of Na glycocholate, 0.4 g. cholesterol, and 100 g. of 96% alc. If, after standing for 20 hrs., a distinct ppt. is produced, the reaction is considered to be positive. In the examn. of 1000 cases of syphilis in all stages, it was found that 51.2% gave a positive Wassermann and 72.7% a positive Hermann-Perutz test. With a large number of controls, 94.4% gave a negative Wassermann and 89% gave a negative Hermann-Perutz test. The latter test was not specific in severe pulmonary tuberculosis, carcinoma, typhoid, sepsis, uremia, and eclampsia. In the examn. of cerebrospinal fluid, it was non-specific only in uremia and eclampsia.

JULIAN H. LEWIS.

Brain lipoid as a hemostatic. ARTHUR D. HIRSCHFELDER. *Univ. Minn. Berl. klin. Wochschr.* 52, 976-7(1915).—By actual tests on experimental animals it is shown that the lipoidal substance prepared from ox brain could control hemorrhages. It stopped the bleeding that occurred during tonsillectomy. On account of its cheapness and ease of prepn., this substance lends itself to many fields of application, especially in field and emergency surgery.

JULIAN H. LEWIS.

The effect of acute serous meningitis on the metabolism of a diabetic. L. LICHTWITZ. Göttingen. *Berl. klin. Wochschr.* 52, 996-8(1915).—A patient who was convalescing from typhoid was being treated for diabetes. Careful analysis of the urine showed that he was improving; the sugar balance was positive, the acidosis was sinking, and there was a retention of N. On the fifth day the patient developed meningitis with a very high fever and as a result marked changes in the metabolism occurred. The vol. of urine increased about 4 times. The total N output increased from 7.39 g. to 30.9 g. Likewise the "acetone bodies" and NH₃ increased. He was given 30.2 calories of food per kg. body wt. but on account of the great excretion of sugar only 19.2 were utilized and consequently he was undernourished. The output of sugar was much over the intake, showing that the source of the excess was the broken down protein, because, being a diabetic patient, his tissues were glycogen-free. It is believed that these developments were the direct influence of the acute infection.

JULIAN H. LEWIS.

The miostagmin reaction with malignant tumors. O. WISSUNG. Copenhagen. *Berl. klin. Wochschr.* 52, 998-1001(1915).—The miostagmin reaction was made on 500 patients with malignant tumors and 350 patients with non-malignant tumors and other affections. A 2% soln. of linseed and castor oils in abs. alc. was used as antigen, and Frank's stalagmometer was used to measure the reaction. A positive reaction was obtained with 84% of the malignant tumors. Most were inoperable carcinomas. None of the non-malignant tumors gave a reaction. All febrile conditions gave a

positive reaction but only for a few days after the disappearance of the fever. All cases of pregnancy gave positive reactions in the last 3-4 months, but not 2 weeks after parturition. Cardiac disease with decompensation, cirrhosis of the liver, icterus gravis, pulmonary tuberculosis, severe diabetes mellitus, chronic rheumatic polyarthritis, chronic nephritis, and uremia gave positive reactions. Although the reaction is not specific it may be of assistance in the early diagnosis of carcinoma.

JULIAN H. LEWIS.

Practical application of the complement-fixation test. M. TSURUMI. *Berl. klin. Wochschr.* 52, 1142(1915).—By using exts. of bacteria instead of a suspension of whole bacteria, the complement-fixation test could be made so delicate that *B. paratyphosus* could be differentiated from *B. typhosus*.

JULIAN H. LEWIS.

The Wassermann reaction in pemphigus. ERNST NATHAN. Frankfurt. *Berl. klin. Wochschr.* 52, 1183(1915).—All cases of pemphigus vegetans and vulgaris, in which syphilitic infection was absent either from the history or clinically, the Wassermann reaction was negative. This is in direct contradiction to a statement made by Hesse that a positive Wassermann reaction is characteristic of pemphigus.

JULIAN H. LEWIS.

The significance of the virulence and morphological conditions of bacteria in immunization and the immunizing action of autolyzed cultures. ERICH TOENNIESSEN. *Centr. Bakt. Parasitenk., Abt. I* 76, 262-75(1915).—To study this question a strain of Friedländer's bacillus was studied. It was highly virulent, had a broad capsule and a well developed ectoplasm and endoplasm. This strain could be divided into 2 variants, one called the fluctuant and the other the mutant. The former was avirulent; it possessed a broad ectoplasm and endoplasm but no capsule. The mutant was also avirulent, possessed a meager endoplasm, only a barely visible ectoplasm, and no capsule. Twenty-four-hr.-old, killed, agar cultures of the stem strain and of the fluctuant strongly immunized mice and guinea pigs while the mutant did so only slightly. This shows that neither the virulence nor the possession of a capsule has any significance in affecting the immunizing properties of these bacteria. The most active part in immunization seems to be the ectoplasm. The immunizing relations of the bacteria were obtained with the use of autolyzed cultures.

JULIAN H. LEWIS.

The mechanism of the Abderhalden reaction with bacterial substrates. G. H. SMITH AND M. W. COOK. Glenolden, Pa. *J. Infect. Dis.* 18, 14-9(1916).—A bacterial immune serum when combined with its specific substrate in the cold and subsequently dialyzed alone undergoes some degradation, as is indicated by a positively reacting dialysate. This same serum, when combined in an identical manner with heterologous substrates, is not digested. A typhoid substrate which has been in contact with a typhoid serum in a specific union, now so acts upon all the sera (typhoid, paratyphoid A, *Staphylococcus aureus*, and normal) so that each serum upon subsequent dialysis gives a positive reaction. This reaction occurs with other bacteria but it is specific, that is, bacteria cannot be acted on by any other than its own antiserum so that it will cause a digestion when mixed with other sera. A previous contact of a substrate with a non-specific serum in no way impairs its activity when subsequently combined with a specific serum. It is thought that these expts. confirm the ideas of Bronfenbrenner and others that the substrate adsorbs antitrypsin and permits autodigestion of the serum.

JULIAN H. LEWIS.

Studies in non-specific complement fixation. I. Non-specific complement fixation by normal rabbit serum. JOHN A. KOLMER AND MARY E. TRIST. Univ. Pa. *J. Infect. Dis.* 18, 20-7(1916).—Fresh active serum from normal rabbits in doses of 0.1 cc. showed non-specific complement fixation with lipoidal exts. in 5-15% of sera. When these same sera were inactivated by heating them in a H₂O bath at 55-56°

for 30 min., complement fixation occurred in 38-49% of sera. With both active and inactive sera the highest percentage of positive reactions was observed when alc. exts. of heart muscle re-enforced with cholesterol were used as antigen; alc. exts. of syphilitic liver gave the 2nd highest, and an ext. of acetone-insol. lipoids gave the lowest percentage of positive reactions. With bacterial antigens of staphylococcus, colon and typhoid bacilli, fresh, active rabbit sera showed some degree of complement fixation in 31-42% of instances; when these sera were inactivated, positive reactions occurred in 51-62%. The degree of complement fixation with normal rabbit serum and lipoidal and bacterial antigens is usually moderate or slight, as about 50-85% of reactions show 50%, or less, inhibition of hemolysis. The reacting state of a rabbit's serum when the animal is on an av. diet is usually const., in that 80% of the animals used in these expts. reacted persistently negatively or persistently positively when examd. at intervals of 3 days or a month. It is emphasized that when rabbits are used for experimental studies with a view of using their sera for complement-fixation tests, their sera should be tested one or more times before inoculation, preferably with the particular antigen to be used, and only those selected that react negatively. II. *Non-specific complement fixation by normal dog serum.* JOHN A. KOLMER, MARY E. TRIST, AND GEORGE D. HEIST. *Ibid* 27-31.—Like rabbit serum, dog serum has a tendency to fix complement in a non-specific manner which is increased by heating at 56° for 30 mins. It is less likely to be non-specific, however, after heating at 62° for 30 mins. III. *The influence of splenectomy and anesthetics on the non-specific complement fixation sometimes shown by normal rabbit and dog sera.* JOHN A. KOLMER AND RICHARD M. PEARCE. *Ibid* 32-45.—Anesthetics, as ether, CHCl₃, and to a slight extent urethan, generally weaken or remove temporarily the power in normal rabbit and dog sera of absorbing or fixing complement with lipoidal and bacterial antigens in a non-specific manner. This alteration is usually not apparent at once after the administration of the anesthetic, but is found 1-3 days after; later the serum returns to its former power of causing this non-specific complement fixation. The administration of ether does not alter negatively reacting sera in such a manner as to bring about a positive reaction. N₂O anesthesia has no appreciable influence on the serum reactions of normal rabbits. Splenectomy alone has probably no influence upon the property in normal rabbit and dog sera of fixing or absorbing complement with various non-specific lipoidal and bacterial antigens, the effects being in a larger degree attributable to the anesthetic; the changes observed in dogs following splenectomy under ether were somewhat more profound than those in rabbits. IV. *The relations of serum lipoids and proteins to non-specific complement fixation with normal rabbit and dog sera.* JOHN A. KOLMER. *Ibid* 46-63.—Both the serum lipoids and proteins are concerned in the antilytic and non-specific complement-fixation reactions with normal rabbit and dog sera. The role of the serum lipoids in these processes is indicated in the observation that extn. of suitable sera with ether and CHCl₃ usually diminished the antilytic and complement-fixing powers of a serum, whereas the enteral and parenteral administration of lipoids increased the antilytic and complement-fixing powers. Sera that are extd. with ether are rendered primarily more antilytic; after heating an extd. serum the antilytic titer is generally reduced, as compared with the titer of plain heated serum. Both the globulin and albumin (filtrate) fractions of normal rabbit and dog sera possess thermostable antilytic and complement-fixing properties, usually the former to a slightly greater degree. The antilytic and complement-fixing substances of normal rabbit and dog sera are not dialyzable. V. *The effect of heat on normal rabbit and dog sera in relation to antilytic and non-specific complement-fixation reactions.* JOHN A. KOLMER AND MARY E. TRIST. *Ibid* 64-87.—Non-specific complement fixation by normal rabbit and dog sera is probably due primarily to thermolabile and thermostable antilytic (anticomplementary) substances in the sera. While fresh and active

rabbit and dog sera may yield non-specific complement fixation, the tendency is greatly increased as a result of heating the sera. At 56° the changes may occur in 20 min. or even sooner; at 62° for 30 mins. the tendency for non-specific reactions is much decreased, and is entirely removed by heating serum at 70° for 30 min., but the optimum temp. is between 55° and 60°. In complement-fixation tests for specific antibodies with inactivated rabbit, dog, and mule sera, it is advisable to heat the sera at 62° for 30 mins. and to use at least 2 units of complement or hemolysin and no more than 1/4 of the anticomplementary unit of antigen after it has been carefully titrated. Complementoids and amboceptoids probably bear no relation to the process of non-specific complement fixation by rabbit and dog sera. The blood corpuscles of various animals and various bacteria may absorb a portion of the antilytic substance from rabbit and dog sera, but they have much less influence on the complement-fixation reactions. Digestion of fresh sera with corpuscles and bacteria frequently increases the anticomplementary properties of the sera. Bacteriolytic amboceptors are not responsible for non-specific complement fixation by normal rabbit and dog sera. Parasitic infestations bear no relation to the antilytic and anticomplementary reactions of the sera. Single, large doses of salvarsan are without effect on the reactions with rabbit serum. Quantitative factors in the hemolytic system and antigen are of considerable importance in relation to these non-specific reactions.

JULIAN H. LEWIS.

Complement fixation in intestinal parasitism of dogs. JOHN A. KOLMER, MARY E. TRIST AND GEORGE D. HEIST. Univ. Pa. *J. Infect. Dis.* 18, 88-105(1916).—According to the results of complement fixation on a large number of dogs infested with intestinal parasites, it is believed that there may occur in the serum of the dog antibodies which are specific for these parasites. Production of antibodies was especially in evidence in infestations with tapeworms, to a less degree with the ascarides or round worms, and to a slight extent with the whip worm. The complement fixations have tended to show a biologic relation between the tapeworms, *Tenia serrata* and *Dipylidium caninum* and between *Ascaris canis* and *Strongylus gigas*, although on account of the wide morphological differences this question is left open; it is probable, therefore, that with the usual technic the complement-fixation test will not differentiate between related species of parasites, although it may show the presence of the parasite.

JULIAN H. LEWIS.

The value of virulent salt solutions in the production of anti-hog-cholera serum by the intravenous method. ROBERT GRAHAM AND L. R. HIMMELBERGER. Lexington, Ky. *J. Infect. Dis.* 18, 118-23(1916).—A NaCl soln. virus was made by injecting 25 cc. per lb. body wt. of sterile 0.9% NaCl soln. into the peritoneal cavity of virus pigs at least 5 hrs. before killing, when the NaCl soln. was removed aseptically. The intravenous injection of this virus together with the blood virus, reduced the cost of production of anti-hog-cholera sera. The strength of the antisera produced was equal to that produced in other ways.

JULIAN H. LEWIS.

The acid-base equilibria in the blood after parathyroidectomy. D. W. WILSON, THORNTON STEARNS AND MADGE DEG. THURLOW. Johns Hopkins Univ. *J. Biol. Chem.* 23, 89-109(1915).—A study was made of the variations of the values of the dissociation const. of oxyhemoglobin, the alveolar CO₂ pressure, and the H-ion concn. of the blood of parathyroidectomized dogs. After the removal of the parathyroids from dogs there may develop a condition of alkalosis in which the basic radicals in the blood are relatively increased over the acid radicals, disregarding CO₂. This alkalosis is counteracted by the acid products formed by the muscular activity incident to the tetany which neutralizes the excess of bases and may even produce an acidosis, which brings about relief from tetany in the same manner as injection of acid. Ca salts, injected into animals in tetany, lower the value of the dissociation const. of oxy-

hemoglobin and the alveolar CO_2 pressure, the action being similar to that due to the administration of acids, and apparently these salts produce a condition of artificial acidosis which is favorable for a relief from tetany.

A. P. LOTHROP.

The excretion of acids and ammonia after parathyroidectomy. D. W. WILSON, THORNTON STEARNS AND J. H. JANNEY, JR. Johns Hopkins Univ. *J. Biol. Chem.* 23, 123-37(1915); cf. preceding abstract.—A sudden diminution in acid and NH_3 excretion and a decrease in the NH_3 ratio and the H-ion concn. of the urine usually occur after parathyroidectomy in dogs. With the development of tetany there is an increase in all these factors. Apparently a condition of alkalosis is primary and acidosis develops only secondarily during tetany after neutralization of the excess of bases by the acid products of muscular activity. An alkalosis period may recur unless the tetany is sufficient to maintain the acidosis.

A. P. LOTHROP.

Rotatory power of plasma in various diseases. G. GASTALDI. Turin. *Chim. med. ital.* 52, 433-42; *Zentr. Biochem. Biophys.* 18, 130-1(1915).—G. has made numerous studies of the rotatory power of blood plasma in various diseases. Levorotation was observed to be very irregular during the course of any given disease. The observed differences in rotatory power appeared to be connected with the various stages of acute disease conditions and, in chronic affections (especially those which produced cachexia), with the condition of nutrition of the individual in question.

H. S. PAINE.

Gaseous gangrene. EDNA S. HARDE. Inst. Pasteur. *Compt. rend. soc. biol.* 78, 18-20(1915).—The following observations were made in the case of wounded soldiers where *B. perfringens* (usually associated with other bacteria) was the active agent in gas production in the 1st stage of gaseous gangrene. It appeared that the acute intoxication of the 1st stage might be due not only to sol. toxins, but also to absorption of gas (H_2S , NH_3 , CO_2 and H have been found in such gas). NaNO_2 was therefore administered both locally and *per os* in an attempt to control this gas production; evolution of gas was quickly checked in all instances where this treatment was employed and a general amelioration of the condition resulted. The diuretic action of NaNO_2 may possibly play an extensive part in the extremely rapid detoxication and possibly other diuretics would have the same beneficial action in this respect.

H. S. PAINE.

Sodium citrate and agglutination of the typhoid bacillus. A. SARTORY AND PH. LASSUR. *Compt. rend. soc. biol.* 78, 36-8(1915).—Expts. in which 1-10 pts. by vol. of a 3:1000 Na citrate soln. were added to agglutinating serum and a const. vol. of 20-hr. typhoid bacillus culture so as to make a const. final vol. of 21 parts indicated that the presence of Na citrate may lead to false conclusions by slightly increasing agglutination in the case of a serum which possesses weak agglutinating power. No agglutination was observed when as much as 4 pts. of a 5:1000 Na citrate soln. were mixed with 1 pt. of the bacterial culture and the agglutinating serum was omitted. Na citrate, even in 15:1000 soln., failed to promote agglutination when used in connection with non-agglutinating serum from a typhoid fever suspect. In another instance a guinea pig which yielded non-agglutinating serum on puncture of the marginal vein of the ear subsequently received an intraperitoneal injection of 5 cc. of a 2% Na citrate soln.; blood drawn at 4 successive periods thereafter failed to show agglutinating action.

H. S. PAINE.

Acute appendicitis produced by a medicinal calculus of bismuth carbonate. ER. BARRAL. *Compt. rend. soc. biol.* 78, 72-3(1915).—B. records some results of auto-observation. As a result of an intestinal hemorrhage resulting from an ulcer of the duodenum the usual treatment with Ca lactate and Bi carbonate in large doses was instituted. Six months thereafter an operation for acute appendicitis became necessary. A calculus which was removed weighed 0.37 g. and was composed of a mixt. of Bi

sulfide and carbonate with albuminoid material; the central nucleus contained 69.5% Bi carbonate.

H. S. PAINE.

Anaphylactic origin of nervous affections caused by intestinal worms. DEMETRIE E. PAULIAN. *Compt. rend. soc. biol.* 78, 73-5(1915).—The nervous derangements, eosinophilia and blood reactions observed in cases of intestinal worms are indicative of anaphylaxis and it is concluded that these nervous affections are due to anaphylactic shock caused by helminthiac toxins. These toxins do not differ in constitution from those of proteins in general and hence are capable of producing the same anaphylactic phenomena.

H. S. PAINE.

The urochromogen reaction in the urine of tuberculous individuals. B. NICOLA. Turin. *Gazz. osped.* 34, 1479-81; *Zentr. Biochem. Biophys.* 18, 120(1915).—The urochromogen reaction proposed by Weisz was found to be constantly positive in cases of pulmonary tuberculosis.

H. S. PAINE.

Significance of the Weisz permanganate reaction in the urine. ENRICO SALUSTRI. Camerino. *Il policlín.* 20, 1730-3; *Zentr. Biochem. Biophys.* 18, 120(1915).—A distinct permanganate reaction of const. occurrence in the urine of patients who are seriously ill indicates that the nature of the disease process is tuberculous and it may be concluded that the infection is in an advanced stage; when the Weisz reaction is negative or indistinct in such patients tuberculosis may be excluded. A positive permanganate reaction does not necessarily indicate tuberculosis in the case of mild disease aspects.

H. S. PAINE.

Lesions of the viscera in experimentally produced pancreatic necrosis. C. GRANDE. Turin. *Liguria med.* 7, 200; *Zentr. Biochem. Biophys.* 18, 117(1915).—G. has studied the extended histological lesions of the viscera which appear in death by pancreatic necrosis or following the introduction of pancreatic enzymes into the abdominal cavity. These lesions were observed in the liver in connection with necrotic and hemorrhagic areas and, in the kidneys, in connection with deposits of blood pigment (lesions were also observed in the suprarenals, spleen and pancreas). Other histological observations are described. These results constitute an argument in favor of the toxic theory of death as a result of pancreatic lesions and render it probable that the toxic effect is essentially dependent upon the action of the proteolytic enzyme.

H. S. PAINE.

Determination of residual nitrogen in the blood as a method for the testing of kidney function. H. HOHLWEG. Giessen. *Mon. Grenzgeb.* 28, 459-78(1915); *Zentr. Biochem. Biophys.* 18, 118(1915).—No increase in the residual N of the serum was observed in unilateral renal affection; a normal residual N value indicates, therefore, that at least 1 of the kidneys is capable of function. The residual N value was also maintained at the normal value after unilateral nephrectomy. The residual N value was increased in cases of bilateral renal suppuration or unilateral suppuration with toxic impairment of the other kidney. Nephrectomy is still indicated for residual N values up to 75 mg.; values of 100 mg. residual N in 100 cc. serum, however, unqualifiedly forbid the extirpation of a kidney. The residual N values are temporarily higher during the 1st few days or even weeks following nephrectomy than before the operation.

H. S. PAINE.

A supposed soluble toxin, produced in artificial culture by the bacillus of malignant edema. G. BARGER AND H. H. DALE. *Brit. Med. J.* 1915, II, 808-9.—The bacillus of malignant edema was grown for 6 days on minced ox heart in an atm. of H₂, and the resultant culture fluid was filtered through paper and a Berkefeld filter. 3-5 cc. of the filtrate were required to kill a 300 g. guinea pig. The large vol. required to produce symptoms, their immediate onset and the necessity of solid meat as a culture medium suggested a non-specific product of putrefaction as the toxic agent. Brief boiling and filtration through collodion did not affect the toxicity. The active agent

could not be concd. even at low temp. and pressure, but could be distd. from the alk. fluid. From 150 cc. of the collodion-filtered "toxin," volatile bases sufficient to neutralize 113.2 cc. NH_4SO_4 were obtained. Animal tests showed the NH_4 -containing fraction of the volatile bases to be responsible for the toxic action. A. H. RAHE.

Gastroalbumorrhoea in gastric cancer. MAX KAHN AND I. JACOBOWITZ. *Med. Record* 88, 1006-7(1915).—In the stomach-washings from 15 cases of gastric cancer the N content varied between 27.9 and 71.5 mg. per 100 cc., while washings from 3 cases of esophageal carcinoma gave figures intermediate between these. Parallel detns. of albumin by the Esbach, Tsuchiya, and Pfeiffer methods are given. Washings from cases of non-gastric disease never contained more than a trace of protein, whereas in cases of cancer the protein content was invariably high (0.4 to 1.2 parts per thousand).

A. H. RAHE.

Occurrence of acidosis in children. E. C. WILLIAMS. *Brit. J. Children's Dis.* 12, No. 143(1915); *J. Am. Med. Assoc.* 66, 64.—Thirteen cases between the ages of 3 and 11 years were studied, some of which were complicated by pneumonia or food poisoning. W. emphasizes the importance of an examn. of the urine for acetoacetic acid and acetone, also for *B. coli* in all cases of doubtful origin. L. W. RIGGS.

Proteolytic ferments of the blood serum in tabes dorsalis and general paresis. F. H. FALLS. Chicago Univ. *J. Am. Med. Assoc.* 66, 22-4(1916); cf. *C. A.* 9, 655, 1936, 2665.—From expts. in 9 cases of tabes dorsalis, 6 of general paresis, and, as controls, 5 of meningitis and 10 of pregnancy F. concludes that the enzyme activity of the blood serum is increased above normal in general paresis, and a lesser increase occurs in tabes dorsalis.

L. W. RIGGS.

Diabetes insipidus and functioning of the hypophysis. K. MOTZFELDT. *Norsk Magasin Laegevidenskaben* 76, No. 11(1915); *J. Am. Med. Assoc.* 65, 2206.—Three cases are reported, in one of which the intake and output of fluids, with the detn. of sp. gr., chlorides, and N, were recorded daily for 3 months while under treatment with an ext. of the posterior lobe of the pituitary substance. A marked improvement followed, the patient being apparently well. The treatment was continued with pituitary substance obtained fresh from the slaughter houses and eaten raw or cooked. The ext. of the anterior lobe seemed to have no action. In a second paper M. reports the administration of the ext. of the posterior lobe to 15 relatively healthy persons resulting in a diminution of the quantity of urine, but the amt. of N was unaffected.

L. W. RIGGS.

Postural albuminuria in relation to nephritis. P. F. HOLST. *Norsk Magasin Laegevidenskaben* 76, No. 11(1915); *J. Am. Med. Assoc.* 65, 2206.—Post-mortem examn. of a youth, who had had typical orthostatic albuminuria for 5 or 6 years, but who died of quick tuberculosis of the lungs, failed to show any traces of inflammation of the kidneys. Ten cases are cited in which orthostatic albuminuria was a chronic condition, but no tube casts were found in the urine. Such cases should be carefully distinguished from true nephritis in order to administer appropriate treatment.

L. W. RIGGS.

Analysis of a calcareous concretion observed in fatal case of heart disease. M. ACREMANN. *J. pharm. chim.* 12, 253-5(1915).—The concretion, in the case of a woman of 52 yrs., was one of pericardial symphysis, a whitish, translucent mass, of conchoidal fracture, horny and friable exterior and up to 2 cm. thick. Its % compn. was: H_2O , 16.40; fat and other Et_2O -sol. matter, 3.68; ash, 57.03; albuminoid matter, etc. (by difference), 22.99%. The ash includes 48.53% $Ca_3(PO_4)_2$ and 2.78% $CaCO_3$. The mode of combination of 1.10% Ca out of a total of 20.99% remains unaccounted for; no doubt it is joined to organic substances. Tests for oxalate and fluoride gave negative results.

S. WALDBOTT.

Ferment-antiferment balance of the serum. J. W. JOBLING, WILLIAM F. PETERSEN AND A. A. EGGSTEIN. Vanderbilt Univ. *J. Lab. Clin. Med.* 1, 172-80(1915).—Review of the literature, with special reference to the work from the authors' lab. on the nature of the normal antiferment of serum. They consider it to be related to the lipoidal constituents. H. G. W.

Effect of hemolytic drugs, toxins and anti-sera upon the hemolytic point (so-called isotonic point), and the association between this point and hemoglobinuria. S. R. CHRISTOPHERS AND K. R. K. IVENGAR. Kasauli. *Indian J. Med. Research* 3, 232-50(1915).—KClO₄, PhOH, Na glycocholate, Na taurocholate, quinine, diphtheria toxin and pyocyanus toxin neither induce hemoglobinuria nor have any effect upon the hemolytic point. Those substances which cause hemoglobinuria (pyrogallol acid, abrin and hemolytic serum) raise the hemolytic point. Hemoglobinuria does not occur until the hemolytic point is raised to 0.9. Cobra and daboia venoms raised the hemolytic point, but probably produced death before the onset of hemoglobinuria. C. J. WESR.

Pathological effects of atmospheres rich in oxygen. HOWARD T. KARSNER. Boston and Cleveland. *J. Exp. Med.* 23, 149-70(1916).—Atms. containing 80 to 96% O under normal pressure produce in 24 hrs., or more commonly in 48 hrs., congestion, edema, epithelial degeneration and desquamation, fibrin formation and finally a pneumonia, probably of irritative origin and to be described as a fibrinous bronchopneumonia. Although deficiency in O may affect the hematopoietic system, the animals subjected to high O percentages failed to show any demonstrable pathologic changes in blood, spleen, lymph, nodes, or bone marrow, except for the presence of congestion. C. J. WESR.

"Acetone bodies" in diabetes mellitus. JACOB ROSENBLOOM. Pittsburgh. *J. Am. Med. Assoc.* 65, 1715-7(1915).—Five cases were studied for 6, 8, 10, 10, and 12 day periods, respectively. The standard strict diets of van Noorden were used, with increased amts. of protein always given as meat. The protein, fat, and carbohydrate intake was measured, and the glucose, acetone, acetoacetic acid, and β -hydroxybutyric acid output was detd. All 5 cases show a marked increase in the amts. of the "acetone bodies" when the protein intake was increased; and a decrease in the excretion of "acetone bodies" when the protein intake was diminished. R. attributes the increase of acetone, etc., following an increased protein intake, to the fact that some of the amino acids in the protein, notably leucine, tyrosine, and phenylalanine, act as ketogenic substances. This agrees with the work of Moorhouse, *et al.* (cf. *C. A.* 9, 1800) wherein the substitution of gelatin (which is low in leucine and phenylalanine, tyrosine being absent) in place of meat, produced a marked diminution in the excretion of "acetone bodies." Three tables and 43 references, mostly recent, are given. L. W. RIGGS.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Experimental study of the biochemical and therapeutic action of colloidal mercuric sulfide employed intravenously. M. QUATTRINI. *Lo sperimentale* 69, 507-22(1915).—The amts. injected (in rabbits) were from 0.0117 to 0.25 g. HgS in vols. of 2, 5, and 25 cc. The HgS after injection changed its physical state in a few mins., becoming a fine granular suspension. The therapeutic effect in syphilitic rabbits is slight; in fact there is none while the scrotal lesion is in its period of increase. Healing, however, is accelerated by HgS during the regressive period of the lesion. HgS is most efficient in cases in which the lesions are situated in organs (spleen, liver, bone-marrow, and lungs) which have a particularly noticeable power of fixation of the HgS. H. W. B.

The absorption of potassium iodide by perfused thyroid glands and some of the factors modifying it. DAVID MARINZ AND H. O. FRISS. Cleveland. *J. Pharmacol.*

7, 557-76(1915).—The object of this work was to ascertain if surviving thyroid cells *in vitro* possess a specific affinity for I similarly to thyroid cells *in vivo*. A special perfusion app. is described. The thyroid perfusion effects were compared with those on the kidney and spleen. It was found that artificially perfused thyroids absorb and retain KI to the same extent as thyroids perfused *in vivo*, but not the perfused kidney and spleen. The absorption and retention of KI are characteristic of the living cells as judged by O consumption and histological structure. Dead cells, as indicated by desquamation of alveolar epithelium, did not absorb as much I as the living cells. Absorption is independent of the concn. of KI. It is inhibited by KCN, probably because enough was used to cause death of cells. The effects of such ions as Br, SCN and NO₂ in this direction were not studied. Small amounts of stored iodothyroglobulin could be washed out from surviving glands and very large amts. from dying glands. The fact that no I was detected in the fluid surrounding the perfused organ, despite the fact that the lymphatic vessels drained directly into it, strongly suggests that iodothyroglobulin is given up directly to the blood stream. Autolyzing glands did not absorb KI; they rapidly give up their stored I to the perfusate. The KI stored in a thyroid from 1 hr. perfusion, whether *in vivo* or *in vitro*, was pharmacologically inactive, as indicated by the tadpole test of Gudernatsch (*Arch. Entwickl.-physiol.* 1912, 25, 457).
P. J. HANZLIK.

Contributions to the physiology of the stomach. XXVIII. Further studies on the action of bitter tonics on the secretion of gastric juice. LOUIS D. MOORHEAD. Chicago. *J. Pharmacol.* 7, 577-89(1915).—The following bitters, tinctures of gentian and calumba, and elixir of iron quinine and strychnine were administered to dogs (normal and cachectic) in the mouth and into the stomach (Pavlov-pouch) in order to ascertain what effects, if any, are produced on the appetite and quantity and quality of gastric secretion. Acting either in the mouth or stomach of normal dogs, these bitters had no appreciable influence on either the appetite or the gastric secretion; acting in the mouths of cachectic animals, there was a favorable influence. Although these effects are not quite equivalent to normal, yet they are definite and worthy of note, indicating that the use of bitter tonics in medicine is not without a certain amount of material foundation. Acting in the stomach of cachectic animals, the bitters had no appreciable influence on the quantity and quality of gastric secretion.
P. J. HANZLIK.

The central action of digitalis as tested by the cardio-inhibitory center. C. W. GREENE AND J. O. PRELER. Columbia, Mo. *J. Pharmacol.* 7, 591-9(1915).—An attempt was made more definitely to analyze the action of digitalis (Mallinckrodt's sol.) on the nervous center of the cardio-inhibitory pathway by perfusion of the isolated head and brain of the turtle. The results obtained were strong and direct stimulation of the cardio-inhibitory center; paralysis of the center by excessive action as indicated by escapement of the heart during perfusion and failure of subsequent perfusions to produce inhibition; cumulative and persistent action as indicated by recurrence of various degrees of inhibition during subsequent perfusion. Besides inhibition of rhythm there was also a blocking of the passage of the contraction wave from the veins and sinus to the ventricle by a decrease in conduct.
P. J. HANZLIK.

The influence of some drugs used in the treatment of gout (and arthritis) on the elimination of uric acid and other waste products from the blood. W. DENIS. Boston. *J. Pharmacol.* 7, 601-12(1915).—Subjects convalescing from various diseases, other than gout, and on purine-free diet were used. BzOH (8 g. per day) increased the uric acid excretion in urine and decreased the uric acid content of the blood. Other drugs which were tried, cinnamic acid (4 to 6 g. per day), quinic acid, wine of colchicum and *p*-(HO)C₆H₄CO₂H, had little or no effect on the urinary or blood uric acid. None of the drugs produced any change in the non-protein N of the blood. No effect on

the creatine content of the blood was observed with BzOH, aspirin and atophan. Cf. *C. A.* 9, 3299. P. J. HANZLIK.

Fatal veronal poisoning. F. HUSEMANN. *Vierteljahreschr. ger. Med. öffent. Sanitätsw.* 50, 43-59(1915).—A general treatment of the subject in which the pharmacology and histology of the tissues are considered. EDWARD J. KELLEY.

Quantitative study of cutaneous analgesia produced by various opium alkaloids. DAVID I. MACHT, N. B. HERMAN AND CHAS. S. LEVY. *Proc. Nat. Acad. Sci.* 1, 582-5 (1915).—Finely graded pain sensations were produced on various surfaces of the body by fine electrodes attached to a graduated inductorium. In this way normal threshold values were first obtained for the hand, nose, lip, and tongue, and results were expressed in C. G. S., or electrical units. Opium alkaloids were then injected and a rise or fall of the sensory threshold noted. Beginning with the strongest the following substances are given in the order of analgesic efficiency: morphine (10 mg.), papaverine (40 mg.), codeine (20 mg.), and narcotine (30 mg.). Narceine and thebaine raised the sensory threshold. A combination of morphine with narcotine exhibited a synergistic potentiation, *i. e.*, a much greater analgesia was produced than could be explained by the arithmetical sum of the constituents (cf. Straub, *C. A.* 6, 2651). The same was true of Sahli's prepn. (a combination of total opium alkaloids). Also in *J. Pharmacol.* 8, 1-37 (1916). D. I. MACHT.

Arterial pressure and diuresis in hypophysis therapy. A. FARINI AND B. CECCARONI. Padua. *Clin. med. ital.* 52, 497-513; *Zentr. Biochem. Biophys.* 18, 110(1915).—Exts. of the posterior lobe of the hypophysis have the property of increasing diuresis and diminishing the max. of arterial pressure (approx. 10-20 mm. Hg). Minimal blood pressure remains practically unchanged so that a reduction of the differential pressure which depends primarily upon a decrease in maximal arterial pressure corresponds to the greatest amt. of urine. This behavior is exactly the opposite of that which is known regarding the diuretic action of digitalis. The pituitrin of Parke-Davis was found to be more active than the hypophysin of Merck; the diuretic action is especially pronounced in oliguria and, since the prepn. does not increase the max. of arterial pressure, it may be administered in cases of hypertension. The diuretic action of hypophysis ext. probably depends on a direct stimulation of the excretory mechanism of the kidney. H. S. PAINE.

Iodine and sodium hypochlorite as wound disinfectants. HARRY A. SCHÜTZE. *Brit. Med. J.* 1915, II, 921-2.—Tables are given showing comparative activities of I, C_6H_6 , and Dakin's soln. against staphylococci and spores of *B. edematis maligni*. A. H. RAHE.

The use of quinine hydrochloride solution as a dressing for infected wounds. KENNETH TAYLOR. *Brit. Med. J.* 1915, II, 923-4.—When employed in wound treatment in 1% soln., quinine-HCl is not pptd. by the serum present. Expts. *in vitro* show that at this strength the bactericidal activity of the compd. is not markedly diminished. A. H. RAHE.

Inhibition of the toxicity of uranium nitrate by sodium carbonate, and the protection of the kidney acutely nephropathic from uranium from the toxic action of an anesthetic by sodium carbonate. WILLIAM DEB. MACNIDER. Univ. North Carolina. *J. Exp. Med.* 23, 171-87(1916).—The toxicity of uranium in animals of different ages is associated with the power of the metal to lead to the formation of organic acids, such as acetoacetic acid, and acetone. The power of Na_2CO_3 to lessen the toxicity of uranium depends upon its power to delay the formation of such bodies and to cause their appearance in the urine in lessened amts., and is not due to any detoxicating action of the carbonate on the metal. The protection of the kidney by Na_2CO_3 is probably

dependent upon 2 factors: the neutralization of org. acids formed prior to and during the anesthesia and the neutralization of HCl which Graham has shown to be liberated by CHCl_3 during an anesthesia induced by this substance. C. J. WEST.

The salicylates. I. A historical and critical review of the literature. PAUL J. HANZLIK. Cleveland. Therapeutic Research Committee of the Council on Pharmacy and Chemistry of the Am. Med. Assoc., *Annual Rept.* 1914, 55 pp.—A very comprehensive review, with references, of the salicylates, their chemistry, pharmacological actions, actions under clinical conditions, modes of administration, and a summary indicating various phases still needful of scientific investigation. E. J. C.

12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

Chemical hygiene. C. H. KETNER. *Chem. Weekblad* 12, 1071-6(1915).—A discussion of some analytical methods in use by the Dutch municipal food laboratories. J. T. FLOHL.

Some bacteriological problems arising under food and drugs act. GEORGE W. STILES. *Am. Food J.* 10, 469-72(1915).—S. reports bacteriological examn. of over 1,200 samples of food products, bottled water, etc., at the Denver, Colorado, laboratory of the Western Food Inspection District of the U. S., and gives a general discussion of bacteriological problems, and their application to the public health, in connection with milk, butter, cheese, condensed milk and other dairy products; candy, dried and frozen eggs, oysters, raw vegetables, bottled water, etc. The paper includes many references to the literature. G. A. MENGE.

Some phases of the citrus by-products industry in California. R. T. WILL. *J. Ind. Eng. Chem.* 8, 78-86(1915).—A discussion of the need for an industry in Calif. that will utilize the cull citrus fruit, with a brief sketch of various attempts that have been made to produce citrus by-products on a paying basis. The different possible products, such as lemon and orange juices, marmalades, citrus oils, candied peel, fruit sirups, and citric acid, are treated in detail. H. S. BAILEY.

Composition of frozen oranges and lemons. H. D. YOUNG. *J. Ind. Eng. Chem.* 7, 1038-41(1915).—Analyses of samples of frozen and unfrozen navel oranges and Eureka lemons. The samples comprized fruit which had been freshly picked and that which had been stored. The following detns. were made: sp. gr. of the fruit and juice, % total and invert sugar, and % acid in juice and g. of sugar per fruit. P. J. D.

Analysis of English malt vinegar. HANS FOERSTER. *Deut. Essigind.* 19, 149-50 (1915); *Chem. Zentr.* 1915, II, 370.—Results of analysis of malt vinegar carried out according to directions in "Aids to the Analysis of Foods and Drugs," by Moor and Partridge. E. H.

Examination of cocoa. KELLER. *Apoth. Ztg.* 30, 560-1(1915).—The article deals with the detn. of shells in cocoa and its products, recourse being had to a microscopical examn. for the possible detection of large spiral organs present in the shell tissue. W. O. E.

Examination of cocoa. T. F. HANAUSEK. *Apoth. Ztg.* 30, 590-1(1915).—Reference is had to the article by Keller (cf. preceding abstract). W. O. E.

Effect of storage on coffee. R. E. DOOLITTLE AND B. B. WRIGHT. *Am. Food J.* 10, 473-4(1915).—*See C. A.* 10, 226. G. A. MENGE.

Coffee. CHARLES. *Repert. pharm.* 27, 293-5(1915).—As a result from Belgium and northern France has been cut off.

Chicory has come to be very generally used among all classes of people not only to fortify the flavor of coffee but also as a separate and distinct flavor. It was thought that at this time other roots might be substituted for chicory. Examn. of a large number of samples did not reveal any such adulteration. Some of the samples showed much more caramel than others. If sugar is a natural constituent of chicory this caramel could be accounted for by variations in the roasting. If chicory root be macerated with water and allowed to stand 24 hrs., an alc. fermentation takes place with an abundant evolution of CO_2 . An aq. soln. of raw chicory gives a strong rotation to the left, due to inulin and sugar. As the root is subjected to increasing intensities of roasting this rotation gradually diminishes and becomes slightly positive. As roasting approaches complete caramelization the dextro rotation approaches zero. This behavior shows the presence of dextrose and sucrose. Chem. analysis revealed as much as 40% sucrose and 10% of dextrose in some varieties of raw chicory. The amt. of sugars found varied with the soil, species, environment, etc. H. R. SMITH.

Non-alcoholic carbonated beverages. Sanitary condition and composition. R. M. ALLEN, J. O. LABACH, W. R. PINNELL AND L. A. BROWN. Kentucky Agr. Expt. Sta., *Bull.* 192, 59-125(1915).—The first part of the bulletin deals primarily with the sanitary side, along with inspection and control work. The second part deals with the chem. examn. of pops. Pops are defined as "non-alcoholic, artificially carbonated beverages, sold in the original bottles, and intended to be consumed as soon as opened." They are sweetened and flavored and colored to imitate some fruit. A discussion of flavoring principles as well as the colors employed is given. Part III deals with bacteriological data. B. E. BROWN.

Short notes from practice. L. KALUSKY. *Z. Nahr.-Genussm.* 30, 337-8(1915).—*Glycerol detns. in wine according to Rothenfusser*: K. uses a Gooch crucible for filtering the ppt. of CaC_2O_4 obtained in the Rothenfusser procedure (*C. A.* 6, 2132), the asbestos of which the filter pad is prepd. having previously been treated with hot H_2SO_4 of the same strength as that used for the final soln. of the CaC_2O_4 and then thoroughly washed. The CaC_2O_4 is washed upon the Gooch; the filter pad and its contents are then introduced into a beaker to which is added half the usual amt. of dil. H_2SO_4 , the acid being first used to rinse the crucible. Boil for 1 min., filter through a new Gooch, wash with the remaining half of dil. H_2SO_4 , then with hot water, and titrate the filtrate as usual. *The microscopical analysis of cocoa, chocolate, tea and coffee*: Rub up 1 g. of the substance (3 g. of sweet chocolate) in a porcelain dish with 20 cc. of hot water, then add 40 cc. of 5% KOH soln. and allow to digest for $\frac{1}{2}$ hr. with frequent stirring on a steam bath. Allow to stand until the solid matter settles, decant the supernatant liquid and wash the residue with 500 cc. portions of hot water by decantation until the washings are practically colorless. Finally decant as much as possible of the liquid and drain the residue by gentle suction on a paper disk within a Gooch crucible. Sep. the material from the paper and soak for 24 hrs. in a satd. chloral hydrate soln. containing a little glycerol. This treatment clears the tissues so that they are easily recognized under a microscope. In the case of ground coffee preps. it is well also to digest a little of the sample for 2-3 hrs. in water on a steam bath, replacing the water as it evaps. The coarse pieces of coffee can then be picked out and after shredding and mounting in chloral hydrate may readily be recognized under the microscope. A. F. SEEGER.

The determination of moisture in sirups by the calcium carbide method. R. M. WEST. *J. Ind. Eng. Chem.* 8, 31-5(1916).—Expts. with a modified McNeil app. (*C. A.* 6, 2120) for the detn. of H_2O by the CaC_2 method lead to the conclusion that on sirups it is accurate within 0.3-0.4%, and equal to the A. O. A. C. method. The CaC_2 method gives a sharp end point, is more rapid than the A. O. A. C. method, and

can be used when acids are present in fruit juices by correcting the vol. of C_2H_2 for total acidity. It is necessary to run a blank on each batch of CaC_2 to detn. its H_2O equiv.

H. S. BAILEY.

Estimation of moisture in dried fruits. H. E. BARNARD. *Am. Food J.* 10, 474 (1915).

—B. briefly discusses the published work of previous investigators in this field. It is recommended that a number of methods heretofore used be discarded as impractical. Commercial New York State evapd. apples were used. Twenty g. of the sample were passed twice through a meat grinder using a fine cutter. Material thus prepd. was applied in 10 sets of expts., the essential technic for drying in each set being as follows: (1) in a current of H in special tubes at 98° ; (2) in special tubes without H, at 98° ; (3) in open dishes on steam bath, at 98° ; (4) rubbed up with hot water, open dishes, steam bath, 98° ; (5) same as (4) except rubbed with alc.; (6) same as (4) except rubbed with amyl alc.; (7) same as (4) except rubbed with satd. NaCl soln.; (8) in open dishes at 23 inches Hg and 70° ; (9) same as (8) except at 72° ; (10) same as (9) except for use of glass-stoppered weighing bottles. The results are plotted on a chart showing time as abscissa in hours from 0 to 20, and loss of moisture as ordinate from 11 to 26%. Drying *in vacuo* at 70° gives lower but more concordant results than the other methods employed.

G. A. MENGE.

Effect of storage on moisture content of cloves. A. W. OGDEN. *Am. Food J.* 10, 474 (1915); see C. A. 10, 90.

G. A. MENGE.

Determination of bitter almonds in sweet almonds. A. F. SEEKER. *Am. Food J.* 10, 474 (1915).—The method of tasting, usually applied among dealers, is not adequate when many samples are involved. A simple application of the Schönbein test is recommended as a rapid method: Sat. a strip of filter paper (similar to C. S. & S. No. 597) with a 10% ext. in 95% alc., of freshly powdered guaiac rosin and allow to dry spontaneously. Immediately before applying the test sat. the paper with $CuSO_4$ soln. (1–10,000) and spread upon a glass or porcelain plate. Take 100 almonds from the sample, cut each in two so as to furnish a smooth cut surface and place one piece of each almond on the wet sensitized paper so as to obtain close contact between the cut surface and the paper. In a few minutes the bitter almonds will show a deep blue stain on the paper while the sweet almonds are without effect. This test compared with the taste test gave identical results. The test does not apply to blanched almonds. These must still be tested by taste.

G. A. MENGE.

Some notes on the examination of saffron. J. F. DARLING. *Am. Food J.* 10, 468–9 (1915).—D. gives a brief botanical description of the flower of the crocus plant, the source of saffron of commerce. The plant has been cultivated for centuries in Europe and Asia Minor. The principal sources of importations to the United States are France, Spain and, in small amounts, Turkey. The yield of dry saffron per acre is about 33 to 36 pounds and the consequent high cost is conducive to adulteration. Methods of applying and detecting adulteration are briefly discussed. Methods of analysis include: (1) Examn. as to identity, (2) moisture and ash, (3) character of stain on filter paper, (4) water-sol. content, (5) sugars, (6) glycerol, (7) NH_4 salts. Saffrons of good quality should conform approx. to the following analytical values: Yellow tissue attached to stigmas 8, moisture 15, ash (dry basis) 6–8, petroleum-ether ext. 1.5, non-volatile ext. (dry basis) 1.1, and water-sol. content (dry basis) 55–65%; the limit for sugars has not been definitely detd. Corresponding data obtained by examn. of 43 samples from Spain, 22 samples from France and 5 samples from Turkey, presented for entry into the United States, are tabulated.

G. A. MENGE.

The banana and its by-products. E. COLLIN. *Ann. fals.* 8, 280–91 (1915).—A botanical and histological description of several varieties of banana, with microscopic drawings, followed by a brief discussion of banana starch and flour. Cuts showing

the microscopic characteristics of these products, and tabulated chem. analyses of banana products and other flours and starches, are given. When the calorific food value and the cost of banana flour are compared with those of other farinaceous foods, it appears to be a very expensive diet.

H. S. BAILEY.

The carbohydrates and the enzymes of the soy bean. J. P. STREET AND E. M. BAILEY. *J. Ind. Eng. Chem.* 7, 853-8(1915).—The soy bean is especially suitable for food for the diabetic, because it is rich in protein and fat and contains only traces of starch. The EtOH and cold water exts. were examd. for sugars and digestions of the soy meal, after extn. with Et₂O and boiling EtOH, made with malt ext. The cell constituents, crude and true cellulose, galactans, and pentosans, and their distribution were detd. A study of the enzymes leads to the conclusion that in addition to urease, amylase, and glucoside-splitting enzymes previously reported, there is also present in soy beans a protease of the peptoclastic type, a peroxidase and a lipase. No sucrase nor protease of the peptonizing type was obtained.

H. S. BAILEY.

The milling of rice and its mechanical and chemical effect upon the grain. F. B. WISE AND A. W. BROOMELL. U. S. Dept. Agr., *Bull.* 330, 31 pp.(1915).—The paper describes the milling processes and machinery employed, and considers each operation in the light of its effect on the chem. and mechanical qualities of the finished products. During the process of milling the rice grain, the hull, the germ, 6 of the bran layers, and a portion of the 7th are removed. Approx. 10% of the wt. of the kernels is lost by removal of the germ and bran coat. In the modern mill the brown or hulled rice loses about 70% of its ash, 85% of its fat or oil, 70% of its crude fiber, 10% of its protein, and 30% of its pentosans, due to the removal of germ and bran coats. The mill yield of rice hulls approximates 30 lbs. of rice hulls, 20 lbs. of rice bran, and 6 lbs. of rice polish per bbl. of rough rice. Bran and polish are rich in fat and protein, and when fresh and not adulterated with hulls are considered an excellent stock feed.

P. B. DUNBAR.

A method for the determination of the strength and baking qualities of wheat flour. C. H. BAILEY. *J. Ind. Eng. Chem.* 8, 53-7(1916).—"The strength of a flour is detd. by the ratio between the rate of production of CO₂ in, and the rate of loss of CO₂ from, the fermenting mass of dough." In baking tests, as ordinarily made, the element of personal judgment enters to a large extent. Details of proposed empirical methods which will tend to place such tests on a more scientific basis are given, and a simple "Expansimeter" which automatically records the max. expansion of the dough is described.

H. S. BAILEY.

Preservation of Indian meal. A. MARBACH. *Oesterr. Chem. Ztg.* 18, 96(1915).—Indian meal can be preserved best by germination previous to milling. It thus loses its specific taste. Maize oil and the oil cake are the by-products. The first is valuable in the manufacture of soap, the latter as a cattle feed.

ARTHUR LEDERER.

A biochemical reaction for rancid fats. I. VINTILESCU AND A. POPESCU. *Bull. acad. sci. roumaine* 4, 151-7(1915); *J. pharm. chim.* 12, 318-23(1915).—By mixing 10 g. fat which had been exposed to the air several hrs., with 4-5 drops dil. blood or hemoglobin, 10 drops tinct. guaiac and 10 cc. H₂O, the mixt. is colored blue. Fresh fat does not give this reaction. Other oxidizable substances like benzidine and guaiacol may be substituted for guaiac but the test is not so good. V. and P. have not been able to detect an oxidizing ferment either in fresh or rancid fat. They therefore conclude that the rancidity of fats (lard, butter, olive oil, almond oil) is due to the presence of some substance which on exposure to air fixes oxygen. This in turn can be released by peroxidases.

L. H. CHERNOFF

Effect of time upon optical rotation of lemon oil. A. F. SEEKER. *Am. Food J.* 10, 466(1915).—Six samples of lemon oil, representing composites of several oils pro-

duced, under the supervision of the U. S. Department of Agriculture, in the 6 principal producing districts of Sicily, were collected during the winter of 1907-8. They were stored in small coppers, partly filled and tightly closed with cork stoppers but not sealed, in a refrigerator which, except at rare intervals, contained ice. When examined in 1915, the samples had a pronounced turpentine-like odor but could still be used as an inferior lemon flavor. $[\alpha]_D^{20}$ in 1908 and 1915, resp., are as follows: (1) 64.92°, 54.92°; (2) 61.53°, 61.63°; (3) 63.33°, 63.16°; (4) 59.58°, 59.58°; (5) 58.30°, 58.06°; (6) 62.22°, 62.01°.

G. A. MENGE.

Recent advances relating to the composition and analysis of edible oils and fats. E. RICHARDS BOLTON AND CECIL REVIS. *Analyst* 40, 494-503(1915).—A review.

P. B. DUNBAR.

The determination of citric acid in milk. R. KUNZ. *Arch. Chem. Mikros.* 8, 129-33(1915).—Using the pentabromoacetone method previously described (*C. A.* 9, 587), with slight modifications, K. detd. the quantity of citric acid in various milks. The market milks of Vienna (4 samples) contained from 0.1553 to 0.1730 g. per 100 cc., 2 samples of human milk gave 0.0618 g. and 0.0439 g. The first of a milking from one cow ran 0.1980 g., that taken during the middle of the milking, 0.1992 g., and the strippings, 0.1806 g. of citric acid per 100 cc. Upon standing 24 hrs., the citric acid content of 1 sample of market milk fell from 0.1707 g. to 0.1206 g. and in a second from 0.1571 to 0.0915. After 48 hrs. neither sample contained any citric acid. When 1 cc. of toluene was added to 100 cc. of fresh milk the citric acid content did not change during 2 days. Bulgarian sour milk (Yoghurt) showed no diminution in citric acid, even after 3 days. The difference between natural souring and that in Bulgarian sour milk needs further investigation.

H. S. BAILEY.

Cheese examination and guarantee of fat content in dry substance of cheese. S. TIJMSMA AND M. KAUFMANN. *Chem. Weekblad* 12, 1052-63(1915).—Method for cheese analysis suitable for rapid work in cheese control stations. Place 3 g. of cheese in the wide part of a cheese butyrometer which has previously been half filled with H_2SO_4 (1.53 sp. gr.). The butyrometer is placed in H_2O at 65-70°, and frequently shaken. When the cheese is disintegrated, 1 cc. amyl alc. is added and more H_2SO_4 up to the mark. Let stand 5 min. in warm water and whirl for 4 min. at not less than 1000 r. p. m. The fat column is read in the usual manner.

P. J. DONK.

Skimmed milk and potatoes as a meat substitute. T. PFRIFFER. *Wiener landw. Zeit.* 65, 366-7(1915).—P. states that 4.5 l. of skimmed milk and 1.1 kg. of potatoes have the same protein content and calorific value as 1 kg. of beef which costs about three times as much. Figures are given to show the saving of meat which can be realized in Germany through the use of this substitute.

C. F. MILLER.

The determination of sucrose in condensed milk. G. W. KNIGHT AND G. FORLANEK. *J. Ind. Eng. Chem.* 8, 28-31(1916).—A review of previous work upon the detn. of sucrose in condensed milk, and the details of a new method are given. Phosphotungstic acid and $Pb(OAc)_2$ are used as clarifying agents, the excess of Pb being removed by $K_2C_2O_4$. The % of sucrose is calcd. from the direct polarization and the tading taken after inversion with HCl in the cold for 8 hrs.

H. S. BAILEY.

Salted market milk. F. REISS. *Z. Nahr.-Genussm.* 30, 333-4(1915).—A milk containing 2.75% fat and showing evidence of having been watered, also gave a nitrate reaction and was found to contain 1.23% NaCl. The peculiar sophistication of this product was found to have been caused by a leak in the brine pipes used for cooling the contents of a stock tank at the dairy.

A. F. SEEGER.

The persistence of hydrogen peroxide in milk. E. HINKS. *Analyst* 40, 482-91(1915).—The length of time during which H_2O_2 persisted in milks was studied, using

varying concn. of H_2O_2 , varying temp., and fresh and old milks. It was found that the H_2O_2 was destroyed rapidly at first, but that the rate of destruction diminished, and if the concn. of H_2O_2 was high enough to withstand the first rapid destruction, the residual H_2O_2 remained const. over long periods. In fresh milk the proportion of H_2O_2 destroyed was much less than in the same milk which had stood for 3 days, and consequently possessed a higher catalytic activity. In general a rise in temp. lengthens the time during which H_2O_2 persists. The ultimate result is due in every case to the resultant of destructive effects of catalase on H_2O_2 , and of H_2O_2 on catalase. $o\text{-HOC}_6\text{H}_7\text{NHMe.H}_2\text{SO}_4$, benzidine and $p\text{-C}_6\text{H}_4(\text{NH}_2)_2$ have all been used for the detection of H_2O_2 in milk. The last named is on the whole most generally applicable. The reaction depends upon the simultaneous presence in milk of H_2O_2 and a peroxidase. Owing to the destruction of the latter by H_2O_2 , it is necessary when testing for H_2O_2 to add some fresh milk as well as the reagent used to insure the presence of peroxidase. Under certain conditions a milk containing H_2O_2 and a heated milk will react in exactly the same manner.

P. B. DUNBAR.

Serological detection of potatoes and potato preparations. A contribution to the knowledge of precipitant serums. D. SCHENK AND H. BURMEISTER. *Z. Natur.-Genussm.* 30, 325-32 (1915); cf. *C. A.* 9, 2112.—A specific anti-serum for potato protein was prepd. by filling an Erlenmeyer flask to the brim with freshly grated potatoes to which a few drops of phenol had been added, allowing to stand for 24 hrs., decanting the juice, filtering and then centrifuging until perfectly clear, the clarified product being injected into rabbits in 5 cc. portions repeated every 5-6 days until each animal had received 30 cc. A serum prepd. from the blood of the rabbits produced a ppt. when added to a dil. ext. of potatoes prepd. with physiological salt soln. Exts. of barley, oats, wheat and rye prepd. in a similar way did not react with the serum. This serum can be used only in the case of unheated potato preps., products like bread containing potato flour giving no reaction. Following the general plan adopted by Schmidt (*C. A.* 6, 2108) in the case of cooked meat, S. and B. also prepd. an anti-serum applicable to heated potato products as follows: Grate well cleaned and scraped potatoes in such a way that the pulp falls into a sufficient quantity of physiological salt soln. to prevent discoloration of the paste by oxidation changes. Strain the pulpy mass, filter the strained liquor, acidify the filtrate slightly with a few drops of dil. HCl, and heat at 70° until no more protein is pptd. Allow the ppt. to settle and wash with water by decantation until the washings show only a slight HCl reaction. Drain the ppt. as free from water as possible, add a few drops of 10% NaOH, and heat at 70° until a clear yellowish soln. is produced. Dialyze in a parchment cell until the protein soln. is only slightly alk. to litmus (12-48 hrs.). Preserve the soln. by adding a few drops of phenol and keeping in a refrigerator. The soln. used by S. and B. contained 17.06 g. of protein ($N \times 6.25$) per l. Prep. the anti-serum from the blood of rabbits injected with this soln. as described above. Test the anti-serum against the soln. used for injection by dilg. the latter with physiological salt soln. until it yields only a weak biuret reaction. The weakest of the serums prepd. by S. and B. gave a reaction in 20 min. when applied to the heated alkali-protein soln. dild. 0.1 cc. to 100 cc., 0.1 cc. of the serum being added to 1 cc. of the dild. protein. The serum does not react with solns. of heated cereal proteins prepd. in the same manner. In order to test bread or similar products by this method proceed as follows: Treat 10 g. of finely divided bread in a 100 cc. Erlenmeyer flask with 1.5% alc. NaOH and heat on a water bath under a reflux condenser to 70° allowing the flask to remain at this temp. for 10 min. Filter while warm, dil. with an equal vol. of water and neutralize with HCl until only slightly alk. to litmus. Add 2-3 cc. of 7% $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ which should render the mixt. slightly acid to litmus. Introduce into a separatory funnel and shake with ether to remove

fatty acids. Allow to sep. and remove most of the aq. layer through the stopcock allowing the liquid to flow upon a filter. Decant the clear ether layer, and reject. Shake the residue of protein once more with ether, allow the layers to sep., and then run the layer containing the suspended protein upon the filter, wash with water, place the filter and its contents in a beaker, moisten with a few drops of 0.1 N NaOH, add a little water, filter through a double filter into a parchment cell, and dialyze until there is only a slightly alk. reaction with litmus. Dilute the alkali-protein soln. with physiological salt soln. and test with the anti-serum as described above. Bread containing as little as 10% of boiled potatoes gives a distinct reaction, whereas in the case of those prepd. from pure cereals the reaction is negative. A. F. SEEKER.

Examination of scallops. A. L. SULLIVAN. *Am. Food J.* 10, 472-3 (1915).—The edible portion, which consists only of the muscle by which the scallop opens and closes its shell, constitutes about 17% by weight of the scallop. They are a valuable food product, containing 19 to 24% of solids and 12.6 to 15.6% of protein. A fraudulent and usually unsanitary practice in the industry consists in soaking the scallops in fresh water overnight, the effect of which is to increase the size and otherwise produce an appearance of superiority. By this treatment $4\frac{1}{2}$ gallons of fresh scallops will swell enough to fill a 7 gallon keg. Under methods of analysis S. briefly discusses the values to be detd., the most important of which are detns. of solids, protein and ash. Analytical data for 31 samples of unsoaked, and for 12 samples of soaked, scallops are included in a table. The range for the important factors are: For the unsoaked samples, solids 19.21-24.17, av. 22.48%; protein 12.62-15.69, av. 14.38%; ash 1.33-1.81, av. 1.56%; the corresponding values for the soaked samples are 14.18-19.64, av. 16.20%; 9.06-11.80, av. 10.57%; 0.93-1.17, av. 1.02%. G. A. MENGE.

Method of desiccating milk or other liquid. G. A. KRAUSE. U. S., 1,166,225, Dec. 28. The liquids are sprayed into a dehydrating gas current.

Apparatus for sterilizing milk by ultraviolet rays. M. VON RECKLINGHAUSEN. U. S., 1,165,921, Dec. 28.

Meat extracts. H. WATKINS-PITCHFORD. *Brit.*, 19,087, Aug. 26, 1914. Meat exts. prepd. as specified in 19,431, 1912 (*C. A.* 8, 539) are mixed with excipients such as glycerol, liquid paraffin, or vegetable oils, which render them palatable and stable. The mixt. may be further concd. to remove all the H_2O , and then mixed with cod-liver oil, with or without malt ext., etc. It may also be mixed with milk, grape juice, wine, brandy, stout, etc., or made into jujubes, etc.

Meat extract. H. WATKINS-PITCHFORD. U. S., 1,165,924, Dec. 28. A highly-flavored meat ext. is prepd. by roasting slices of meat, scraping off the browned superficial portions, extg. the remaining portion with warm H_2O , evapg. the ext. thus formed *in vacuo* and mixing this concd. ext. together with an ext. prepd. from additional fresh meat with the browned portion previously sepd. The ext. of fresh meat may be predigested if desired by treatment with pawpaw juice.

Predigested meat product. H. WATKINS-PITCHFORD. U. S., 1,165,925, Dec. 28. Lean meat is treated with warm H_2O to dissolve out salts and extractives and then is digested with pepsin, papain or pawpaw juice. The digested product is boiled and filtered, mixed with glycerol or bland oils and the mixt. is concd. *in vacuo* to drive off the H_2O .

Granulated meat product. C. MARCHAND. U. S., 1,167,193, Jan. 4. Meat pulp is macerated with dil. HCl at a temp. of about 25° until a gelatinous mass is formed. This is neutralized, treated with H_2O_2 to prevent decompn., heated to 40° to melt the fat, the latter and moisture are removed by skimming and centrifuging and the residue is dried and granulated.

Extracting grape pomace. E. MONTI. U. S., 1,167,006, Jan. 4. Crushed, pressed grape pomace is soaked in H_2O at a temp. of $50-60^\circ$ until thoroughly extd., the liquid is pressed out and strained and then used to ext. another portion of the pomace, cooled to 0° and concd. by freezing or evapn. *in vacuo* until an ext. is obtained containing 66-80% of sugar and other solids.

Preserving fruit. A. F. HOFFMAN. U. S., 1,166,588, Jan. 4. Fruit is chilled in H_2O of a temp. near 0° , sterilized by ultraviolet rays and then coated with wax, applied at a temp. of $100-105^\circ$.

Pineapple waste. R. A. GOULD and C. S. ASH. U. S., 1,166,674, Jan. 4. Recovery of albumin, sugar and acid from pineapple waste is effected by pressing out and straining the juice and adding to the expressed juice an additional amt. of juice recovered by diffusion, heating the mixed juices to about 82° to coagulate the albumin. The juice is sepd. from the pptd. albumin and treated with CaO or $CaCO_3$ to form an insol. citrate (still leaving the juice with an acidity equal to 0.01 *N*). The initial ppt. of citrate is sepd. and a further ppt. produced by concn. *in vacuo* of the soln. remaining. After filtration the soln. is heated to about 70° and decolorized with charcoal and reduced to a sirup. The dried exhausted pulp is utilized as a source of cellulose.

Preserving food stuffs. CHEM. FABRIK VON HEYDEN. Ger., 285,726, Nov. 5, 1913. The preservative used is furfuracrylic acid, added to the food in soln. or not, or applied to the surface of the food. The furfuracrylic acid is said to have the advantage over cinnamic acid in that as the Na salt it does not irritate the kidneys. A mixt. of 100 g. curd and 50 cc. H_2O , to which 1.0 g. furfuracrylic acid has been added, shows no decompn. after 4-6 days nor any bad odor.

Preserving eggs. H. L. S. LOFT. Brit., 19,721, Sept. 12, 1914. Eggs are treated with vapors of a disinfectant or sterilizing agent such as $HCHO$, in air or other gas, which may contain steam, at about 35° and are then cooled to about 10° while still in the vapors. The eggs are finally coated with paraffin.

Milk containing iron and glycerophosphate. G. HÖNSCH. Ger., 285,725, Dec. 5, 1913. The product is especially suitable for anemics and children. By glycerophosphates is to be understood the salts of glycerophosphoric acid, the active substance of lecithin. From 20 to 30% of commercial Fe glycerophosphate is added to skimmed milk which is then heated, the casein pptg. out. The ppt. and the filtrate contain large amts. of Fe, about in equal proportions. Glycerophosphoric acid, however, is present in the ppt. only in traces. The excess acid in the filtrate is neutralized by Na glycerophosphate (75%). From 5 to 10% of the filtrate treated in this manner is added to the whole or skimmed milk, according as a smaller or larger content of Fe and glycerophosphates is desired. The milk does not curdle now upon heating, it has a pleasant taste, and is very stable.

Flavoring jams. A. CORDIER. Brit., 20,143, Sept. 24, 1914. An aq. ext. from apples or pears which have been pressed to make cider or perry, is sterilized and dried to obtain a flaky product which is used for flavoring jams, etc.

14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

Determination of the electrical conductivity of Caculata water to verify its stability and chemical composition. G. A. DAMIAN. *Bull. acad. sci. roumaine* 4, 136-43 (1915).—This water contains highly ionized compds. and results of elec. cond. detns. are therefore of great interest to the chemist and from the hygienic and therapeutic standpoint. D. has detd. the elec. cond. every day for a month and has found the variations to be

exceedingly slight in spite of heavy rainfall. Chem. analyses by various investigators at various times have shown the compn. of the water to be const. The work supports the hypothesis that a direct relationship exists between elec. cond. and the compn. of a water.

L. H. CHERNOFF.

Contribution to the study of the physical properties of Roumanian mineral waters. Electrical conductivity. Applications. E. GIURGEA. *Bull. sci. acad. roumaine* 2, 171-9(1914); *Chem. Zentr.* 1915, I, 1339.—G. has detd. by the Kohlrausch method the elec. cond. of a large number of mineral waters and shows that the method affords a means of detg. the presence of waste waters or the admixt. of other waters. Similarly the degree of chem. change caused by the material of the conduit pipe may be detd. Fe or Cu pipes are often to be replaced with pipes of Al, cement, clay, or wood. The cond. enables one to follow the changes in mineral waters on warming and to det. an optimum. Results are reported and discussed.

F. W. SMITHER.

Contribution to the study of the physical properties of Roumanian mineral waters. Determination of the cryoscopic coefficient. E. GIURGEA. *Bull. sci. acad. roumaine* 2, 311-9(1914); *Chem. Zentr.* 1915, II, 47.—G. reports the results of his detns. of the cryoscopic coeff. for a number of noted Roumanian springs and discusses the significance of this work for judging the physiological action of the waters.

F. W. SMITHER.

Quantitative determination of the alkalinity of Roumanian mineral waters. E. GIURGEA. *Bull. sci. acad. roumaine* 3, 18-23(1914); *Chem. Zentr.* 1915, II, 47.—G. reports and briefly discusses results for a number of noted Roumanian springs. Method: Titrate 20 cc. of the water with 0.1 N H_2SO_4 , using methyl red as an indicator. Cf. *C. A.* 9, 3015, 3312.

F. W. SMITHER.

True object of water analysis. F. L. RECTOR. *J. Am. Water Works Assoc.* 2, 709-11(1915).—R. emphasizes the need to consider each individual water in connection with its surroundings rather than by a strict lab. standard. The U. S. Public Health Standard is criticized for ignoring the bacterial count at 20° F. and such criticism is justified by a practical example.

D. K. FRENCH.

Estimating the sanitary quality of water supplies. W. H. FROST. *J. Am. Water Works Assoc.* 2, 712-34(1915).—The subject is considered specifically from the standpoint of typhoid fever causes as typical cases. The detn. of evidence and extent of pollution in a water supply in itself is not sufficient but should be used in connection with further information as to the effect produced by a given amt. of pollution on the community. The methods of sanitary survey and examn. of water supplies with reference to their effect in causing typhoid fever are considered in detail, but the fact is emphasized that most of these results depend upon detn. of intestinal bacteria of all kinds rather than knowledge of any specific form; consequently, the necessity to det. effects produced by such pollution. In the liberal discussion which follows methods of applying the standards established for interstate carriers are considered extensively. In general, laboratory methods, both bacteriological and chemical, should be considered always with careful epidemiological studies of their relation to typhoid prevalence.

D. K. FRENCH.

The determination of alkalinity in water. F. W. BRUCKMILLER. *Chem. Eng.* 22, 231-2(1915).—Both the phenolphthalein and the methyl orange alkalinities are detd. from a single portion of water as compared with 2 portions recommended in "Standard Methods of Water Analysis" and elsewhere.

W. F. LANGELEIR.

Present status of disinfection of water supplies. F. F. LONGLEY. *J. Am. Water Works Assoc.* 2, 679-92(1915).—L. considers principally the results from the use of hypochlorite and liquid Cl in water disinfection. 80 % of the municipalities coöperating in the gathering of the information use $CaOCl_2$; the others liquid Cl. The av.

cost of treatment is about 25 cents per million gallons. Concrete tanks and wood tanks lined with concrete are used in connection with the treatment in $\frac{2}{3}$ of the cases. Concrete tanks, lead pipes and rubber compn. showed the greatest resistance to corrosion. The results from the use of hypochlorite in the reduction of typhoid death rate are itemized in about 15 typical cases. Reference is made to the objectionable odor and the quantities capable of producing this are given in several cases. Sufficient information is not at hand to establish relations between color and turbidity of the supply and the quantity of disinfecting agents that can be used without objectionable results. The discussion brings out more interesting information regarding in particular the use of hypochlorite and deals especially with odor produced. D. K. FRENCH.

Sterilization of water by carbon dioxide under pressure. H. COLIN. *Compt. rend.* 161, 652-5(1915).—A metallic cylinder of 2000 cc. capacity and capable of withstanding a pressure of 54 kg. per sq. cm. was used. One liter of water was introduced into the app. and after sterilization in an autoclave, was inoculated with 200 cc. of broth culture of the organism under investigation. CO₂ under pressure was then applied with const. shaking of the app. so that satn. of the liquid was obtained for any given pressure. The results with *B. typhosus* showed that in order to produce sterilization 20 hrs. at 10 kg., more than 8 and less than 20 hrs. at 15 kg., more than 3 and less than 9 hrs. at 20 kg. and 3 to 6 hrs. at 25 kg. pressure were required. *B. coli communis* resisted a pressure of 25 kg. for more than 5 days. *B. dysenteriae* was destroyed in less than 15 hrs. at 15 kg. and in less than 6 hrs. at 20 kg. pressure. *B. cholerae* was killed in less than 10 hrs. under 10 atmospheres. *B. pyocyaneus* under 18 kg. preserves its vitality and faculty of pigment formation for a few hours but at the end of 24 hrs. growth is slight and after 48 hrs. sterilization is complete. With *B. diphtheriae* at pressures of 10, 15 and 20 atms., sterilization was obtained after 24, 9 and 3 hrs., resp. *B. subtilis* spores resisted 25 kg. pressure for 4 days. A sample of polluted water from the Seine at 20 atms. was found to contain many putrefactive organisms after a long time but at 25 kg. pressure all organisms except *B. subtilis* were killed within a few hours. W. F. LANGELIER.

Water softening by lime and soda process. F. A. ANDERSON. *J. Soc. Chem. Ind.* 34, 1180-2(1915).—In softening water with lime and soda the detns. that are necessary are CO₂, Ca, Mg and alkalinity. CO₂ is detd. by the Seyler method. Total Ca and Mg is detd. by the Lunge-Pfeifer method. The accuracy of the method is indicated by the fact that in 13 consecutive tests, grav. detns. of Ca and Mg differed from detns. by this method by not more than 1°, the av. difference being 0.2°. Mg is detd. by A.'s modification of the Pfeifer method which is as follows: make 100 cc. of water slightly acid and conc. to about 30 cc. by boiling. Neutralize exactly to methyl orange and transfer to 100 cc. cylinder. Add 10 cc. 0.1 N NaOH, make up to 100 cc., stopper and allow to stand 2 hrs. or more. Titrate supernatant liquid. In comparative tests the following amounts of MgO in gr. per gal. were found: Gravimetric 0.93, 1.66, 1.92, 10.96; above method 0.90, 1.62, 1.95, 10.80. After treatment, the water should be tested with soap soln. and the alkalinity to phenolphthalein and methyl orange detd. If the amt. of soda added has been correct the hardness and alkalinity will be the same. If the quantity of lime added has been correct the phenolphthalein alkalinity will slightly exceed $\frac{1}{2}$ the methyl orange alkalinity. The excess OH ions are due to sol. Mg(OH)₂ and vary with the Mg salts originally present in the water. Any correction necessary in the quantities of chemicals applied can be calcd. from these simple control tests. W. F. LANGELIER.

Washing slow sand filters. J. GAUB. *J. Am. Water Works Assoc.* 2, 596-611 (1915).—Improvements in sand handling during the last few years are discussed. 1. the Blaisdell machine and the Nichols washer are described. Washing-

ton, D. C., and Springfield, Mass., use methods almost identical, the sand being removed by ejectors to sand washers, discharged into storage bins and carried by another ejector back to the filter bed. The ejectors and washers are described. Albany, N. Y., and Philadelphia, Pa., use the Nichols machine. Denver, Colo., replaces sand by cars loaded by hand owing to stratification due to high uniformity coefficient of sand. Toronto, Canada, uses portable washer. Lawrence, Mass., returns sand by hand owing to stratification due to uniformity coefficient which prevents replacement by hydraulic means. Pittsburgh uses the hydraulic method. Wilmington, Del., uses the Blaisdell machine. The cost for cleaning and replacing sand by hydraulic processes is slightly lower than the cost of cleaning by machine. The methods in practice at Washington and Springfield are the most economical of those considered. The uniformity coefficient of sand must be considered in connection with hydraulic processes.

D. K. FRENCH.

Water from gravel wells. C. W. WILES. *J. Am. Water Works Assoc.* 2, 625-8 (1915).—The paper deals largely with physical difficulties due to air leakage in the pipe lines, the suggested cause being due to the fact that the 4 in. wells in question are too small; a diam. of 8 in. to 10 in. is recommended.

D. K. FRENCH.

Design and operation of intermittently operated water purification plants. N. T. VRECH. *J. Am. Water Works Assoc.* 2, 759-61 (1915).—V. considers in particular plants where the water is retained in the basins from 4 to 6 hours. The design of the settling and coagulating basins is equally important with the operation of filters. Variation in the time of agitation, degree of mixing, with alum, lime, or lime and iron, as a coagulant, application of the chemical treatment in the basins, sedimentation, point of application of chemicals, etc., are discussed. Continuously operated plants are much more easy to handle than those of intermittent operation.

D. K. F.

Impounded waters of Alabama in relation to public health. E. B. KAY. *J. Am. Water Works Assoc.* 2, 657-78 (1915).—A very extensive and comprehensive discussion of the development of impounded waters, covering the geographical features of the drainage areas and existing knowledge regarding the physical effect of such supplies upon the fauna of the submerged area. In preliminary treatment to an investigation as to the effect of such supplies upon public health, there is a very thorough discussion of existing health conditions including malarial fevers and mosquito breeding, based upon records prior to such development. No conclusion is drawn.

D. K. FRENCH.

Distilled feed water. C. F. HIRSHFELD. *Eng. Mag.* 49, 725 (1915).—H. reviews present chem. methods of feed water treatment and discusses various means for obtaining distd. feed water.

A. N. BENNETT.

Arsenic content of filter alum. E. BARTOW AND A. N. BENNETT. *J. Am. Water Works Assoc.* 2, 585-95 (1915).—A minimum of 0.8 and a maximum of 4.0 p. p. m. of As_2O_3 was found in the alum used by Illinois water purification plants. Samples obtained from 17 sources outside of Illinois showed an As_2O_3 content of between 0.5 and 1240 p. p. m. An expt. treating water with 6 grains per gal. of an alum containing 941 p. p. m. of As_2O_3 showed that 78% of the As was pptd. and could be recovered in the sludge. It is concluded that an alum of low As content can readily be obtained and that water works officials should specify a low content.

W. F. LANGLEIER.

Effect of algae on bicarbonates in shallow reservoirs. S. T. POWELL. *J. Am. Water Works Assoc.* 2, 703-8 (1915).—Certain forms of algae can entirely remove free CO_2 from water and can convert bicarbonates to normal carbonates by removal of the half-bound CO_2 . The dissolved O at the same time is greatly increased, thereby materially changing the chemical compn. of a water. In the case under observation in 2 reservoirs, in addition to complete removal of free CO_2 , there was a bicarbonate de-

crease of from 52 to 43 p. p. m. and then a further decrease of 11 p. p. m.; a dissolved O increase from 90% to 125% of satn. and an algae increase of 444.2%. CuSO_4 was used to destroy algae after which there was a great increase in the number of bacteria.

D. K. FRENCH.

Preventing boiler scale formation by means of aluminium. I. POUGET. Paris. *Lumiere elec.* 30, 284(1915); cf. *C. A.* 10, 362.—By actual test P. finds that after 15 days heating of 2 small boilers, the one with Al (Al powder was contained in a small bag suspended in the boiler) had a scale of but 7 g. whereas the one without the Al had scale of 17 g. Coarse Al grains were not as efficient. The best results were obtained with Al "bronze" made up with fine powder added to oil of turpentine and a little resin.

C. G. F.

Leading situations in the waterworks field. *Eng. Record* 73, 6-7(1916).—Litigation at Denver and San Francisco with water companies is detailed.

F. B.

The disposal of waste liquors from industrial plants. E. ROTH. *Völjschr. off. Gesundh.-Pflege* 47, 129-68; *Chem. Zentr.* 1915, II, 727.—The legal ordinances which are of importance to health officers as forming a basis for the control of waste liquors are discussed. The compn. and disposal of the following org. wastes are dealt with: Sugar, starch, brewery, dairy, slaughter house, tannery, wool scouring, cellulose, strawboard, paper, bleachery and dyes. Inorganic wastes are: NH_3 , mine, metal working, potash liquor, chemical manuf., electric and automobile works. The ordinance of April 7, 1913, is given verbatim.

W. F. LANGEЛИER.

Sewage disposal for manufacturing plants. H. WINKELMANN. *Z. angew. Chem.* 28, I, 331-2(1915).—Preliminary treatment of the waste in septic tanks and subsequent treatment in contact beds or trickling filters (preferably the latter) are recommended. Details of plant design and comments on the proper mode of operation are given.

W. F. LANGEЛИER.

Experts testify on means of eliminating odors in garbage reduction. ANON. *Eng. Record* 73, 20-1(1916).—Suit at Springfield, Mass. evokes opinions regarding best methods of treating foul gases from digester tanks.

FRANK BACHMANN.

The character and extent of atmospheric pollution in English and Scotch towns. J. B. C. KERSHAW. *Mel. Chem. Eng.* 13, 967(1915).—The atm. burden of soot and dust in tons per sq. mile area per yr. for various towns is as follows: Oldham 1064, Birmingham 764, Sheffield 642, Manchester 526, Malvern 64. The results were obtained by the analysis of rain water and are reported as tar, carbonaceous matter and ash. A device for measuring sunlight is described and it is shown that approx. 12% of sunlight is cut off in the lowest 100 feet of atm.

F. N. CRAWFORD.

Phenol coefficient of germicides. F. B. KILMER, A. W. CLARK AND P. HAMPTON. *J. Ind. Eng. Chem.* 8, 45-7(1916).—The writers discuss their experiences in trying to check the results of another lab. in detg. the coeff. of camphenol using the Hygienic Laboratory method. It is claimed that the method as outlined in *Bull.* 82 is not explicit enough. Investigation showed that the inability to obtain a satisfactory check was due to the fact that the 2 labs. used broth of different compn.

W. F. LANGEЛИER.

Use of alkaline hypochlorites as disinfectants. P. BRETEAU. *J. pharm. chim.* 12, 248-9(1915).—When an alk. hypochlorite soln. is dild. with distd. H_2O , there is dissociation of the salt and loss of a small amt. of Cl. (1) When 5 cc. of a soln. containing 0.047 g. active Cl are dild. with 400 cc. H_2O , there is loss of 3.8% of titer, due to dildn. This loss is increased, even doubled when dildn. is made with H_2O containing slight amts. of carbonates, bicarbonates or chlorides. (2) The remaining hypochlorite is dissociated by about 0.4 if dildn. is made with 200 cc. distd. H_2O , by 0.6 if dild. with 400 cc. Small amts. of NaHCO_3 or NaCl do not hinder the dissociation; but small

amts. of Na_2CO_3 reduce it by $\frac{1}{2}$. (3) When 1 drop of Javel water is added to 1 liter of H_2O , the hypochlorite may be considered almost completely dissociated. Acidification would not contribute further to bactericidal action. (4) The same is not the case for Labarraque soln., which contains excess of Na_2CO_3 , and whose diln. is made with only a few vols. of H_2O . The addition of an excess of boric acid with or without subsequent addition of NaHCO_3 seems bound to increase the disinfecting power of this alk. hypochlorite soln. S. WALDBOTT.

The sterilization value of "Katacid" and the precipitation of bacteria by ferric hydroxide. P. KÖTHNER. Univ. Marburg. *Arch. exp. Path. Pharm.* 79, 118-37 (1915).—Strauss's "Katacid" tablets, containing about 0.4 g. H_2O_2 , 0.53 g. citric acid and traces of catalase (absent in many preps.) are not suitable for sterilizing drinking water. Better results are obtained by using a soln. containing 2.5 g. citric acid, 0.379 g. FeCl_3 and 1.0 g. $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$ per l. C. J. WEST.

Determination of carbon dioxide in sea water (MORGULIS) 11B. Sewage sludge for gas making (SNYDERS) 21.

Purifying water. H. NEEL. Brit., 19,722, Sept. 12, 1913. Excess of Cl is removed from H_2O which has been treated for purification, clarification, or sterilization with Cl or compds. of Cl such as NaOCl or $\text{Mg}(\text{OCl})_2$ by addition of FeSO_4 and filtration through base-exchanging bodies, such as permutite, containing Mn. Thiosulfate, sulfites, or bisulfites may be added before or after the FeSO_4 , and "ferric alumina" (containing sulfates of Fe and Al), $\text{Al}_2(\text{SO}_4)_3$ or other salt, alum, Mn salts, or other clarifying agents may be added at any stage prior to filtration.

Purifying and filtering water. C. J. RICHARDSON and F. KNIGHT. Brit., 20,170, Sept. 25, 1914. A filter comprises, within a single casing, a cloth filter and a container for ppt.-forming chemicals which is situated adjacent to but out of the direct path of the liquid entering at a suitable inlet. The liquid upon entering the filter dissolves the chemicals and deposits the ppt. upon the cloth, the ppt. thus forming the filtering medium. The chemical may have a sterilizing action and may consist of $\text{Al}_2(\text{SO}_4)_3$ and Na_2CO_3 together with bleaching powder, or a mixt. of alum and bleaching powder.

Purifying sewage. W. JONES and JONES & ARTHUR. Brit., 19,915, Oct. 11, 1913. In purifying sewage and other impure liquids, the sewage, etc., is aerated and forced from one compartment or tank to another by means of compressed air introduced by a pipe into the lower end of an uptake pipe which delivers into the upper funnel-shaped end of a down-take pipe terminating in a hollow chamber or foot vessel. The falling column of liquid in the down-take pipe draws in air through a suitable pipe. Air sepg. from the liquid in the foot vessel escapes through holes into the liquid in the 2nd tank, while the liquid containing the remainder of the absorbed air passes out through apertures in the bottom of the foot vessel.

Purifying sewage. W. JONES and JONES & ARTHUR. Brit., 19,916, Apr. 11, 1914. In a tank in which sewage, etc., is treated with diffused air, diffusers of porous material are arranged in the bottom of the tank at distances apart so that an up-and-down circulation and distribution of the liquid takes place, the bottom of the tank being curved or inclined downwards to the diffusers from points between the same to cause the deposited solids falling to the bottom of the tank between the diffusers to pass under the influence of the air currents from the diffusers. Cf. C. A. 9, 1814.

Aerating sewage. G. W. NAYLOR and J. F. NAYLOR. Brit., 20,259, Sept. 28, 1914. Sewage is aerated by air forced through porous tiles laid at the bottom of a sewage tank and supplied with air by horizontal pipes laid on or embedded in the base of the tank. Each tile or each row of tiles encloses an independent air space.

Sewage filtering system. R. W. AMOS. U. S., 1,165,741, Dec. 28.

Destructor furnaces. S. O. S., LTD. and E. W. JANSON. Brit., 19,561, Sept. 8, 1914. In app. for treating fecal or other sewage matter of the kind comprizing a mechanical retort having a series of superposed chambers with revolving arms or scrapers mounted on a vertical shaft and with hollow floors through which are passed furnace gases, heated feed-rollers are arranged in the feed-hopper for evapg. urine and destructively distg. the organic contents thereof.

Fertilizer from sewage. T. K. IRWIN. U. S., 1,166,373, Dec. 28. Basic or acid phosphate is added to a flowing stream of sewage and the ppt. formed is collected and mixed with yeast and starch waste or other fermentable matter which causes the solid material in the ppt. to rize to the surface, so that the liquid may be drawn off. Cf. C. A. 9, 3111.

Disinfectant. C. S. MINER. U. S., 1,167,360, Jan. 4. A dry powdered mixt. is made of CaO 98% and KMnO₄ 2%, which when moistened liberates O.

15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

The principles of crop production. EDWARD J. RUSSELL. *J. Chem. Soc.* 107, 1838-38(1915).—A lecture. W. H. FRY.

Salts, soil-colloids and soils. L. T. SHARP. Coll. Agr. Univ., Cal. *Proc. Nat. Acad. Sci.* 1, 563-8(1915).—A preliminary statement of the effect of certain substances upon soils before and after leaching. W. H. FRY.

The development of a dynamic theory of soil fertility. FRANK K. CAMERON. *J. Frank. Inst.* 181, 27-49(1916).—Early theories, the humus theory and the mineral theory are briefly discussed and the dynamic theory described at length. The role of the soil soln. in the nutrition of plants receives special consideration. W. H. FRY.

The adsorption of potassium by the soil. A. G. MCCALL, F. M. HILDEBRANDT AND E. S. JOHNSTON. *J. Phys. Chem.* 20, 51-63(1916).—Durham sandy loam soil was used as the adsorbing material and KCl as the material to be adsorbed. The app. used consisted of a porcelain-lined filter chamber into which was fitted a short filter tube, made by cutting off the upper end of a Pasteur-Chamberland filter tube and forcing it down over the projection on the rubber gasket at the bottom of the chamber. A brass jacket, which serves as a container for the soil, surrounded the filter tube. Twenty g. of air-dry soil were used as a charge, being placed in the brass jacket; the salt soln. was poured into the porcelain-lined chamber. The filter tube serves to give a clear filtrate. Grinding the soil very fine by means of a ball mill increased the solubility of the soil K 10-fold. In the expt. in which the KCl soln. was run through the 20 g. of soil the concn. of the soln. was first decreased from 62 parts per million of K to 40 p. p. m. and later to 36 p. p. m. After this, with a further supply of soln. the strength of the soln. rose to within 3 p. p. m. of that of the original soln. It is shown that the amt. of K retained by the soil after the passage of 250 cc. of KCl soln. is 233 p. p. m. By passing 300 cc. of water through the soil the adsorbed K was reduced to 99 p. p. m. The authors also give results on the adsorption of K from KCl soln, by finely pulverized soil and in addition the amt. of K adsorbed from such soil by water alone. B. E. B.

The determination of nitrates in soils. P. S. BURGESS. Honolulu, H. I. *Science* 43, 67-8(1916).—Polemical. B. favors the Al reduction method. W. H. FRY.

Soil gases. J. W. LEATHER. *Mem. Dept. Agr. India (Chem. Ser.)* 4, 85-134 (1915).—The object of this investigation was to det. the compn. of the gases in the soil

under various conditions, and the rate of diffusion of gases out of and into the soil. In unmanured fallow soil the % of O varied from 16 to 18% in the hot dry season and was higher than in the cool wet season, when it varied from 8 to 12%. The % of CO₂ varied within wide limits, and was as high at a depth of 5 and 6 ft. as in the surface soil. In a manured soil the % of O was slightly less than in the unmanured, and there was an increase in the amt. of CO₂. The amt. in the surface and subsoil was practically the same. With green manured soil the results were indecisive except that the % of N was greatly increased. An analysis of the gas from a swamp rice soil showed it to be composed of 84.2% N, 4.3% CO₂, 8.8% H, 1.4% CH₄ and less than 1% of O and A. The vol. and compn. of the gas surrounding the roots of growing *Crotalaria juncea*, *Indigofera arrecta* and *Zea mays* are given. The % of N was about the same in the gas surrounding each plant. The O was higher from the *Zea mays* and the CO₂ was higher from the *Indigofera arrecta*. The other constituents varied but slightly. In green manured soil the quantity of O diffused is much in excess of that required for CO₂. In the neighborhood of growing crops, N, CO₂ and in some cases H were found to be passing out of the soil while O diffused into it.

J. J. SKINNER.

Effect of temperature on some of the most important physical processes in soils. GEORGE J. BOUYOVOS. Michigan Agr. Expt. Sta., *Tech. Bull.* No. 22, 63 pp. (1915).—Data are presented on the influence of temp. on capillary movement and retention of moisture, gravitational flow of water, thermo-osmosis, gas flow, aeration of soils, etc.

B. E. B.

Cyanamide, dicyanodiamide, and calcium cyanamide. J. C. DE RUIJTER DE WILDT AND A. D. BERKHOUT. *Versl. Landbouwk. Onders. Rykslandbouwproefstat* 1913, No. 13; *J. Soc. Chem. Ind.* 34, 972.—Cyanamide (0.5%), when kept for 3 years in 0.002 N solns. of NaCl, NH₄Cl and KCl, was only slightly decomposed; in presence of CaCl₂ (0.002 N) and CaCO₃, decompn. was more marked. Mineral acid solns. (0.02 N) contg. 0.5 and 1.0% of cyanamide, which were kept for 2 months, were found to contain urea. The results of pot expts. in which buckwheat grown in humus sand received cyanamide and Fe oxide showed that the Fe was without effect. Decompn. of CaCN₂ when stored is shown to be due to atm. moisture rather than to CO₂; production of dicyanodiamide is to be expected more than loss as NH₃. CaCN₂ may be mixed with K₂SO₄, magnesia and kainite. The results of fertilizing expts. with fresh and with stored CaCN₂ showed that the value of the stored fertilizer was considerably less than that of the fresh.

E. J. C.

Composition of wood and plant ash. R. A. BERRY. *J. Board Agr.* 22, 766-8 (1915); *J. Soc. Chem. Ind.* 34, 1263.—The quantities of potash and of H₃PO₄ present in various wood ashes, etc., are shown in the following table:

Ash.	Potash (K ₂ O).		Phosphoric acid (P ₂ O ₅). Total %.
	Total %.	Sol. in water. %.	
Bracken.....	20.45	10.61	3.37
Spruce.....	11.94	8.23	7.01
Hardwood, largely oak trimmings	3.53	2.75	....
Mixed forest produce.....	3.13	1.50	1.54
Soft wood, forest fire.....	11.79	6.53	5.23
Hardwood, engine fire.....	10.44	6.77	5.02
Flue dust from blast furnaces...	3.75-3.93	2.13-2.64	....

The phosphates are present chiefly in the form of Ca and Mg phosphates. While it is difficult to value the ashes for fertilizing purposes on the basis of the total potash, it is evident that four of the above ashes could be used in place of a low-grade potash fertilizer, such as kainite. The phosphates have much the same value as those in

steamed bone flour. From the "lop and top," undergrowth, weed growth, and litter in any av. type of woodland, about 0.5 ton of ash is obtained per acre; 10 acres of fully stocked bracken land produce 1 ton of ash. Cf. Russell, *C. A.* 9, 684. E. J. C.

Cause of the occasionally observed red coloration of the sulfuric acid solution of Thomas meal. HUGO DIRZ. *J. prakt. Chem.* 91, 507-20(1915).—The color is due to a mangani-phosphoric acid compd. It does not appear if the meal contains an excess of reducing substance. Meals which gave the usual green color on digestion with H_2SO_4 could be made to give the red color by sufficient preliminary roasting of the meal with the Bunsen burner or the blast. L. J. GILLESPIE.

Lead nitrate as a catalytic fertilizer for sugar beets. J. K. GREISENEGGER. *Oesterr.-ung. Z. Zuckerind.* 44, 91-6(1915).—Expts. in which $Pb(NO_3)_2$ was used, together with superphosphate and potash salt as a fertilizer for sugar beets, show that this compd. either does not affect the quality of the beet at all, or that its effect is so uncertain that it must be used with great care. E. A. TSCHUDY.

Blasting artificial fertilizer heaps. WILHELM SZIGHTI AND WILHELM FÄRBER. *Brassó. Chem. Ztg.* 40, 11(1916).—For drilling holes in heaps of hardened superphosphate sharpened Fe or steel tubes, provided with a head for hammering, have proved better than a spiral borer. A cut of a simple press is shown for making superphosphate plugs for tamping. J. H. MOORE.

Effect of elemental sulfur and of calcium sulfate on certain of the higher and lower forms of plant life. WALTER FITZ. *Agr. Expt. Sta., Univ. Wis. J. Agr. Research* 5, 771-80(1916).— $CaSO_4$, when added to a soil, apparently has no marked effect on the total number of bacteria that grow on agar plates; nor does it produce any marked increase in ammonification or nitrification. Large amts. of elemental S cause a decrease in the total number of bacteria that grow on agar plates, but produce an increase in ammonification at concns. of 0.05%. This increase is accompanied by a parallel decrease in nitrate formation. The decrease is very probably due to the acidity or toxicity produced by the oxidation of S. $CaSO_4$ stimulates the growth of pure cultures of red-clover bacteria in nutrient solns. and in soil exts. The increase is as great with 0.01% as with 0.1%. The root development of red-clover is increased by $CaSO_4$, the above per cents. apparently being equally efficient. In small amts. $CaSO_4$ increases the yield of red clover and also the number of nodules. Concns. as high as 0.5 to 1% however, produce no increase in growth. The application of elemental S to Miami silt loam soil increased but slightly the yield of clover and apparently did not affect root development or nodule formation. In producing this slightly increased growth 0.01% was as efficient as were higher concns. W. H. FRY.

The influence of nitrates on the development of root tubercles. A. J. EWART. *J. Dept. Agr. Victoria* 13, 759-60(1915).—The object of this investigation was to det. whether or not the addition of nitrate to the soil decreases the formation of root tubercles in legumes. The total yield of beans (*Vicia faba*) fertilized with KNO_3 was slightly greater than in the case of the control and the yield with $NaNO_3$ was the same as that of the control. The nitrates used did not diminish appreciably the formation of root tubercles, yet their use as fertilizers proved unprofitable, the plants being able to gain all the N they required through their root tubercles. J. J. SKINNER.

How contact insecticides kill. III. GEORGE D. SHAFER. *Michigan Agr. Expt. Sta., Tech. Bull.* No. 21, 67 pp.(1915); cf. *C. A.* 6, 525.—S. has studied the properties of CS_2 , gasoline, and a few other liquids, and certain dry powdered contact insecticides, e. g., borax, NaF, white hellebore, etc., which give them insecticidal action after their absorption into the insect tissues. The effect of temp. also was studied. Suggestions for possible practice are given. Reductases, catalases and oxidases were

found in aq. exts. and in the insol. pulp of the tissues of insects, which were injuriously affected by heat, and by gasoline, CS_2 , borax, etc., if in great enough concn. It was shown that an absorption of gasoline ensued when the living insect was subjected to the influence of air laden with gasoline vapor which rendered the membranes (fat-like) less permeable to oxygen. Absorption of certain solid insecticides was shown. Generally these act as stomachic poisons. B. E. B.

Fertilizer. T. L. WILLSON and M. M. HAFF. U. S., 1,166,104, Dec. 28. A dry fertilizer containing CaNH_4PO_4 , a small amount of NH_4 phosphate and free from acid is mixed with NH_4Cl , $\text{Ca}(\text{NO}_3)_2$, NaNO_3 , KCl or other fertilizing salts.

Salts; nitrates; fertilizers. NORSK HYDRO-ELEKTRISK KVAELSTOFAKTIESELSKAB. Brit., 19,791, Sept. 15, 1914. Salts such as $\text{Ca}(\text{NO}_3)_2$ and NH_4NO_3 , which may be used as fertilizers, are prevented from hardening into lumps by mixing with diatomite or kieselguhr, a small quantity being sufficient. The salt may be heated directly or by blowing hot gases therethrough before mixing with the kieselguhr.

Insecticide. A. S. RAMAGE. U. S., 1,166,387, Dec. 28. A H_2O -repellent insecticide for spraying on plants is formed by coating particles of Pb arsenate with Pb stearate or other Pb soap, e. g., pptg. the insol. soap in an aq. suspension of Pb arsenate, Cu soap may be similarly pptd. on Paris green.

16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Physico-chemical study of wine. Electrolytic dissociation constant of wine. CLELIA DI MAIO. Milano. *Ann. chim. applicata* 4, 245-68(1915).—The process of dissociation follows, with sufficient approximation in genuine wines, the law of diln., $K = \alpha^2/(1 - \alpha)v$, in which K = dissociation const., α , the degree of dissociation of the binary electrolyte, v , the vol. in which the gram-mol. is dissolved. K has different values for different wines, but the variations are comprized within narrow limits, so that the appreciable convergence permits of the application of the method in detg. adulteration with strong mineral acids. K , for 9 wines examd., had an av. value of 0.0184 ± 0.0016 , with probable variations of 9.1%. When strong mineral acids are added to wines, they alter considerably the value of K , and if in quantities above 0.5%, change very much the degree of constancy in relation to the prevalence of strong electrolytes that do not follow the law of diln.. This lack of uniformity in the value of K also exists in those wines poor in natural acidity, to which metabisulfite has been added. While the study of the variations of K is of great importance in recognizing genuine wines, the difficulty and laboriousness of the methods of research limit its practical application at the present time. S. LEVY.

Proceedings of the chemical research and pure yeast breeding laboratories and of the institute cellars of the K. K. Höheren Lehranstalten für Wein- und Obstbau in Klosterneuburg. W. SEIFERT. *Separate* 56 pp.; *Chem. Zentr.* 1915, II, 161.—On freezing the must an abundance of $\text{HKC}_4\text{H}_4\text{O}_6$ sepd. The unfrozen portion tasted like the original wine, and the ice water possessed a wine-like character. By sub-cooling, new wines changed their characters in a manner not understood. During the formation of volatile S compounds, a small and regular increase in the sugar content was noted in the fermenting mass, but no marked increase of AcOH was observed. Expts. on the action of different breeds of yeast upon $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$ during their growth and fermentation in beer worts seemed to show that the disappearance of large amts. of the free acid was due

to bacteriologic rather than to chem. activity, and was dependent upon the lively condition of the yeast. Yeast cultivated in unsulfured must was more resistant toward SO_2 , than if cultivated in the presence of SO_2 . CHCl_3 up to 4 cc. and $\text{C}_2\text{H}_5\text{CNS}$ up to 13 drops per liter of must appear to be the limits to which these agents can be added without lessening the activity of *penicillium*. SO_2 bleaches the color of red wine but the color slowly returns, reaching its original intensity in 14 days; this shows that the color is not decomposed. The peronospora activator "Diasogen" contains soft soap 35 and HCHO 6%; on trial it gave a negative result. The "copper-sulfur paste" of Heider in Warnsdorf has the following compn.: At 105° the liquid constituents amount to 68.49, CuS 22.10, CuSO_4 3.86, Fe_2O_3 + Al_2O_3 0.10, H_2SO_4 2.16, Cl 0.38, water of crystn. 0.44%.
L. W. RIGGS.

Acid ratio of malt. A new basis for malt valuation. C. A. NOWAK. Communications U. S. Master Brewers' Assoc.; *Brewers' J.* 51, 509-12(1915); cf. C. A. 10, 367.—N. considers the malt acidity of greatest moment in the valuation of malt for brewing purposes. Basing his conclusions on a careful study of the analytical data covering several thousand malt analyses, he finds that: Malts giving highest acidity in cold water ext. will invariably yield a lab. wort which filters more rapidly and is far more brilliant than a wort prepd. from a malt which has a comparatively low acidity. He also finds that: (1) Medium-berried barleys are, as a rule, preferable for malting purposes. (2) Brilliancy of filtration and yield of ext. are partially dependent upon the natural acidity of the malt. (3) Six-rowed, two-rowed, and Western malts behave differently and require different standards of valuation. (4) Growth and kilning-off temp. exert a far-reaching influence upon the acid ratio. N. sees no reason why two-rowed barleys could not be so malted as to be high in acid ratio and yield a malt well suited for the prepn. of stable bottle beer.
C. A. NOWAK.

Determination of moisture and bitter principles in hops. D. WIEGMANN. *Allgem. Brau.-Hopfen-Ztg.* 55, 1711-2(1915).—A reply to Ö. Winge's response (C. A. 10, 248) on D. Wiegmann's criticism (C. A. 10, 248).
L. W. HAAS.

Barleys of crop 1915. R. HEUSS. *Z. ges. Brau.* 38, 393-4(1915).—Analyses of Bavarian barleys from 29 different localities are given with regard to moisture, N, protein, starch, yield of ext., hl-wt., 1000 berry wt., assortment as to size, and germination energy and capacity. The av. protein content of 12.53% exceeds that of the previous crop by 1.2%, while with regard to the other data, there is a general resemblance between this and last year's barleys.
L. W. HAAS.

The resins in hops from various geographic localities. G. A. RUSSELL. *J. Ind. Eng. Chem.* 7, 1033-5(1915).—R. intended to investigate the variations in the compn. of hops due to locality and season, and to establish the influence of the size of the sample on the final result of hop analyses. The soft resins were extd. by petr. ether (b. p. $35-60^\circ$) and the hard resins subsequently by Et_2O . R. draws the following conclusions: One 10 g. sample picked either at random or from selected cones does not give a correct index to the amt. of soft resins in a quantity of hops. The av. from a number of detns. of 10 g. samples picked at random gives a true value of the amt. of soft resins in a quantity of hops, as likewise does one large representative sample of approx. 1.5 kg. wt. The yield of soft resins varies from season to season in the same and in different localities. The percentage of ash in hops varies in samples from different localities but remains approx. the same in samples from the same locality from year to year.
L. W. HAAS.

Determination of moisture in worts, sugar solutions, barley, hops, malt sprouts and yeast by means of the carbide method. W. WINDISCH AND M. GLAUBITZ. *Wochschr. Brau.* 32, 389-91, 397-8(1915).—The quantity of C_2H_2 evolved was detd. from the loss in wt. of the small app. used for the detns. For the detn. of moisture in barley,

malt, hops, dregs, grounds (lees), etc., the carbide method gives acceptable results, which are regularly higher than those by direct drying. The difficulties of accurate moisture or ext. detns. in worts are not yet overcome by the carbide method. With worts or similar solns., the regulation of the flow of gas can cause difficulties leading to erroneous results. A principal weakness of the carbide method is the necessary employment of very small quantities of soln. (0.2–0.4 g.) to work with. The investigations are being continued, using an entirely different arrangement, which allows working with a far greater quantity of soln. and promises most accurate results.

L. W. HAAS.

Fermenting vessels. P. ROHLAND. *Z. ges. Brau.* 38, 203–5 (1915).—Aluminium vessels, which are enveloped by concrete or a brick wall, usually show after a short time bad corrosions (white efflorescence of Al_2O_3). These may be caused by the alkalinity of the mortar and concrete on getting damp or by electrolytic oxidation due to the impurities of the Al employed in conjunction with the damp mortar or concrete serving as electrolyte. R. recommends the coating of Al vessels first by a protective and insulating layer (asphaltic material, etc.) and then enveloping by concrete or brick walls.

L. W. HAAS.

Change in the nutritive value of potatoes by the distilling process. W. VÖLTZ. *Z. Spiritusind.* 38, 145–6, 153–4 (1915).—Expts. on ruminantia and omnivora revealed that the transformations in the utilizable nutritive substances in potatoes involve a gain of 7.2% for the former against a loss of 6.3% for the latter. L. W. HAAS.

Bákhar, the Indian rice-beer ferment (HUTCHINSON) 11C. Estimation of methyl alcohol in presence of ethyl alcohol (REIF) 7. Glycerol determinations in wine (KALUSKY) 12.

Extracting hops. T. R. SHERCLIFF. *Brit.*, 19,380, Sept. 3, 1914. An app. is specified.

Oxygenated water for malting purposes. O. SCHULZE. *Ger.*, 283,532, July 4, 1913.

Light and dark caramel malt. A. BEHR. *Ger.*, 282,646, Aug. 1, 1912. The green malt is saccharified by treatment with hot air, supersatd. with moisture and having a circular motion; then it is dried, and roasted by superheated air. The germination of the green malt follows according to a special process.

Removing bitter constituents of malt extracts having a burnt taste and odor. E. CANTOR. *Ger.*, 283,471, Mar. 7, 1913. The removal of these substances from colored malt ext., wort, or beer, is effected easily by the passage of steam through these worts.

Obtaining acetone and alcohol by fermenting sugar and materials containing sugar. BAYER & Co. *Ger.*, 283,107, July 19, 1913. Sugar cane 90 is mixed with malt-husks 60, chalk 45, and H_2O 3000, and sterilized for 20 min. at 2 atms. After inoculation with *B. macerans*, an active fermentation takes place at 40°, and after 5 days the cane sugar has disappeared completely. About 30 parts of alc. and acetone, however, are found in the mash. Without the husks, a yield of 10 parts is obtained during 7 days of fermentation. Cf. C. A. 9, 3326.

Non-alcoholic wine. M. DÖNITZ. *Ger.*, 283,641, Dec. 7, 1913. Wine, freed from alc. by the usual process, is mixed with H_2O , without the addition of sugar, and then subjected to fermentation with yeast with the formation of alc. Cf. C. A. 9, 2791.

Rendering used sparkling-wine bottles suitable for re-use for the same purpose. H. EBBERT. *Ger.*, 284,515, Mar. 11, 1914. The old bottles are heated to a high temp.,

preferably until they begin to soften, then cooled slowly in the known manner, and finally filled with the crude wine and carried through the sparkling-wine manuf. in the usual manner.

17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

Procedure for the mechanical purification of used alcohol by means of a drop of paraffin. A. POHL. *Deut. med. Wochschr.* 41, 1373(1915).—Alc. contaminated by particles of dust, etc., is put in a dish and some paraffinum liquidum is dropped in. Moving the dish about the drop of paraffinum rolls along the bottom and takes up all particles. The alc. can also be shaken in a bottle with a little larger amount of paraffin leaving a heavy residue. S. AMBERG.

Method for the determination of tobacco resins and its application to various tobaccos. J. VON DEGRAZIA. *Fachliche Mitt. der österreichischen Tabakregie* 1914, 1-4; *J. Soc. Chem. Ind.* 34, 978; cf. *C. A.* 8, 3096.—Two portions of 60 g. each of the dry powdered tobacco are extd. in a Soxhlet app. with ether, about 100 g. of ether being used for each portion. One of the ethereal solns. is then washed with water contg. a small quantity of acid to remove nicotine, the ether evapd., the residue dissolved in 90% alc., and the soln. strongly cooled. After the sepd. wax has been removed, the alc. soln. is boiled with the addition of 150 cc. of 2% KOH soln., and the mixt. is extd. with ether; the ethereal soln. contains the tobacco resin, together with small quantities of ethereal oils. The soln. usually has a reddish brown color, but in the case of Cserbel tobacco it has a green color. After the ether has been evapd., the residue of tobacco resin is weighed. The alk. soln. contains the resin acids and the resin alc.; the latter is in suspension, and is sepd. and weighed, while the resin acids are sepd. by extn. with ether in the usual way, the ethereal soln. evapd., the residue weighed, the acids dissolved in alc., and the tobaccic acid pptd. by the addition of alc. Pb(OAc)₂ soln. The Pb salt is sepd. by filtration, and the filtrate mixed with ten times its vol. of water acidified with HNO₃; the β -tobaccic acid which seps. in flocks is collected, dissolved in ether, the soln. evapd., and the residue weighed. The γ -tobaccic acid is found by difference. The other portion of the ethereal soln. is evapd., and the residue extd. with alc. to dissolve the α -tobaccic acid; the alc. soln., which contains tannin and nicotine in addition to the acid, is evapd., the residue heated with very dil. KOH soln., cooled, filtered, the filtrate neutralized, and the sepd. α -acid collected. The following table shows the compn. of the resins from various tobaccos expressed as percentages of the latter; the figures indicate that it is possible to differentiate between different kinds of tobacco:

Kind of tobacco.	Total resin.	Wax.	Resene.	Acids.			Resin alcohol.
				α .	β .	γ .	
Havana.....	4.65	0.59	2.64	1.44	0.18	0.38	0.01
Brazilian.....	3.36	0.55	1.97	0.93	0.12	0.32	0.02
Java.....	4.45	0.55	1.37	0.96	0.27	1.75	0.10
Virginian.....	7.59	0.77	5.75	0.86	0.43	0.44	0.02
Hungarian.....	5.15	1.32	3.41	0.83	0.24	0.65	0.02
Cserbel (<i>Nicotiana rustica</i>).....	4.57	0.69	3.46	1.04	0.03	0.04	none
Dalmatian.....	7.86	1.48	5.88	1.22	0.26	0.45	0.05
Turkish.....	7.00	1.00	3.80	2.02	0.32	0.81	0.07

E. J. C.

Wood alcohol as denaturant. ANON. *Oil, Paint and Drug Rep.* 88, No. 26, 18 (1915).—Treasury decision, T. D. 3368, has been revized so that the specification

for the acetone content of approved wood alc. calls for not more than 20 or less than 10 g. of acetone per 100 cc. A method of detg. acetone by absorption of I is given.

E. W. BOUGHTON.

Comparative investigations on the evaluation of semen sinapis, spiritus sinapis, oleum sinapis and charta sinapisata. FR. WEHRMANN, K. WEGENER, FR. H. BRAUN-WARTH AND K. MEYER. *Arch. Pharm.* 253, 306-27(1915).—A résumé of the work by H. Frerichs. The investigation of W. and W. embodies a large number of expts. which relate, however, to the best known methods. M. likewise considers only the more common procedures and makes but few expts. B. treats the subject more from the literary than the practical side and considers some 25 fundamental methods for detg. ol. sinapis, together with variations of such methods. The work presents a very careful compilation of the available literature.

W. O. E.

Chrysanthemum cinerariaefolium Trev. P. SIEDLER. *Ber. pharm. Ges.* 25, 287-302(1915).—In addition to cultural and morphological data, the paper deals with the microscopical exam., the importance of pollen grains in identification, and the investigation of volatile principles. Steam distn. of the flowers yielded 0.067% of a peculiar aromatic, salve-like mass containing among other things the elements of palmitic and other fatty acids, unidentified phenols, ketone or aldehyde-like substances.

W. O. E.

Norwegian turpentine oil. H. W. FOSSE. *Ber. pharm. Ges.* 25, 303-13(1915).—The crude oil resulting from the distn. of pine and fir in closed retorts contained in addition to terpenes and sesquiterpenes oxygenated substances (resins) as well as S compds. belonging to the mercaptans. The terpenes consist largely of *d*-pinene and small quantities of sylvestrene. Cadinene could not be detected. Oil purified with CaOCl_2 proved to be free from S compds. and no longer possessed the disagreeable odor of the crude oil. A purified sample was found to be *d*-rotatory, thus indicating a possible change of *l*-pinene to *d*-pinene during the process of purification. Purified oil consisted of almost 80% pinene, with small quantities of sylvestrene and sesquiterpene. Pine oil was present in neither the crude nor purified product.

W. O. E.

The hypodermic injection of ergot and ergotinine. M. G. PEGURIER. *Reperl. Pharm.* 27, 265-9(1915).—The article calls attention to the confusion often observed in prescribing and using certain prepn. of ergot mentioned in the Codex. In order to obviate the uncertainty frequently obtaining in the administration of such products, suggestions are offered relative to the prepn. and sterilization of the solns. in question.

W. O. E.

Changes in iodized benzine. RAPP. *Pharm. Ztg.* 60, 609-10(1915).—The principal changes, due to age and the action of light, result in the formation of HI and an I deriv. of a hydrocarbon. Iodized petroleum ether was found to be more stable than iodized commercial benzine. The addition of paraffin liq. to iodized benzine is to be discouraged.

W. O. E.

Determination of chloroform in cough sirups. EARLE B. PUTT. *Am. Food J.* 10, 467-8(1915).—By analysis of more than 100 sirups, P. found that they contained CHCl_3 in amts. ranging from 5 minims to a fraction of one minim, an av. of 2 to 3 minims, per fluid ounce. Small amts. of CHCl_3 can be readily detd. by utilizing the well-known reaction with KOH and detg. the resulting KCl. For most sirups this method cannot be applied directly because of the presence of interfering substances. P. proposes a modification which makes the method applicable to all cough sirups and to other medicinal prepn. containing CHCl_3 such as pastilles and lozenges: For sirups, to a 10 cc. sample in a 250 cc. Kjeldahl flask add about 1 g. CaCO_3 (to neutralize free acid) and 80 cc. 95% alc. Distil through a vertical condenser, having a delivery

tube extending well down into a 150 cc. pressure flask standing in cold water, until about 70 cc. of distillate is collected. To the distillate add exactly 10 cc. standard alkali (100 g. KOH in 100 cc. H_2O), close the flask with a sound cork securely wired, mix thoroughly and heat on a gently boiling water bath for 1 hr., cool, transfer to a 400 cc. beaker and det. KCl with $AgNO_3$, either gravimetrically or volumetrically. For lozenges, etc., to about 2 g. of sample in 10 cc. of water the alc. is added and the chloroform distilled off as for the sirups, further procedure being identical. The method, checked with a known alc. soln. of $CHCl_3$, was found to be reasonably accurate.

G. A. MENGE.

Nature of pharmaceutical naphthene oil (liquid petrolatum). B. T. BROOKS. Mellon Inst., Pittsburgh. *J. Am. Med. Assoc.* 66, 24-6(1916).—The claim that Russian oils alone consist of naphthene hydrocarbons is not warranted as America has great quantities of petroleum of the same general characters as the Baku oil. Emphasis is laid on the necessity of a uniform nomenclature to be adopted to designate the viscous, water white, tasteless mineral oils which are now known by a score of trade names. Most of the so-called paraffin oils contain no paraffin being made up of the naphthene and polynaphthene classes; hence B. suggests that they be called "white naphthene oils." The most important tests for these preps. are taste, keeping quality and viscosity.

L. W. RIGGS.

Formic acid as a reagent in essential oil analysis. WM. H. SIMMONS. *Analyst* 40, 491-4(1915).—The use of HCO_2H as a reagent in the quant. analysis of essential oils is based on the fact that geraniol is very largely converted into terpenes by treatment with HCO_2H , while citronellol is esterified to citronellyl formate. The method is carried out by heating a mixt. of 1 vol. of oil with 2 vols. of 100% HCO_2H under a reflux condenser for 1 hr. on a boiling water bath, washing the esterified oil with brine until free from sol. acid, rendering it neutral to phenolphthalein, and then saponifying it with 0.5 *N* alc. KOH, and titrating back the excess of KOH with standard acid.

% citronellol =

$$\frac{\text{Number of cc. 0.5 } N \text{ KOH absorbed} \times 0.078 \times 100}{\text{Wt. of esterified oil taken} - (\text{number of cc. 0.5 } N \text{ KOH absorbed} \times 0.014)}$$

Wt. of esterified oil taken — (number of cc. 0.5 *N* KOH absorbed $\times$ 0.014)

S. has applied the method to a number of oils, including oils of geranium, peppermint, sandalwood, etc. In a previous paper he has shown that the decompn. of geraniol and the esterification of citronellol are incomplete (*Yearbook of Pharm.* 1913, 565-8; cf. also *C. A.* 7, 3816). He concludes from the present work, however, that terpineol is almost completely decompd. by formylation, geraniol and linalol are both converted into an appreciable quantity of ester, while santalol is only partially decompd., and citronellol, menthol and the borneol in rosemary oil may be approx. estd. by the process. The use of HCO_2H as a reagent is undoubtedly of value in the examn. of geranium oils, and, if the right conditions as to strength and proportion of acid and duration of heating can be detd., enables an accurate detn. of the proportion of menthol in peppermint oils.

P. B. DUNBAR.

Estimation of methyl alcohol in presence of ethyl alcohol (REIF) 7.

Medicinal composition. H. HÖRRLIN. U. S., 1,166,208, Dec. 28. β -Imidazolylethylamine hydrochloride is combined with 4 times its wt. of *p*-hydroxyphenylethylamine hydrochloride to obtain a medicine in which desirable physiological action of each constituent predominates without harmful after-effects such as follow the use of the constituents separately.

Aperient extracts. R. TAMBACH. U. S., 1,167,230, Jan. 4. An alc. ext. is prepd from rhubarb, cascara or senna and ether is added to the ext. as long as a ppt. is formed.

The liquid is then concd. by evapn. and reduced to the desired standard strength by addition of sugar of milk.

Lipoid compounds containing phosphorus from high-molecular fatty acid derivatives. F. HOFFMANN-LA ROCHE & Co. Ger., 284,736, July 31, 1914. Addition to 281,801 (C. A. 9, 2292). In order to obtain a purer product with a better yield than possible by the parent process, PCl_3 instead of phosphorous acid is allowed to act on the high-mol. keto fatty acids and their derivs.

Lipoid compounds containing phosphorus. F. HOFFMANN-LA ROCHE & Co. Ger., 285,991, Apr. 26, 1914. Addition to 280,411 (C. A. 9, 1708). The products are obtained from higher-mol. fatty acid derivs. The hydroxyphosphinic acids obtained according to the parent process are esterified according to the usual methods.

Separating the pharmacologically active constituents of *Cannabis indica*. F. HOFFMANN-LA ROCHE & Co. Ger., 285,829, Dec. 5, 1913. The exts. obtained from *Cannabis indica* with org. solvents, which are not miscible with H_2O , are treated with dil. alkali with exclusion of air, and from the resulting solns. the alkali-sol. and the alkali-insol. constituents are sepd. The resulting products are distinguished from each other in their poisonous and narcotic properties.

A tasteless cholic acid compound. Ger., 285,828, Mar. 19, 1914. BAYER & Co. Cholic acid is treated with acetyl formate or with a mixt. of AcOAc and HCOOH . In addition to the properties of cholic acid, the product possesses disinfecting properties.

Cobalt cholate. KNOLL & Co. Ger., 284,762, Oct. 21, 1913. Co cholate is obtained by the reaction between Co salts and alkali cholates.

Diarylurea chlorides. BADISCHE. Ger., 285,134, Aug. 5, 1913. COCl_2 is allowed to act upon diarylamines or their hydrochlorides, with heating and in the absence of substances which prevent the formation of diarylamine hydrochlorides, until the reaction mass contains no unconverted diarylamines or their hydrochlorides, or contains them only in inconsiderable amts.

Urea nitrate. ÖSTERREICHISCHER VEREIN FÜR CHEM. UND METALLURGISCHE PRODUKTION. Ger., 285,259, Mar. 19, 1913. The product is obtained by treating the aq. soln. of cyanamide with HNO_3 . The acid is added with continued cooling of the reaction mixt. in which the temp. must not be allowed to exceed $+20^\circ$. This is accomplished by evapg. the cyanamide soln. carefully, practically to the consistence of a sirup, taking care that it does not become alk. by adding small amts. of free acid (HNO_3 , H_2SO_4 , etc.). The sirupy cold lye is carefully cooled, and HNO_3 of 40°Bé . is added with stirring, so slowly that the cooling prevents a rise in temp. until the gas evolution begins. Even a temp. of $+20^\circ$ is to be avoided. The lye thickens finally to a stiff slurry. The ppt. is then drained and must be freed from adhering HNO_3 by covering it with concd. aq. soln. of urea.

Ureas of the naphthalene series. BAYER & Co. Ger., 284,938, Oct. 17, 1913. Addition to 278,122 (C. A. 9, 1096). According to the process of 278,122, ureas of the naphthalene series are obtained by treating aminobenzoylated 1,8-aminonaphthol-sulfonic acids with COCl_2 . The same products are obtained if in these aminonaphthol-sulfonic acids the aminobenzoyl residues and their derivs. are wholly or partially substituted by aminobenzenesulfonyl residues, their homologs or substitution products.

Compounds of urethans and diurethans with methyl bromides. GEHR & Co., AKT-GES. Ger., 284,734, May 14, 1913. The urethans are heated with CaBr_2 or SrBr_2 in a suitable solvent in the mol. proportion of 1 to 4. The process is completed in several hrs.

Hydroxyisopropyl derivatives of hydrocarbons and their derivatives. BAYER & Co. Ger., 284,764, Nov. 29, 1913. Addition to 280,226 (C. A. 9, 1371). In the

parent process for the introduction of the hydroxyisopropyl group into organic compds. the compds. (ketones, aldehydes, etc.) are allowed to act upon the soln. of Na acetone in ether, ligroin, etc., at a low temp. Instead of Na acetone, other ether-sol. alkali compds. of acetone can be employed.

Derivatives of 2,3-hydroxynaphthoic acid amide. BAYER & Co. Ger., 284,997, Nov. 29, 1913. These derivs. are obtained by the action of the halides of 2,3-hydroxynaphthoic acid, or of the free acids in the presence of dehydrating agents, on aminonaphthols.

Hydrazine monocarboxylic acid esters. E. MERCK. Ger., 285,800, Feb. 12, 1914.

Sulfomethylbenzophenone-*o*-carboxylic acids. FARBW. v. M. L. & B. Ger., 285,700, Oct. 21, 1913. These acids and their substitution products are obtained by oxidizing *unsym*-dimethylbenzophenonesulfonic acids obtained from the chlorides of benzoic acid and their substitution products with *m*-xylene followed by sulfonation.

Ethyl acetate. CONSORTIUM FÜR ELEKTROCHEM. IND. G. M. B. H. Ger., 285,990, Jan. 31, 1914. Addition to 277,111 (C. A. 9, 1829). In accordance with the parent process the production of EtOAc from AcH is effected with the employment of an alcoholate catalyzer. A more practicable procedure consists in applying this alcoholate catalyzer in dissolved form, preferably in AcOEt soln. The procedure is preferably such that the solvent acts simultaneously with the aldehyde upon the catalyzer. Cf. C. A. 9, 1226.

Acetic anhydride. BOSNISCHE ELEKTRIZITÄTS-AKT.-GES. Ger., 284,996, Jan. 20, 1914. For the manuf. of Ac₂O from the HOAc esters of the aliphatic aldehydes with not more than 4 C atoms, these esters are heated, alone, above the b. p. They may also be warmed with catalyzers or superheated highly in their presence.

Formates. G. BREDIG and S. R. CARTER. Ger., 283,895, Dec. 23, 1913. Salts of HCO₂H are obtained by the catalytic reduction of carbonates and bicarbonates.

Crystalline polymerization products of formaldehyde. F. POLLAK. Ger., 284,756, Dec. 14, 1912.

3-Methyl-butinol and its homologs. BAYER & Co. Ger., 285,770, Nov. 22, 1913. These products are obtained by allowing acetone or its homologs to act upon the alkali compds. of C₂H₂ and its homologs.

Esters of orthosilicic acid. L. KNORR and H. WEYLAND. Ger., 285,285, Mar. 22, 1914. Esters of H₄SiO₄ with polyvalent alcs. are obtained by heating the simple silicic acid esters, such as Me₄SiO₄ or Et₄SiO₄, with polyhydric alcs., in varying proportions. The products are said to possess therapeutic properties.

Pyrimidine derivatives. S. J. THANNHAUSER. Ger., 285,286, Apr. 25, 1914. Pyrimidine derivs. are obtained by treating diaminopyrimidines with sugars or other substances containing an aldehyde group, or with the carboxylic acids obtained from such sugars by oxidation.

Salt-like double compounds of the ω -methylsulfonic acid of *p*-aminophenyl salicylate with purine derivatives. J. ABELIN, E. BÜRG and M. PERELSTEIN. Ger., 285,579, May 18, 1913. The double salts are obtained by acting upon an alkali salt of ω -Me-sulfonic acid of *p*-aminophenyl salicylate with a basic deriv. of purine, or upon an alkali compd. of such a purine deriv. with the free ω -Me-sulfonic acid of *p*-aminophenyl salicylate. The purine derivs. specified are 1,3,7-tri-Me-2,6-dihydroxypurine, 1,3-di-Me-2,6-dihydroxypurine. The products, which are readily sol. in H₂O and are suitable for injections, are applicable therapeutically.

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

The disposal of niter cake. ANON. *J. Soc. Chem. Ind.* 34, 1121(1915).—A report of the special joint committee of the Chemical Society and the Society of Chemical Industry, appointed to consider the question of utilization of niter cake. The following suggestions were received. Heating the cake with NaCl, collecting the HCl, and afterwards treating the Na_2SO_4 in the black-ash furnace in the usual way. Heating with magnesite to make Epsom salts for use in the textile industries. Replacing H_2SO_4 in the manuf. of superphosphates. Roasting with Fe scale to get off the available acid in its most concd. form. Use in the making and glazing of slag bricks. Sprinkling on manure heaps to fix the NH_3 . Heating with mixed sulfide ores to ext. the Zn. Blowing steam or air into the melt and directing the mixt. of acid vapors into the H_2SO_4 plant. Granulating the melt by pouring into H_2O and centrifuging the grains to obtain a clean Na_2SO_4 and an acid mixt., which can be sprayed into an auxiliary chamber of acid plant, the chamber acid obtained being concd. and used again in the HNO_3 process where a little NaHSO_4 is unimportant. Using the niter cake to increase extn. of Cu when roasting chalcopryrite, by charging into the lower floors of a multiple hearth furnace. Utilizing niter cake as a source of acid for lixiviation of Cu materials, pyrites, cinders, etc. Utilization in the trenches in place of $\text{Fe}_2(\text{SO}_4)_3$. Using the cake instead of H_2SO_4 to decompose soap suds and to liberate free fatty acids instead of discharging into rivers. Using after neutralizing to ppt. $\text{Ba}(\text{SH})_2$ to make blanc fixe and NaSH (cf. U. S. Pat. 714,145). Mixing 1 part of leather-clippings with 2 parts of niter cake and heating to 300° , when much of the N is converted into $(\text{NH}_4)_2\text{SO}_4$; the product is cooled and mixed with 1 part of mineral phosphate and sold as fertilizer. Use as a weed killer; for flushing drains; in place of H_2SO_4 to make "pearl hardening;" roasting with potash feldspar and crystg. out the potash alum. Using it with NaCl for the roasting of Cu, Zn, and Ni ores previous to leaching. Using it in the place of Na_2CO_3 in the manuf. of W powder. Grinding with dry CaCl_2 to produce HCl, and then adding more CaCl_2 to form gypsum. Replacing H_2SO_4 in converting Na_2CrO_4 into $\text{Na}_2\text{Cr}_2\text{O}_7$; for opening up W ores. Neutralizing the free acid, reducing to sulfide by means of fine coal at $600\text{--}850^\circ$, and crystallizing the product. Manuf. of soda alum (cf. U. S. Pat. 714,846). Fusing the cake with sand to produce H_2SO_4 and Na silicate for glass making, etc.

F. W. SMITHER.

Preparation of alkali nitrates from calcium nitrate. H. LECHATELIER AND B. BOGRRCH. *Compt. rend.* 161, 475-9(1915).—A description is given of the prepn. on a commercial scale of NH_4NO_3 from $\text{Ca}(\text{NO}_3)_2$, such as is obtained from Norway. The chief difficulty met with lies in the nature of the pptd. CaSO_4 , but by heating to 150° a mixt. of CaSO_4 and $\text{CaSO}_4 \cdot 0.5\text{H}_2\text{O}$ can be obtained which settles and filters rapidly.

GEORGE W. MOREY.

Internal temperature of sulfur furnaces. STEFANO PAGLIANI. Palermo. *Ann. chim. applicata* 4, 268-70(1915).—A reply to criticisms on a previous article by P. (C. A. 9, 3331).

S. LEVY.

Relations of the inorganic nitrogen compounds to protein and their technical production from coal and the constituents of the atmosphere. A. BAUDREXEL. *Wochschr. Brau.* 32, 264-6(1915); cf. C. A. 9, 2772.—A review of the synthetic manufacture of the different inorganic N compounds and their use for industrial and agricultural purposes.

L. W. HAAS.

The chemical industry of Holland under the influence of the war. ANON. *Chem. Ztg.* 39, 965-6(1915).

J. H. MOORE.

Progress of the inorganic heavy chemical industry in 1913 and 1914. BRUNO WASSER. *Chem. Ztg.* 39, 741-3, 750-4, 782-5, 848-9, 886-9, 902-6, 915-7, 934, 957-61, 967-9, 977-9, 988-9(1915).—A review of conditions, processes and app., with 26 cuts and a bibliography of 1756 references. A special edition of the review may be ordered from *Chem. Ztg.*, Cöthen, Germany. J. H. MOORE.

The royal bureau for testing materials at Lichterfelde-West near Berlin and its problems. WERNER MECKLENBURG. *Naturwissenschaften* 3, 645, 665(1915).—Descriptive. The investigations carried out by this laboratory are similar in nature to those carried out at the Bureau of Standards, Washington. The paper is profusely illustrated. C. G. F.

The gaging of storage tanks. R. L. OGDEN. Rahway, N. J. *J. Ind. Eng. Chem.* 8, 58-9(1916).—Method of solution of the problem of calcg. the vol. of liquid in a cylindrical tank with dished ends, lying on its side, for each inch of depth. F. A. H.

The reciprocal salt pair $\text{KCl} + \text{NaNO}_3 \rightleftharpoons \text{NaCl} + \text{KNO}_3$ and the manufacture of conversion salt-peter (REINDERS) 2.

Nitric acid. NORSK HYDRO-ELEKTRISK KVAELSTOFARTSELSKAB. Brit., 19,792, Sep. 15, 1914. In concg. HNO_3 in counter-current with H_2SO_4 , the requisite temp. is maintained in the concg. tower by introducing the HNO_3 as a mixt. of liquid and vapor preferably produced by boiling the HNO_3 outside the concg. tower. Cf. C. A. 9, 1375.

Ammonia from the elements. BAYER & Co. Ger., 285,698, Jan. 3, 1914. When the ferri- or ferro-cyanic acid salts of the alkali and alk.-earth metals are heated, at first alone with as complete exclusion of air as possible (e. g., in a covered crucible or in a current of gas free from O), and H and N are then conducted over the resulting decompn. products, a union of the gases, to form NH_3 , results, with an exceptionally large yield. The union of the elements is effected with the employment of these catalytic agents, at a relatively low temp. and pressure. E. g., $\text{K}_4\text{Fe}(\text{CN})_6$ is heated at 600-700° in a current of H under atm. pressure. The grayish black roast is placed in a high pressure app., heated to 430°, and upon passing through this mass a N-H mixt. under a pressure of 150 atm., a continuous formation of NH_3 results, yielding 15 vol. % in the escaping gas.

Catalyst for synthesis of ammonia. C. ELLIS. U. S., 1,167,280, Jan. 4. Atomized molten Ce containing La, Yt or Di is intimately mixed with granular charcoal.

Ammonia and carbon compounds containing nitrogen. H. KOPPELS. Ger., 285,354, Sep. 16, 1913. Addition to 257,188 (C. A. 7, 2289). The heating of the nitrogenous masses is effected by means of circulating gases, freed from their NH_3 -content by keeping the content of water vapor as constant as possible.

Titanic oxide. A. J. ROSSI and L. E. BARTON. U. S., 1,166,547, Jan. 4. Ore containing oxides of Ti and Fe is melted with NaOH. The melt is lixiviated to remove excess NaOH and the residue is digested with an amt. of concd. HCl which is proportioned to combine only with the Fe and alkali present. Cold H_2O is added to promote the settling of hydrated TiO_2 , while retaining the other compds. in soln. (the settling being accelerated if desired by adding NaCl) and the ppt. is calcined. The product contains 90-99% TiO_2 .

Pure zinc oxide. W. ASKE. U. S., 1,165,743, Dec. 28. Na_2CO_3 is added to a soln. of Na zincate to ppt. pure ZnO and form NaOH in soln. The ppt. is sepd. and the mother liquor is treated with lime and the resulting CaCO_3 ppt. is sepd. to recover the NaOH in soln.

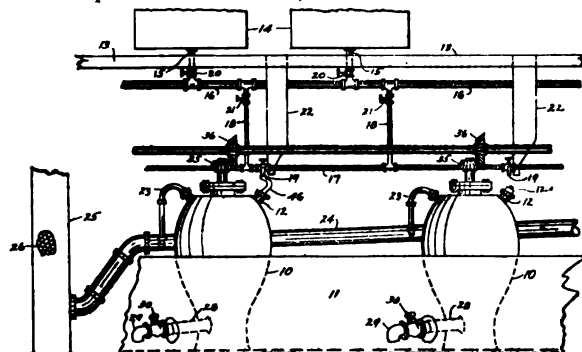
Aluminium sulfate. J. BOULTON. Brit., 20,227, Sept. 26, 1914. $\text{Al}_2(\text{SO}_4)_3$, free from Fe, is obtained by treating crude material such as bauxite or oxidized shale with H_2SO_4 under the action of electrolysis and magnetism at 100°F ., the liquor being finally filtered and crystd. The electrolysis and magnetism are applied by means of a frame of magnetized steel wires having Cu wire cross-pieces from which hang electrodes of Zn. The whole is immersed in the liquor and is supported on a wooden stool.

Sodium carbonate. M. SPAZIER. Brit., 19,245, Aug. 29, 1914. App. for mfg. soda crystals from soda ash by the process of 29,827, 1913 (C. A. 9, 1673), consists of open tanks in which the soda ash is dissolved in cold H_2O , drainage boards, and reservoirs for receiving the mother liquor from the tanks. The soda ash is preferably fed to the tanks through a screen. The tanks are preferably used alternately, the crystals from one being removed to the drainage board, and the mother liquor to the reservoir while crystn. proceeds in the other tank. The liquor drains back from the drainage boards to the tanks, the liquor is returned from the reservoir through one of the openings closed by screw plugs, and H_2O is added from one of the taps provided for that purpose.

Solid ammonium carbonate. J. BUEB and DEUTSCHE CONTINENTAL GAS-GES. Ger., 285,498, Mar. 22, 1914. Experiments have demonstrated that in the production of sublimed $(\text{NH}_4)_2\text{CO}_3$, if the gaseous components (NH_3 , CO_2 and steam) be intimately mixed before entrance into the sublimation chamber, and heated above the decompn. temp. of the $(\text{NH}_4)_2\text{CO}_3$, the union of the components can be effected in the sublimation chamber. For this purpose, a sufficient amt. of H_2O or NH_3 soln. is placed in the lower portion of the sublimation chamber. The supply pipes for the CO_2 and NH_3 dip into the liquid to a sufficient depth. If, now, the gaseous components are conducted into the liquid in a rapid stream, while at the same time the upper portion of the sublimation chamber is cooled, the H_2O heats up to such a degree that at the surface a rapid sublimation of $(\text{NH}_4)_2\text{CO}_3$ takes place with deposition of the solid salt, in a thick crust, in the upper, cooled portion of the sublimation chamber. The H_2O , as used, may be replenished, either continuously or from time to time, as such or in the form of steam.

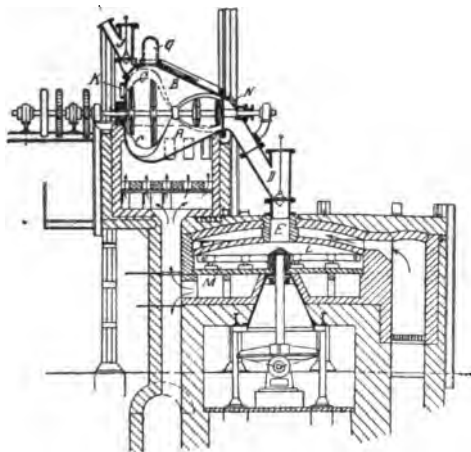
Solid ammonium carbonate. J. BUEB and DEUTSCHE CONTINENTAL GAS-GES. Ger., 285,531, Mar. 22, 1914. In previous processes the product obtained is not uniform, for the layers deposited in a disintegrated state in the sublimation chamber show a higher content of $(\text{NH}_4)_2\text{CO}_3$ than those layers produced later in the process and deposited higher up. A solid product, uniform throughout, may be obtained by cooling the upper portion of the sublimation chamber, while supplying heat to the lower portion. In this way the yield of the sublimed product is increased, while at the same time the $(\text{NH}_4)_2\text{CO}_3$ deposits quickly on the walls, so that the period of reaction is shortened.

Apparatus for treating lead ore with nitric acid. S. W. ANDERSON. U. S., 1,165,742, Dec. 28. Stoneware vessels 10, each of which contains a vertical spiral agitator operated by gears 35, 36, are partly filled with galena through the chutes 22



and with HNO_3 from the tanks 14 and the vessels are heated by hot H_2O in the trough 11. Pb nitrate soln. produced is drawn off and purified and N oxides are led off from the tops of the vessels 10 and reconverted into HNO_3 in the tower 25.

Furnace for making sodium sulfate and hydrochloric acid. K. THELEN and F. WOLF. U. S. 1,165,815, Dec. 28. H_2SO_4 , NaHSO_4 and NaCl are heated together



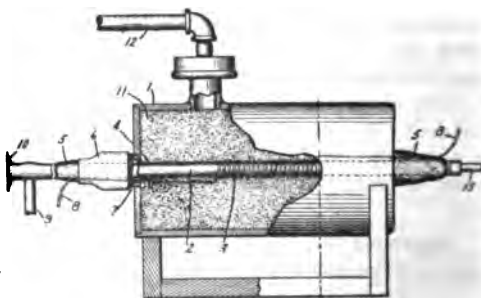
in the furnace to produce HCl . The charge is introduced through the inlet *J* into the mixing vessel *B*. The stirrer *C* when rotated in one direction mixes the charge and when rotated in the opposite direction feeds the charge through the conduit *D* to the calcining furnace where the stirrer *L* and scraper *M* distribute it. Gaseous HCl is led off through the outlet *G* and through another outlet from the furnace chamber.

Anhydrous sodium hyposulfite. E. VON PORTHEIM. U. S., 1,166,160, Dec. 28. A mixt. of Na formate and Na pyrosulfite is reacted on with SO_2 in dil. alc. containing about 75-80% alc. at a temp. of 65-70°.

Barium chloride. E. V. GRANO. U. S., 1,167,061, Jan. 4. Cl gas is passed into a concd. soln. of BaS at a temp. of about 85° and the S and BaCl_2 formed are sepd. by allowing the pptd. S to settle through a perforated false bottom in the reaction vessel.

Continuous production of nitrogen compounds from metal carbides and nitrogen. C. KRAUSS, P. STÄHELIN and AKT.-GES. FÜR STICKSTOFFDÜNGER. Ger., 285,699, June 15, 1913. Addition of 282,213 (C. A. 9, 2298). In order to prevent the reversion of the cyanamide obtained according to the parent process, and to avoid the fusion of the transporting agent, the channel furnace is provided with a regulable external cooling device. The reaction can then, throughout its entire extent, be maintained readily within the temp. limits which are necessary to obviate the difficulties stated. Also practically only the theoretical amt. of N required for the reaction need be used.

Obtaining nitrogen from the air. R. WINNE. U. S., 1,166,294, Dec. 28. Air is led through the inlet *g* into a porous alundum tube 2 glazed at one end 4 and heated throughout most of its length by a resistance wire 3. This tube is maintained at 800-900° and H_2 is supplied through the pipe 12 and passes through a porous sand filling 11 and the wall of the tube 2, forming a mixt. of almost pure H_2O and N which is led off through the outlet 13 and treated to remove the H_2O and other impurities present in small amts.



Catalyst containing copper or nickel. C. ELLIS. U. S., 1,165,956, Dec. 28. A friable mixt. containing non-colloidal $\text{Ni}(\text{OH})_2$ and sol. salts is prepd. from $\text{Ni}(\text{NO}_3)_2$ or $\text{Cu}(\text{NO}_3)_2$ and NH_4OH and employed as a starting material for making a catalyst by drying, washing and reducing with H_2 .

Treating blast furnace slag. T. TWYNAM. Brit., 20,258, Sept. 28, 1914. Molten blast-furnace slag is used for raising steam, *e. g.*, by allowing it to flow into H_2O or by discharging jets of H_2O onto the slag in a closed receptacle, the slag being thereby granulated; the steam is used, as in low-pressure turbines, for the production of high-tension elec. current, which is used to obtain HNO_3 by oxidation of atm. N, the HNO_3 being then used to obtain from the slag $Ca(NO_3)_2$ and other products. The acid should be neutralized by the slag as completely as possible. SiO_2 is sepd. in a gelatinous form, and to the soln., lime or dolomitic lime is added to ppt. the metals other than Ca, the filtrate being $Ca(NO_3)_2$. The ppt. is treated with soda to obtain $NaAlO_2$, from which Al_2O_3 is prepd. by known methods. and the residue, consisting of MgO and MnO , may be used for the production of MgO bricks. Alternatively, the Al_2O_3 may be pptd. first. The $Ca(NO_3)_2$ is evapd. to dryness. It usually contains some potash from the slag, and may be used mixed with $(NH_4)_2SO_4$ or K_2SO_4 as a fertilizer, to which the SiO_2 obtained as above described may be added as a diluent; or the SiO_2 , which usually contains a little $Ca(NO_3)_2$, may be used alone as a fertilizer, or may be used as an ingredient of mortars and bricks.

Absorber for absorption refrigerating machines. A. ZELLNER. Ger., 285,026, Jan. 25, 1914.

Electric insulating materials. W. TRIGGIN and LONDON ELECTRIC WIRE Co. and SMITHS LTD. Brit., 19,878, Sept. 17, 1914. An insulating material for elec. conductors which is not readily combustible consists of strip asbestos coated on one side with an even layer of combed or carded cotton or wool, or a mixt. of cotton and wool, or paper made from manila, wood pulp, hemp, flax, jute, or mixts. of these substances, the whole being impregnated with rubber soln. A machine is specified.

Plastic compositions. A. G. HOPKINS. Brit., 19,437, Sept. 4, 1914. A sol. silicate and pptd. chalk are mixed to produce $CaSiO_3$, which is rendered sticky and non-drying by the addition of molasses or treacle and glycerol or the like. The product may be employed for mending tanks for containing hydrocarbons, etc., or for making liquid-tight joint for use in connection with hydrocarbons, etc. The compn. may be spread upon calico and applied as a patch, or it may be worked into a plug.

Phosphorescent motion-picture screen. A. WRIGHT. U. S., 1,166,569, Jan. 4. The surface of the screen is coated with varnish mixed with willemite or other material which becomes luminescent by the action of light and thus reduces eye-strain in viewing motion pictures by effecting continuous illumination of the screen when in use.

19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

Jena glass and the war. E. ZSCHIMMER. *Chem. Ztg.* 40, 7-8(1916).

J. H. MOORE.

Special glasses and their constituents. A. GRANGER. *Mon. sci.* [5] 5, 274-85 (1915).—A review and discussion (with some analytical data) of the literature under the captions: (a) Ba glass, (b) ZnO in glass, (c) MgO in glass, (d) Al_2O_3 in glass, (e) B_2O_3 , P_2O_5 , Sb, As in glass.

F. W. SMITHER.

The influence of some unusual zinc compounds in a chrome green glass. R. H. MINRON. *Trans. Am. Ceram. Soc.* 17, 667-71(1915).—Various forms of Zn were introduced while Cr_2O_3 was kept const. All ordinary Zn salts were tried in 2 burns: (1) regular kiln, (2) small muffle test kiln. From burn 1 the following conclusions were drawn: (1) no evidence of green color is found in any glaze containing Zn from any source; (2) $ZnCrO_4$ produces strongest color; (3) $Zn_3(PO_4)_2$ produces the strongest pink shade;

(4) most of these salts have not produced good glaze texture; (5) Zn salts not containing O destroy the green color of Cr_2O_3 the same as Zn salts combined with O. From burn (2) the conclusions were: (1) short fire has made much difference in maturity; (2) the short fire changes most of the colors showing more of the green tints.

C. H. KERR.

Causes of stony glass and the relation of potassium carbonate to it. C. J. BROCKBANK. *Trans. Am. Ceram. Soc.* 17, 760(1915).— K_2CO_3 is not ordinarily a cause of stones. One case is cited where K_2CO_3 containing 16% H_2O was replaced by H_2O -free material resulting in a scum which caused some stones.

C. H. KERR.

Causes of stony glass and the relation of potassium carbonate to it. FREDERIC CARDER. *Trans. Am. Ceram. Soc.* 17, 761-3(1915).—The chief cause of stones are: (1) soln. of the pot; (2) slow fusion; (3) imperfect mixing of the batch; (4) too large SiO_2 grains. K_2CO_3 makes glass more liable to stone simply because it is less liquid than Na glass.

C. H. KERR.

Cause and differentiation of seeds in glass. ROBERT L. FRINK. *Trans. Am. Ceram. Soc.* 17, 793-802(1915).—Causes given are: (1) increase in factory production, meaning overworking of the tank; (2) faulty furnace operation. Seeds (or bubbles) are stated to come from: (1) CO_2 and CO from batch materials; (2) smoke or oil vapor; (3) SO_2 or volatilized NaCl; (4) gas evolution accompanying devitrification; (5) arsenic; (6) occlusion of air. Characteristic appearances and methods of occurrence are described.

C. H. KERR.

The silvering of glass. ALEXANDER SILVERMAN AND PAUL D. NECKERMAN. Univ. Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 505-19(1915).—Some historical data are given and a good bibliography. Tabulation of qualitative results is given, using a reducing agent, both hot and cold in each case, both concd. and dil., the reagents and results being briefly as follows (consult original for exact data): (1) Na-K tartrate, good; (2) HCHO, fairly good; (3) tartaric acid, fair; (4) citric acid, poor; (5) dextrin, poor; (6) tannic acid, poor; (7) Na tartrate, fair; (8) milk sugar, fairly good; (9) SnCl_4 , poor; (10) cane sugar, good; (11) phenylhydrazine, poor; (12) HCOOH , poor; (13) KNO_3 , poor; (14) Na_2SO_3 , poor; (15) HNO_3 , poor; (16) FeSO_4 , poor; (17) CH_3CHO , good.

C. H. KERR.

Memorial lecture on M. L. E. Solon. R. L. HOBSON. *Trans. Eng. Ceram. Soc.* 14, 80-95(1914-15).

C. H. KERR.

Saggers: past, present, future, their scientific, humanitarian and commercial aspects. J. P. GUY. *Trans. Eng. Ceram. Soc.* 14, 27-37(1914-15).—Saggers should be fired to their max. temp. of use before being put into service. A special material called "aluminous asbestos" from South Africa is highly recommended. This apparently is a waste product (probably the rock matrix) accompanying S. African asbestos. A sample sagger containing this material was exhibited in good condition after 10 burns. Cf. C. A. 9, 1835.

C. H. KERR.

Microscopic investigation of some compounds noted in the systems soda-zinc oxide-silica and soda-zinc oxide-titanic oxide-silica. A. A. KLEIN AND G. H. BROWN. U. S. Bureau of Standards, Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 745-59(1915).—In melts of that part of the system, Na_2O - ZnO - SiO_2 lying between the following concn. in mol. %: 90.0 SiO_2 , 10.0 ZnO , 10.0 ZnO ; 50 Na_2O , 40.0 SiO_2 ; and 60.0 ZnO , 40.0 SiO_2 , 3 types of structures are encountered, glassy, mat, and cryst. In the mat and cryst. melts, with 1 exception, the compd. which seps. appears to be 2 $\text{ZnO} \cdot \text{SiO}_2$. This closely resembles the mineral willemite in optical constns. Allowing for the chem. inhomogeneity of the glass the max. n follows the Lorentz-Lorenz law of sp. refractivities fairly closely. Glassy, mat and cryst. structures occur in melts of Na_2O - ZnO - TiO_2 -

SiO_2 . Two types of crystals are noted. One type is 2ZnOSiO_2 containing a small amt. of TiO_2 . The compn. of the other type is unknown, but its peculiar optical properties, point to either zinc titanate or TiO_2 .
C. H. KERR.

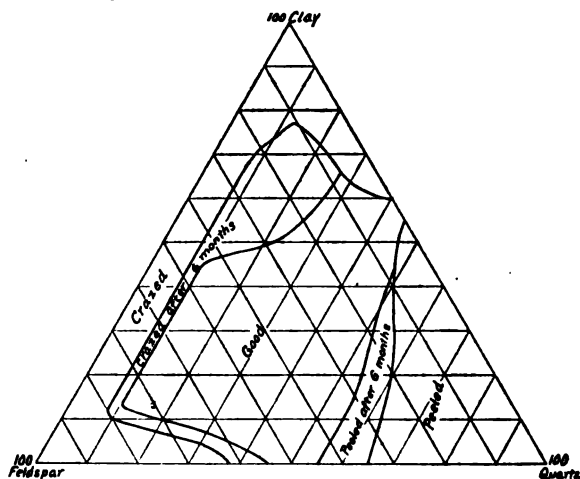
The physics of the clay molecule. R. F. MACMICHAEL. *Trans. Am. Ceram. Soc.* 17, 616-28(1915).—As a result of several years' exptg. the following statement of the case is made: (1) The strength of clay is due to the mol. cohesion of the clay particles themselves. (2) H_2O when added to a mass of dry clay produces a disruptive force within the mass. (3) Plasticity results from a balancing of the forces of cohesion and disruption. (4) Fluids other than H_2O produce plasticity in clay. (5) Org. matter, sol. salts, sols, and colloids, except as the latter are considered to be merely very fine clay particles, are not essential to plasticity.
C. H. KERR.

Use of sodium salts in the purification of clays and the casting process. A. V. BLENNINGER. Bur. of Standards, *Tech. Paper* 51(1915).—Deflocculation of clays in aq. suspension by use of alkalies permits a more complete sepn. of the fine clay matter from the coarser granular material and a quicker sedimentation of the latter takes place due to the reduced viscosity. The "liquifying" action is due to OH ions from hydrolysis of Na_2CO_3 and Na_2SiO_3 , which repel the clay particles, due to their negative charges, and increase the dispersion. An increase of the alkali beyond the point of max. deflocculation causes coagulation. It may be followed by a second liquefaction, due to absorption of the salts. Org. colloids have a somewhat similar action but also protect the clay particles from the flocculating anions. The presence of chlorides or sulfates of Ca, Mg or Al requires an increased amount of alkali for deflocculation and may prevent max. liquefaction. In using alk. reagents in clay washing a dil. soln. of a definite amt. of NaOH or of Na_2CO_3 and Na_2SiO_3 in equal parts replaces the H_2O used in the blunger. After passing the settling troughs and screening, the slip stands until sufficient sepn. of fine-grained SiO_2 , biotite, etc., takes place. It is then run into another tank, is flocculated with AlCl_3 and filter-pressed. The reagents should not cost over 7-8 cents per ton of clay. In certain fire clays $\text{Na}_2\text{C}_2\text{O}_4$ was a better deflocculator. This washing process greatly improves the color, increases the content of clay substance, decreases the drying shrinkage and tends to increase the burning shrinkage of most kaolinitic clays. It is not successful with clays containing finely divided Fe_2O_3 . The elec. process of clay purification does not result in a product superior to that from the ordinary washing process. Finely divided Fe_2O_3 is not removed, but finely divided quartz in suspension is deposited with the clay on the + electrode. The electrical process itself is a mechanical separation having the same function as the filter press. The preliminary sedimentation by use of electrolytes is the real purification feature of the process. The viscosity of clay slips and casting slips is detd. with a flow viscosimeter in the Mariotte tube principle. Na_2SiO_3 is more effective than Na_2CO_3 in reducing viscosity. N. C. kaolin slips are not markedly affected by these reagents due to coarseness; Georgia kaolin shows a well defined min. viscosity of short range; Tenn. ball clay No. 3 and Florida kaolin show no well defined min. viscosity. A large vol. of air is absorbed in clay slips, removal of which increases the viscosity. Interaction occurs between different clays in slips independently of alk. additions, which may considerably influence their behavior in casting. The ball clay should be reduced to a min. in casting slips. The absorption of NaOH by clays is greater than that of Na_2CO_3 . The tensile strength of cast bodies containing alkali additions may be greater than that without alkalies and the strength with max. deflocculation does not seem to be less than with a less addition of alkali. The formula, $n_1 = n(1 + Kf)$ is suggested for interpolation purposes for const. alk. additions. Casting bodies with low additions of alkali are more likely to change in viscosity with time than those containing larger amounts.
R. K. HURSH.

Notes on German clayworking plants. T. W. GARVE. *Trans. Am. Ceram. Soc.* 17, 592-605(1915).—Descriptive. C. H. KERR.

The testing of clay. R. F. MACMICHAEL. *Trans. Am. Ceram. Soc.* 17, 639-59 (1915).—Details of the ordinary physical tests are given, describing some new modifications of app. C. H. KERR.

Factory practice in the casting of clay ware. A. V. BLEININGER, T. G. McDUGAL, R. C. PURDY, *et al.* *Trans. Am. Ceram. Soc.* 17, 691-6(1915).—Unless the slip is beaten up vigorously when mixed it will change on standing, especially after the first 24 hrs. Even if well beaten some changes occur during the first day. Temps. also are very important. The thicker the wall of the ware to be cast the greater the amt. of electrolyte needed. C. H. KERR.



A study of earthenware bodies. I. LIONEL J. TRUSS AND P. STANWAY. *Trans. Eng. Ceram. Soc.* 14, 173-5(1914-15).—To find the difference in behavior of china clay and ball clay in their effect on crazing and peeling when used in earthenware bodies, mixtures were made of all compns. in 10 and 15% steps from 0 to 85% each of clay, feldspar and quartz, $\frac{1}{2}$ of the clay being ball clay and the other half china clay. The results are shown in the accompanying triaxial diagram. C. H. KERR.

A study of fire clay, shale and surface clay mixtures with reference to their porosity-temperature relations. G. H. BROWN. Bur. Standards, Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 451-8(1915).—When shales or surface clays are mixed with fire clays the impure clays retain their characteristic tendency to overburn, but the temp. of overburning is increased with increasing amts. of fire clay. Intimate grinding would probably change these results. Addition of 10-30% fire clay to surface clays, or shales, improves their vitrification behavior but increased burning temp. is necessary. C. H. KERR.

The relation between the modulus of elasticity and the porosity of burned clay. A. V. BLEININGER AND G. H. BROWN. Bur. Standards, Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 464-70(1915).—Two No. 2 fire clays, 2 paving brick shales and 3 surface clays were tested. The modulus of elasticity was found to be a function of the porosity, each clay having its own characteristic porosity-modulus curve. With shales the modulus of elasticity increased gradually from max. porosity, remained const. during vitrification and rose rapidly when complete vitrification was reached. The marked difference in the value of modulus of elasticity favoring paving brick shales indicates the possible application of such data in estg. toughness. C. H. KERR.

The effect of lime on certain cracking clays. N. B. DAVIS. *Trans. Am. Ceram. Soc.* 17, 497-504(1915).—Preheating is usually too costly. In agriculture lime is used to granulate soils. The same idea may be applied to clay working. Adding Kelley Island hydrate to 4 clays which cracked in drying, the trouble was overcome with 3, 4, 6 and 12%, resp. Analysis of clays shows low CaO in clays which crack. The

effect of the lime is to form Ca salts with the acid silicates and silicic acid. Clay should be ground to 15 mesh and hydrate mixed in dry before using. C. H. KERR.

The deformation of plastic bodies under compression as a measure of plasticity. WARREN E. EMLY. U. S. Bur. Standards, Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 612-5 (1915).—Working with hydrated limes, samples were molded into cylindrical form and placed on the pan of a Troemner soln. balance. The top head could be adjusted to place. Load was applied upward by placing wts. on the beam and any deformation previous to rupture was taken up by lowering the top head. Measurements were made of load area and the angle of the plane of rupture was measured by a comparometer. With 31 samples the order agreed well with practical comparisons. Thus a sticky, high-CaO hydrate showed a value of $n = 0.8$, $S_0 = 17.5$; a dolomitic hydrate of excellent plasticity showed $n = 0.56$, $S_0 = 32.5$; and a short, sandy hydrate showed $n = 0.44$, $S_0 = 17.0$. n is the coeff. of internal friction and S_0 is the force of cohesion between the particles, these being calcd. from the formula: $S_0 = S \tan \theta/2n$. With clays the 2 chief objections are: (1) the load should be increased continuously rather than by adding 100 g. every 30 secs.; (2) difficulty of applying the load exactly parallel to the axis of the cylinder. An improved machine is being built. C. H. KERR.

The effect of salts on the drying behavior of some clays. HOMER F. STALEY. Iowa State College. *Trans. Am. Ceram. Soc.*, 17, 697-719 (1915).— Na_2CO_3 usually decreases the rate of drying, increases the tendency to crack and lengthens the vitrification range. It is seldom of commercial value. NaCl decreases rate of drying, usually increases shrinkage and helps color and vitrification behavior. The use of 1/4-2% NaCl is a feasible method of rendering workable certain Iowa clays, which crack in drying and burning. The use of MgSO_4 or CaSO_4 is objectionable because of harmful effects in the burning. Reduction of cracking by certain salts is due to coagulation and the production of a structure favorable to capillary action which permits H_2O to be drawn from the interior as rapidly as it evaps. from the surface. C. H. KERR.

Some casting slip troubles. J. A. AUDLEY. *Trans. Eng. Ceram. Soc.* 14, 151-63 (1914-15).—A review of Ger. publications. [Cf. *Keram. Rundschau*, are 22, 317 (1914).] Usually the very plastic clays are but little affected by alkali and they therefore not well adapted for use in casting. Often the presence of very fat clay is the cause of poor casting results. Adding scrap clay helps to correct the trouble but is apt to bring in dirt. The Na_2CO_3 added is commonly regarded as the cause of dark stains on the ware. Repeated use of the plaster molds may have some connection because of sol. salts evapd. on the surface of the dried molds. Fe rust from blunger and other vessels containing the slip must be avoided. Hard spots in the molds absorb H_2O more slowly and leave moist patches which show different structure. The most likely theory of the discoloration is that in pouring the slip into the mold a thin layer of raw clay particles remains sticking to the mold at the point of pouring, while the non-plastic ingredients rebound and are washed away, thus causing difference in body compn. Very low calcination of part of the mix may be helpful. Cf. C. A. 9, 1835. C. H. KERR.

Slip weight and specific gravity of solutions of water glass. H. STEELE AND J. W. MELLOR. *Trans. Eng. Ceram. Soc.* 14, 164-6 (1914-15).—The object was to find the relation between sp. gr. and dry silicate content of water glass so as to standardize additions to casting slips. Detn. showed that the wt. of dry silicate (in oz. per pint of liquid) = $(1.33 \times \text{oz. per pint wet wt.})$ minus 27.8. A complete table is given. C. H. KERR.

Some notes on hard or felspathic porcelain. J. W. MELLOR. *Trans. Eng. Ceram. Soc.* 14, 176-92 (1914-15).—No ware is made in England. The chief Eng. raw material

not used in Germany is Cornish stone. Standard types of bodies are given as follows: Standard porcelain: clay 50, feldspar 25, quartz 25; insulator body: clay 51, feldspar 43, quartz 6; mortar body: clay 62, feldspar 21, quartz 17; parian body: clay 40, feldspar 58, quartz 2. The analysis of a number of German porcelains shows that they vary between these limits: clay 42-66, feldspar 18-35, quartz 12-30. The old French and Berlin bodies contained, resp.: clay 42, 53, feldspar 25, 27, quartz 33, 20. Seger porcelain (low firing) is made of: clay 25, feldspar 30, quartz 45. A body used near Limoges which is fairly translucent at cone 11 contains: clay 43, feldspar 27, flint 30. Berlin body for chem. ware contains: clay 75, feldspar 23, flint 20. Eng. ball clay spoils translucency and the china clays are not plastic enough. Ball clay must be kept low and casting may be necessary on account of low plasticity. Ageing is necessary if the ware is to be thrown or pressed and perhaps introducing tannin, etc., might be helpful. With hard porcelain the glaze burning is at higher temp. than the biscuit. It is often done in double deck kilns, the glaze below and biscuit above, the waste heat from the glaze section being used in burning the biscuit above. Marquardt porcelain analyzes between 30 and 35% SiO_2 with 60-65% Al_2O_3 . The tubes are suspended vertically in the oven for firing. Hard porcelain glazes have the formula of cone 4 softened with 0-0.3 BaO and 0-0.3 MgO. The variation is usually: 0.1-0.3 K_2O , 0-0.3 MgO, 0-0.3 BaO, 0.4-0.7 CaO, 0.4-1.2 Al_2O_3 , 3.5-11.0 SiO_2 . With the RO just given the maturing temps. with varying Al_2O_3 (a) and SiO_2 (b) are as follows: 0.4 (a), 3.5 (b) cone 7; 0.5 (a), 4.5 (b) cone 9; 0.6 (a), 5.5 (b) cone 10; 0.7 (a), 6.5 (b) cone 11; 0.8 (a), 7.5 (b) cone 12; 0.9 (a), 8.5 (b) cone 13; 1.2 (a), 11.0 (b) cone 16. The atm. of the hard porcelain kiln is usually reducing. C. H. KERR.

Experiments in casting heavy pieces of porcelain for electrical purposes. HUGO J. LUNDGREN. *Trans. Am. Ceram. Soc.* 17, 627-38(1915).—Sp. gr. of 1.82-1.85 gave the best results for the casting of large wares. One objection found was the presence of small blisters near the surface. C. H. KERR.

Coloration of porcelain. S. T. WILSON. *Trans. Eng. Ceram. Soc.* 14, 213-5 (1914-15); cf. Bernard Moore also S. T. Wilson, *Trans. Eng. Ceram. Soc.* 1905.—President's address. C. H. KERR.

Cobalt and nickel colors. A. D. HOLLINSHEAD, J. TURNER AND J. W. MELLOR. *Trans. Eng. Ceram. Soc.* 14, 167-72(1914-15).—Mixts. of Co and Ni with Zn and Al_2O_3 calcined at cone 10, wet ground, sieved through 200-mesh and dried, were printed on standard earthenware slabs. The colors were hardened on at a dull-red heat, and dipped (a) in standard leadless glaze, (b) in standard raw-lead glaze, and (c) in the same as (b) but converted into a low soly. glaze. The Thenard's blue tint of the Co_2O_3 - Al_2O_3 -ZnO colors is unstable when heated in the vicinity of free SiO_2 , Pb glazes, etc., for it passes into the violet-blue characteristic of Co silicate. Violet-blue is the equil. tint of Co blues, under Pb glazes and leadless glazes. Anything that favors the attack of SiO_2 or glaze hastens the change from the mat blue to the equil. tint. The tint of the mat blue is very sensitive to the compn. of the glaze, high Al_2O_3 glazes low in Pb() favor the color, while high PbO glazes and glazes with vigorous solvent action on the body rapidly change the color to the equil. tint. This shows why the flux on underglaze mat blues must be low, and why the color must be worked as dry and as high in Al_2O_3 as possible. The color must be protected from the solvent action of the glaze. Ni colors were all unsatisfactory, being too unstable. C. H. KERR.

Experiments to overcome scumming and improve the color of brick. A. E. WILLIAMS. *Trans. Am. Ceram. Soc.* 17, 764-70(1915).—The expts. are summarized as follows: (1) treating the surface of a stiff-mud clay column with FeSO_4 did not markedly effect the color in burning; (2) treatment with Fe_2Cl_6 helped the color, evidently by removing the scumming, but as results in commercial kilns have been

obtained; (3) MnCl_2 , volatilized in brick kilns at the finish of a burn, produced dull black colors with but little previous flashing of the kiln; (4) CuCl_2 darkened the color very slightly.

C. H. KERR.

Strength tests of Oregon building brick. IRA A. WILLIAMS. *Trans. Am. Ceram. Soc.* 17, 660-6(1915).—Samples were tested from 29 firms, 15 stiff mud, 13 soft mud and 1 dry pressed brick. Soft mud bricks (a) and stiff mud bricks (b) showed the following range of properties: absorption (a) 17.4-49.6, (b) 9.5-28.7; modulus of rupture, (a) 207-732, (b) 163-1340; compressive strength tested dry, (a) 1186-3524, (b) 1386-9038; compressive strength tested wet, (a) 1151-3327, (b) 1429-8670.

C. H. KERR.

Note on the silica bond in sand-lime brick. W. E. EMLEY, A. A. KLEIN AND E. M. SANBORN. *Bur. Standards, Pittsburgh. Trans. Am. Ceram. Soc.* 17, 471-3 (1915).— H_2S soln., CH_3COOH and alc. are unsatisfactory as solvents to recover the free CaO . Any attempt to dissolve the free CaO must result in partial decompn. of the silicate no matter how weak the acid used. Results of Parr and Ernest are, therefore, unsatisfactory (cf. *C. A.* 5, 3886; *Illinois State Geol. Surv.*, *Bull.* 18).

C. H. KERR.

Choice of raw material for the manufacture of silica (dinas) bricks. A. K. KHOETSKY. *Rev. soc. russe de metall.* 1, 170-202(1914); *Rev. Metal.* 12, 143-5; *J. Soc. Chem. Ind.* 34, 1055.—The value of natural SiO_2 for the manuf. of bricks is detd. by the chem. purity, size of grain obtainable, and the smallness of the increase in vol. on being heated. To withstand a temp. of 1700° the brick must contain not less than 96% SiO_2 , this condition requiring that the raw material must contain 98% SiO_2 . The raw material must not give too fine a powder on crushing, as bricks composed of fine grains are not sufficiently porous, and break down on being heated. As regards the 3rd factor, the order of merit of the natural forms of SiO_2 is given as follows: Chalcedony, plutonic quartzites, quartzite derived from vein quartz, vein quartz. The 2 latter forms contain a modification, α , which passes on roasting into a second modification, β , with increase of vol. Schistose quartz, sandstones, and sand are unsuitable for the manuf. of bricks, the first on account of its structure and the presence of many impurities in the form of inclusions, the two latter on account of their variability of compn. and their too great fineness after being ground.

H. J. C.

Classification of floor tiles as related to degree of vitrification. FORREST K. PENCE. *Trans. Am. Ceram. Soc.* 17, 484-92(1915).—The following is offered as a basis of classifying all floor tiles not obviously belonging to special types. "The class to which floor tiles shall be assigned shall be detd. by the amt. of H_2O they will absorb. Absorption shall be detd. by immersing the tile in boiling H_2O for 1 hr., followed by soaking in the same H_2O for 24 hrs. Av. results shall be obtained from no less than 5 tiles and shall be expressed in terms of % of the dry wt. Classes of tiles shall be defined by the amt. of absorption as follows: absorption 0-2%, vitreous; 2-10%, semi-vitreous; 10 or more %, plain unglazed."

C. H. KERR.

Oxide of lead versus carbonate of lead in glazes. ARTHUR S. WATTS. *Ohio State Univ. Trans. Am. Ceram. Soc.* 17, 474-83(1915).—The lowest PbO content is possible when litharge is used, the increase being very slight in using Pb_2O_3 and quite appreciable in using PbCO_3 .

C. H. KERR.

Note on pros and cons of use of zinc oxide in glazes for semi- and vitrified China bodies. ROSS C. PURDY. *Norton Co., Worcester. Trans. Am. Ceram. Soc.* 17, 520-6(1915).—The advantages of ZnO are: (1) improved color; (2) improved gloss; (3) absence of egg shell finish; (4) less crazing; (5) greater heat range, thus decreasing requirement of PbO and B_2O_3 . The disadvantages are: (1) decreased range of possible

color; (2) soln. of ZnO glaze in caustic washing solns. used at hotels, etc. The use of ZnO for cheaper wares is recommended; for vitrified goods it should be omitted.

C. H. KERR.

Galena and lead-bearing waste materials as glaze ingredients. JULIUS MILLER. Ohio State Univ. *Trans. Am. Ceram. Soc.* 17, 779-92(1915).—Suggestions applicable to cheap ware are offered.

C. H. KERR.

Notes on the burning of salt-glazed sewer pipe. GEORGE D. MORRIS. *Trans. Am. Ceram. Soc.* 17, 606-11(1915).—Water smoking (up to 177°) must be slow to avoid scaling, blistering and cracking. The heating up (177-427°) may be rapid if other precautions are taken. The oxidation (427-760°) must be slow if the clay is high in C. Vitrification (760-1149°) is commonly carried to a point where draw trials show a glassy fracture, if broken while hot. Salt glazing should be done when the fires are clean and the draft good but not excessive. Details of control are given.

C. H. KERR.

Quarry tile. C. P. OUDIN. *Trans. Am. Ceram. Soc.* 17, 777-8(1915).—A steam sewer pipe press is now used.

C. H. KERR.

Protective coating for dryer cars. M. C. BOOZE. Univ. Ill. *Trans. Am. Ceram. Soc.* 17, 727-44(1915).—Bakelite is recommended.

C. H. KERR.

Bauxite: a source of aluminium. ANON. *Engineering* 100, 625-6(1915).—A general article in which are discussed the occurrence and properties of bauxite and its use as a refractory lining for cement kilns and metallurgical furnaces, particularly lead furnaces.

E. H.

Data on the effect of pressure applied to a dust body. C. W. PARMELEE. *Trans. Am. Ceram. Soc.* 17, 459-63(1915).—With increase in pressure the d. of the mass increased rapidly up to a certain point which varied with different materials, but beyond that point increase in pressure did not produce a proportionate or even material increase in d.

C. H. KERR.

Progress in economy and efficiency in firing. The Dressler tunnel oven. P. O'H. DRESSLER. *Trans. Am. Ceram. Soc.* 17, 527-48(1915); cf. following abstract. —Data are given from a large up-draft kiln in Staffordshire holding 1300 tons of ware and requiring 1600 tons of fuel, which is 26% of the wt. of ware and saggars, or 121% of the wt. of the ware alone. Since 3.5% of the wt. of the ware is the theoretical fuel requirement, this means that only 2.9% ($3.5 \div 1.21$) of the heat of combustion was used in heating the ware. The wastage was 97%. Ring and tunnel ovens are described. Advantages claimed for the Dressler tunnel oven are: (1) stationary heat zone, saving fuel and repairs; (2) exhaust gases are cooled to 200-250°; (3) recuperation of the heat from cooling ware is used for burning gas and a large excess is available for drying, etc.; (4) skilled labor is unnecessary; (5) freedom from combustion gases surrounding the ware; (6) no saggars are required; (7) uniform heat distribution; (8) absence of dunting troubles; (9) absence of second quality ware; (10) allowable decrease in factory stocks because of short time required for burning.

C. H. KERR.

Development of the Dressler tunnel oven since 1911. CONRAD DRESSLER. *Trans. Eng. Ceram. Soc.* 14, 41-61(1914-15).—The novelty lies in keeping the flame away from the goods inside suspended chambers so arranged that the heat reaches the goods by convection of hot air or by radiation from the chamber surfaces. In July, 1912, at the Barrett Plant, fuel consumption with the Dressler oven was 4256 lbs. of coal per 24 hrs. to burn 10.5 tons of ware and supports to 1050° (17.5%). The latest plan at Barrett's has been in use for 1 yr. and is satisfactory. To correct dunting (due to ware coming out too hot) the direction of travel of the air beyond the hottest point has been reversed. Architectural faience may be cooled from 1050° to correct handling temp. in 8 hrs. This cooling and using the heat elsewhere reduced fuel consumption

from 17.5 to 12.5%. By using a hollow refractory lining, softening of the refractory was prevented and 1250° can be attained. With latest improvements coal consumption will be reduced to 5% of the wt. of ware and supports. Recent work with driers is described.

C. H. KERR.

A gas-fired frit crucible furnace. J. H. SINGLETON. *Trans. Eng. Ceram. Soc.* 14, 38-40 (1914-15).—The crucible has a bib at the bottom so arranged that the metal may be tapped from the bottom as in cupola practice. A temp. of 1650° is attainable.

C. H. KERR.

Veritas firing disk. ROSS C. PURDY. Norton Co., Worcester. *Trans. Am. Ceram. Soc.* 17, 493-6 (1915); cf. *C. A.* 8, 3713.—Correction is made of a mistaken understanding that veritas disks are made from Cook Pottery Co. body. Pottery materials, however, are used. Analysis of a disk showed: Al_2O_3 , 20.98; Fe_2O_3 , 1.18; SiO_2 , 67.48; TiO_2 , 0.40; CaO , 0.44; MgO , trace; Na_2O , 0.43; K_2O , 1.69; ignition loss, 6.80%. This shows clay, feldspar and flint as the probable raw materials. The disks have value in studying the rate of burning.

C. H. KERR.

Electrically heated enamelling ovens. C. W. BARTLETT. *Gen. Elec. Rev.* 18, 1130-6 (1915).—This type of oven insures greater production with a lower unit cost, it permits of utilizing a positive heat control, eliminates the danger of explosions and produces a better enamel. Practically all thermal energy is applied in useful work and a uniform heat radiation results. The revolving type of oven takes little space compared with the output, the baking can go on while work is being put in and taken out, and it is unnecessary to cool down the oven every time a charge is made. In the drawer type, the work is placed in a carriage and pushed into the oven. Enamels may be hardened at 71° in about $\frac{1}{4}$ the time consumed by air-drying methods. Enamels requiring high temp. for baking are hardened in a short time with no danger of explosion. This advantage increases with temp. As temp. rises rapidly there is less danger of overheating of the products.

W. H. BOYNTON.

Titration of calcium oxide or hydroxide in the presence of some aluminates or silicates (EMLEY) 7. Electrical pyrometry (PAUL) 1.

Glass. J. O. MEARA. U. S., 1,166,922, Jan. 4. Illuminating glass is made by fusing together sand 100, Al_2O_3 30, PbO 22, silex 12, soda 37, borax 6, As_2O_3 3, Sb_2O_3 1.25, NaCl 1.5, saltcake 1.5, cryst. Na_2SO_4 2 and gypsum 1.5 parts. The heating is stopped when the specks in the mixt. are practically all eliminated and before the glass becomes clear, thus producing a translucent glass.

Refractory furnace lining. T. A. R. W. TORSÉN. U. S., 1,167,135, Jan. 4. "Carborundum fire sand" 40-50, is mixed with fire clay 15-25 and SiO_2 33-48 parts, using a binder of molasses and H_2O .

Base-exchanging bodies. PERMUTT AKT.-GES. Brit., 20,144, Sept. 24, 1914. Base-exchanging bodies prep'd. by pptn. are filtered, incompletely lixiviated, and dried in the form of press-cakes at a temp. below 100°. A white stony mass is produced, which, on hydrating with cold or hot H_2O , breaks up into hard transparent pieces. Cf. *C. A.* 9, 1235.

Base-exchanging bodies. PERMUTT AKT.-GES. Brit., 20,145, Sept. 24, 1914. The process of converting gelatinous zeolitic ppts. into granular form described in 20,144 1914 (*supra*) is varied by employing high pressure in the production of the press-cakes which yield, on drying, a material which is as hard as glass and breaks up into granular form on hydrating.

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

A brief observation on the paper by G. A. Rankin on the ternary system lime-silica-alumina. ERNST JÄNCKE. Hannover. *Z. anorg. allgem. Chem.* **93**, 271-2 (1915).—J. comments on the fact that R. does not give the compd. $8\text{CaO} \cdot 2\text{SiO}_2 \cdot \text{Al}_2\text{O}_3$ as one of the solid phases occurring in the system $\text{CaO}-\text{Al}_2\text{O}_3-\text{SiO}_2$, and affirms the belief that such a compd. exists. An error in the arrangement of the boundary curves is pointed out. Cf. *C. A.* **9**, 702.

GEORGE W. MOREY.

Study of the most fusible mixtures of $\text{K}_2\text{O}-\text{CaO}-\text{Al}_2\text{O}_3-\text{SiO}_2$. HAROLD H. HANNA. *Trans. Am. Ceram. Soc.* **17**, 672-90 (1915).—The following raw materials were used com. feldspar, kaolin and flint (analyses are given). *Kaolin-feldspar*. Mixts. with 0-20% kaolin were made into cones and fused. Results were not entirely clear but the eutectic was very close to 8% kaolin, 92% feldspar. *Feldspar-ball clay*. The same % eutectic was found at 8% ball clay, 92% feldspar. *Feldspar-quartz*. There was a eutectic at 4% quartz. Rankin and Wright (cf. *C. A.* **9**, 702) gave 1165° as the m. p. eutectic between pseudo-wollastonite, anorthite, and tridymite, the compn. being 23.25 CaO, 14.75 Al_2O_3 , 62.0 SiO_2 . Deformation point of cones with ranges and compn. covering this point showed this to be the deformation eutectic as well as the actual m. p. eutectic. Expressed in mol. form this eutectic is 1.00 CaO, 0.348 Al_2O_3 , 2.489 SiO_2 . Trials were then made with all mixts. of the 3 eutectics: (1) 96% feldspar, 4% quartz; (2) 23.5 CaO, 14.75 Al_2O_3 , 62.0 SiO_2 ; (3) 92% feldspar, 8% kaolin. The first to deform was: 0.6 K_2O ; 0.4 CaO; 0.739 Al_2O_3 ; 4.829 SiO_2 . The next to deform was: 0.6 K_2O ; 0.4 CaO; 0.777 Al_2O_3 ; 4.830 SiO_2 . The third to deform was: 0.6 K_2O ; 0.4 CaO; 0.8114 Al_2O_3 ; 4.824 SiO_2 . The only difference in these 3 compns. is in Al_2O_3 . The lowest fusing point mixture of K_2O , CaO, Al_2O_3 and SiO_2 is: 0.60 K_2O , 0.40 CaO, 0.739 Al_2O_3 , 4.829 SiO_2 , which starts to deform with Seger cone 3 but is completely deformed when cone 3 is only $\frac{3}{4}$ down.

C. H. KERR.

The influence of temperature on the strength of concrete. A. B. McDANIEL. Univ. Illinois Eng. Expt. Sta., *Bull.* **81**, 24 pp. (1915).—Under standard conditions at temps. of $150-210^\circ$ the compressive strengths of concrete after 7, 14, and 21 days are approx. 50, 75 and 90% of that after 28 days. After 7 days at $15-21^\circ$ it has twice the strength of concrete kept at $0-4^\circ$.

H. L. OLIN.

Testing of Eisen portland cement in comparison with portland cement. Supplement 2. M. GARY AND H. BURCHARTZ. *Mitt. Materialprüfungsamt.* **33**, 29-34; *Chem. Zentr.* 1915, II, 492.—The results of tests on the 10 yr. old specimens are added to the results of previous tests. Cf. *C. A.* **7**, 1273.

J. C. EVANS.

The rusting of iron reinforcement in concrete. W. ROEDER. *Tonind. Ztg.* **39**, 106-7 (1915).—Two samples of concrete were made with cement from the same factory, but the Fe in one rusted while the other was clean. Analyses showed the cements to be similar except that the one in which the Fe did not rust contained sulfides, while the other did not. R.'s explanation is that the sulfides combine with dissolved O_2 in any H_2O which penetrates the concrete and thus protect the Fe. W. L. BADGER.

Compressive strengths of portland cement mortars and concretes. R. J. WIG. G. M. WILLIAMS AND E. R. GATES. *J. Frank. Inst.* **180**, 608-13 (1915); *Tech. Paper Bur. Standards* 58.—A collation and study of about 20,000 tests of mortars and concretes, from which it is concluded that the compressive strengths of concrete are as much affected by workmanship and use of the proper amt. of H_2O , as they are by the use of the proper amt. of cement. Compressive strengths may be greatly reduced if there is exposure to relatively dry atms. after fabrication. The value of fine aggregates can only be detd. by testing in the combined state with coarse aggregates. Coarse

aggregates must be tested to det. what % gives max. density and no type of aggregate is superior to all other types. Density is a good measure of the relative compressive strengths of different mixes of the same aggregate, but two concretes of the same density composed of different aggregates may vary widely in their compressive strengths. No definite relation exists between gradation of aggregates and compressive strengths, which is applicable to a number of different aggregates. With the relative vols. of fine and coarse aggregate fixed, the compressive strengths increase, directly, though not in the same proportion as the cement content is increased. A. J. PHILLIPS.

The properties of lime from limestone containing magnesia. CHEM. LAB. FÜR TONIND. Berlin. *Tonind. Ztg.* 39, 518-9(1915).—A limestone (a) and the commercial CaO from it (b) had the following compn.: CaCO_3 , (a) 45.98, (b) 34.02; MgCO_3 , (a) 36.64, (b) none; MgO , (a) none, (b) 21.26; Ca(OH)_2 , (b) 15.62. To ascertain whether the MgCO_3 could be decomposed without also decomposing the CaCO_3 , the stone was burned in the lab. at cones 022, 015a, and 010a. At the lowest temp. none of the CaCO_3 and about half the MgCO_3 was decomposed; at cone 015a, all the MgCO_3 and about $\frac{1}{2}$ the CaCO_3 ; and at the highest temp. only 5% CaCO_3 was left. Mixts. were made of coarse CaCO_3 and fine MgCO_3 , and of coarse MgCO_3 and fine CaCO_3 . Sep. portions of each mixt. were burned at the cones above mentioned, sepd. by screening, and the coarse and fine CaCO_3 from each temp. mixed, the MgCO_3 being similarly combined. At cone 022, $\frac{2}{3}$ of the MgCO_3 and none of the CaCO_3 was decomposed; at 015a, 1% of the CaCO_3 and 90% of the MgCO_3 was decomposed, and at 010a $\frac{2}{3}$ of the CaCO_3 and all the MgCO_3 . The material burned at the 2 lower temps. was inert to H_2O , the CaO from cone 010a slacked instantly and was set after 4 days, while the MgO began to slack after 2 hrs. and was set after 4 days. W. L. BADGER.

Note on Estrich plaster. R. K. HURSH. Univ. Illinois. *Trans. Am. Ceram. Soc.* 17, 549-56(1915).—Two rocks ("S" a very pure rock and "O" with about 15% impurity) were burned at 100° temp. intervals from 600 to 1100°, 5 hrs. being allowed at the finishing temp. of each burn. Samples were then ground to 100-mesh, mixed with H_2O and made into briquets. These were placed in a moist chamber for 24 hrs. and later kept moist until tested. Samples burned up to 800° were smooth working but those heated at 900° and above seemed sandy. Burning at 600° (both "S" and "O") gave plasters that did not harden in 7 days. A portion of this soft material from "S" burned to 600° was placed under the microscope with a little H_2O and showed slow crystn. of $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$. Burns at 700° gave the best strength for both "S" and "O," this being a much lower temp. than is usually quoted. This may be due to the duration of the heat treatment which was very long in comparison with factory work or usual tests. C. H. KERR.

Mortars from a Roman hunting villa. CHEM. LAB. FÜR TONIND. Berlin. *Tonind. Ztg.* 39, 557-8(1915).—Analyses are given of 5 mortars dating from the time of Constantine. Masonry was set in a 1:3 mortar from a slow-setting dolomitic lime with the addition of ground brick. Plaster was about 1:4 without the brick dust. Mosaics were set in a straight lime paste with a little brick dust. In the heating flues was a 1:2 plaster, the CaCO_3 of which was crystallized as aragonite and calcite. All the limes contained considerable MgO. W. L. BADGER.

The valuation of sand and gravel. ANON. *Tonind. Ztg.* 39, 583, 588.—Specifications of screen analyses for sand and gravel for different purposes. W. L. B.

Report of committee on wood block paving. C. H. TRESDALE. *Proc. Am. Wood Pres. Assoc.* 1916, 5 pp.—A specification is offered, covering selection, treatment and laying of wood paving blocks. GEO. M. HUNT.

Report of special committee on specifications for preservative for wood paving blocks. *Proc. Am. Wood Preservers' Assoc.* 1916 (advance copy).—The committee

makes the following recommendations: The preservative shall be wholly derived from coal-gas tar or coke-oven tar; d_{40} shall not be less than 1.06 or more than 1.12; substances insol. by hot continuous extn. with C_6H_6 and $CHCl_3$ shall be not over 3%; when distd. as specified there shall be not more than 5% up to 210°, not more than 30% up to 235°, not less than 35% nor more than 70% up to 315°, not less than 65% up to 355°; $d_{15.5}^{38}$ of distillate between 235° and 315° shall be not less than 1.02, between 315° and 355° not less than 1.08; specific viscosity (Engler) at 82° shall be not over 1.3; not over 3% of water shall be present and not over 2% of dirt shall be allowed to accumulate during treatment. Method of analysis is specified. In the discussion the authors stated that this specification would permit the use of a pure distd. creosote, or mixts. containing up to about 35% of low carbon tar.

GEO. M. HUNT.

Methods of creosoting Douglas fir timbers. O. P. M. GOSS. *Proc. Am. Wood Preservers' Assoc.* 1916 (advance copy).—The "boiling" and "steaming" processes for creosoting D. fir weakened structural timbers 33 to 35% (cf. C. A. 10, 108). The "boiling under vacuum" process, a modification of the Boulton process, has been developed to prevent this. In it the timber is heated in creosote at atm. pressure at 87.7° for 5 to 6 hrs., then a vacuum is drawn through a condenser, gradually increasing to 24 to 27 inches while the temp. of the oil is kept constant. The vacuum is maintained until the water condensed amounts to not over 0.1 lb. per cu. ft. of wood per hr. (usually 12 to 16 hrs.), after which pressure is applied for 4 to 6 hrs., reaching a max. of 120 to 135 lbs. per sq. in. Strength tests on 16 pairs of matched bridge stringers, of which 1/2 were untreated and 1/2 treated by the "boiling under vacuum" process, showed on the av. that the treated material was 99.2% as strong in modulus of rupture as the untreated. Tables of strength values are given.

GEO. M. HUNT.

Overcoming scumming and improving the color of brick (WILLIAMS) 19. Strength tests of Oregon building brick (WILLIAMS) 19. Silica bond in sand-lime brick (EMLEY) 19. Penetration test for asphalts and asphalt cements (HUBBARD) 22.

Preserving wood. W. D. CLARK. U. S., 1,165,753, Dec. 28. Penetration of a preservative such as creosote into the wood is controlled by coating the wood with a mixt. of MgO , Mg silicate and $MgCl_2$ to exclude the preservative from portions where its penetration is not desired, *e. g.*, in treating piling. The wood may first be boiled in the preservative to season it and again treated with the preservative under pressure after application of the coating mixt.

Preserving wood. A. V. ST. ARMANDE. Brit., 20,260, Sept. 28, 1914. Wood is preserved by treatment with dichlorobenzene or other chlorinated deriv. of benzene applied in molten condition or in soln. Oils, waxes, resins, other known preservatives, or other substances may be added.

Seasoning wood. A. P. DERBY and J. H. DARGIE. U. S., 1,166,819, Jan. 4. Air mixed with steam is applied to the wood in a closed chamber, being alternately applied under pressure and suddenly blown off, followed with similar treatment of the wood by hot air alone.

Wall-coating composition. M. B. CHURCH. U. S., 1,166,325, Dec. 28. Un-calcined pulverized gypsum is mixed with about 1.5 times its wt. of whiting or other inert powder and about 10% its wt. of glue to form a H_2O -miscible compn. for coating walls.

Asphalt-fiber mixture for making roofing sheets. J. C. WOODLEY. U. S., 1,166,166, Dec. 28. Paper is dipped into molten asphalt, surplus asphalt is drained off and the paper coated with asphalt after cooling to a gummy or pasty mass is forced through perforated plates or otherwise thoroughly disintegrated to distribute the fibrous material

uniformly throughout the mass. The product is then formed into sheets by rollers. Cf. C. A. 9, 3347.

Roofing mixture. O. MATTER. U. S., 1,167,195, Jan. 4. Fibrous material such as paper or felt is H_2O -proofed with tar or asphalt and rendered fire-proof with Ph_2PO_4 .

21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

Selecting and buying fuel. W. H. GRADY. *Proc. Am. Wood Preservers' Assoc.* 1916 (advance copy).—G. describes factors to be considered and methods for comparing the suitability and economy of different kinds of fuel for boiler heating. G. M. H.

Flameless surface combustion. J. POKORNY. *Oesterr.-ung. Z. Zuckerind.* 44, 114-39(1915).—A historical and theoretical résumé of surface combustion, including the results of some expts. with the Schnabel-Bone boiler. P. concludes that this type of boiler as compared with the most modern installations of well-known types in recent years, appears to show no great advantages which would make its installation in sugar factories desirable at the present time.

E. A. TSCHUDY.

The coal and coke handling equipment of the gasworks of Budapest-Obuda. VIKTOR SCHÖN. *J. Gasbel.* 58, 461-8, 477-82, 496-505(1915).—A lecture, illustrated with 31 excellent photographs and drawings.

W. L. BADGER.

The spontaneous combustion of coal. R. NÜBLING AND HERTA WANNER. Stuttgart. *J. Gasbel.* 58, 515-8(1915).—An attempt was made to find the substance responsible for the spontaneous heating of coals. A Ruhr coal (A) and a Yorkshire coal (B), both subject to spontaneous combustion, and a Saar coal (C) which gave no trouble on storage, were used. By heating in a stream of O_2 and noting the temp. at which there was a sudden rise in temp. the "ignition temp." was detd. This was lower as larger samples were taken, so 20 g. was made the standard sample. Matter sol. in pyridine was detd. by shaking with the solvent in the cold, pptg. the dissolved material by adding ether to the soln., repeating this, and finally evapg. the pyridine in a vacuum at 80° , the last being driven off in a vacuum at room temps. After washing with ether and drying, the material pptd. by ether and obtained by evapg. the pyridine soln. was combined as "extract." The ignition point of a 20 g. sample (1), of a 20 g. sample after extn. (2), of 6-7 g. of ext. (3), and the % ext. obtained were: Coal A, (1) 152° , (2) 187° , (3) 146° , (4) 6.5%; coal B, (1) 138° , (2) 173° , (3) 146° , (4) 9.4%; coal C, (1) $165-182^\circ$, (2) 172° , (3) not detd., (4) 5.8%. The ignition temps. of mixts. of ext. and coal were detd.; in most cases they were between the ignition temps. of the constituents. Ultimate analyses showed a higher H content in the ext. than in the original coal, so Br absorptions were detd. Grams of Br taken up by 5 g. of untreated coal (1) or extd. coal (2) were: Coal A, (1) 0.7, (2) 1.9; coal B, (1) 0.6, (2) 1.3; coal C, (1) 1.0, (2) 2.6. The ext. in no case absorbed Br. W. L. BADGER.

Products and by-products of coal. E. S. STANSFIELD AND F. E. CARTER. *J. Gas Lighting* 132, 135-6(1915).—A discussion of a recent bulletin of the Canadian Dept. of mines, in which are described the present state and outlook for the future of the coal by-products industry in Canada.

F. L. GROVER.

Experiments on the removal of carbon disulfide from illuminating gas. HERTA WANNER. *J. Gasbel.* 58, 456-7(1915).—Gas was passed through coke from several sources, kieselguhr, coal (gas and boghead), sawdust, pitch, and charcoal. Gas coal and coke from lignite showed some absorption of CS_2 but not enough to be of importance; the other materials were without effect. A gas of 73.1 g. S per 100 cu. m. was passed

through 1 kg. of charcoal with a velocity of 0.13 cm./sec. From 5 to 6 cu. m. were purified below 20 g. S per 100 cu. m. (a figure considered satisfactory) and after 9 cu. m. had passed the S was 34 g. per 100 cu. m. Regenerating the charcoal gave a slightly lower activity, pulverizing it, a slightly higher effect. A test using 15.7 kg. in 2 layers showed that 1 kg. would purify about 10 cu. m. of gas below 20 g. S per 100 cu. m.

W. L. BADGER.

Gas purification by carbonate of potash. P. L. PETIT. *Gas World* 63, 374(1915); *J. Gas Lighting* 131, 645-6(1915).—The gas is passed through a rotary washer containing a solution of K_2CO_3 which removes H_2S and HCN as follows: $H_2S + K_2CO_3 = KSH + KHCO_3$. $HCN + K_2CO_3 = KCN + KHCO_3$. CO_2 is also absorbed up to a point of equil. between K_2CO_3 , $KHCO_3$ and CO_2 . This retards the absorption of H_2S , but not to the point of inefficiency. In fact the process is found much more efficient than iron oxide treatment. The soln. is easily regenerated by passing air through it. By warming the soln. and charging the ingoing air with 2 or 3% of CO_2 the regeneration is considerably accelerated.

R. H. SAWENS.

Gas from peat. G. A. BRENDER & BRANDIS. *J. Gas Lighting* 132, 94(1915).—Expts. were made upon two sorts of peat (heavy lumps and small lumps) in a horizontal retort. The gas contained CO_2 13, heavy hydrocarbons 2.1, CO 23.8, CH_4 12.1, H 39.6 and N 8.7%, and had gross calorific value of only 366 B. t. u. Roughly 17,500 cu. ft. of such gas were produced per metric ton of peat, and 0.402 ton of wet coke of poor quality. It was found that the most practical way of carbonizing peat was to mix it with 80-90% English gas coal. This increased the yield of gas from 10,000 cu. ft. per ton for 100% coal to 12,700 cu. ft. for 80% coal and 20% peat. The quality of the coke was fairly good in this case, and the calorific value of the gas was hardly affected.

F. L. GROVER.

Development in Doherty washer-cooler as gas-condenser at Detroit. R. B. ROWLEY. *J. Gas Lighting* 132, 141-2(1915); *Am. Gas Light J.* 103, 231, 234-6(1915).—A single-stage gas condensation has been substituted for a double stage at the Detroit City Gas Plant, which allows of condensation of the tar at a high temp. in a very short time. Simplification and added ease in manipulating by this change are claimed.

F. L. GROVER.

New system of retort-house control. ANON. *Gas World* 63, 495-6(1915).—The fundamental idea of the system is to make it possible to det. the quality of the gas immediately after it is produced, instead of being compelled to wait until the jet photometer at the exhauster gives some indication. Where the jet photometer is fitted after the exhauster there is a delay of 30 min. to 1 hr. between the time of actual gas making and actual test, by which time the conditions in the retort house may have altered to such an extent as to require modification in the opposite direction from that inferred from the jet photometer reading. With the new arrangement the value of the gas is known as soon as it is produced in the retort house and the "pull" increased or decreased "on the spot" as may be found necessary. A special means of efficient drawing gas from the foul main and delivering it to the testing app. under pressure has been devised. The instrument can be placed in the retort house. A drawing showing the max. and min. variations in illuminating power with and without the controller is shown; an outline sketch of controlling app. is given.

M. L. TROWBRIDGE.

Bradford road gas works of Manchester corporation. J. G. NEWBICING. *J. Gas Lighting* 132, 248-50(1915).—A description of some of the more important features connected with the new installation.

F. L. GROVER.

Glover-West verticals at Ottawa. ANON. *J. Gas Lighting* 132, 196(1915).—Description of recent installation of Glover-West retorts at the plant of the Ottawa Gas Company.

F. L. GROVER.

Care and maintenance of "DeBrouwer" retort charging and discharging plant.

H. C. WIDLAK. *J. Gas Lighting* 132, 480-2(1915).—The charging mechanism described in this article is dependent in principle upon the velocity of a horizontal belt which carries the coal, and projects it horizontally into the retort. From a hopper the coal is fed by gravity into a large groove cut in the face of a pulley covered by the belt. Thus enclosed the coal is carried around $\frac{1}{4}$ of a revolution of the pulley and out on the belt to the mouth of the retort into which it is projected. Detailed diagrams of electrical connections and safety devices are given. Various sizes of coal demand different "projector belt" speeds, and in filling a retort it is desirable to slow up as it fills from back to front.

R. H. SAWENS.

Sewage sludge for gas making. C. J. SNYDERS. *J. Gas Lighting* 132, 643(1915).

—City sewage was first settled in a tank and the water drawn off, leaving a sludge with less than 25% H_2O . This was distd. from a specially constructed oven giving 5966 cu. ft. of gas per ton with net calorific value of 454 B. t. u. The poor quality coke resulting was used only in the ovens for treatment of refuse. It was found that the heat of the chimney gases could be used to carbonize the sludge. The tar yields a high distg. oil suitable for engine oil.

R. H. SAWENS.

Increased toluene production. B. DUNGLINSON. *J. Gas Lighting* 132, 637-8

(1915).—A short discussion of methods now in use for the detn. of aromatic hydrocarbons in coal gas is given, and it is suggested that the detn. could be made to better advantage by washing the gas free from olefins and H_2O and passing over naphthalene with a paraffin catch bottle following. Ordinary methods for increasing toluene yields are of doubtful value. Passing steam through the coal charge promotes dissociation and different recombination of H and O. The principal effect however is the lowering of the distn. temp. and thus decreasing the "cracking" of aromatic hydrocarbons already formed. Referring to C_6H_6 , high yields are obtained by using low H_2O coal and a lower coking temp. This also increases the NH_3 yield.

R. H. SAWENS.

Benzole. GEORGE TAYLOR. *Colliery Guardian* 110, 1285-7(1915); *J. Gas Lighting* 132, 639-42(1915).—A detailed description of methods of extn., distn., and purification.

H. L. OLIN.

Iron carbonyl in water gas. LEONARD M. LIDDLE. *J. Ind. Eng. Chem.* 8, 89-90 (1916).—The presence of Fe in water gas kept in steel cylinders under 500 lbs. pressure was found to be due to the action of CO on the metal with the formation of $Fe(CO)_5$.

H. L. OLIN.

Tar dehydration. E. V. CHAMBERS. *J. Gas Lighting* 132, 261-4(1915).—The Roads Board Authorities issue specifications for temps. at which tar must be dehydrated for various purposes: for tar spraying 230°, for tar macadam 260° and for pitch grouting 288°. The distillate contains a larger % of light oil when the tar is dehydrated at a const. temp., and more phenol and cresol at a high temp. An app. is described for dehydrating tar continuously. The tar is heated in a layer not over 6 in. thick with 2.5 ft. vapor space above to prevent frothing over. Tar containing 40% water is easily dehydrated in this app. To prevent coking of the tar by overheating, the heat is evenly applied inside a horizontal tube submerged in the tar. The incoming tar is heated by the outgoing hot tar in a heat exchanger. A special coke breeze furnace is used as a source of heat. 67 lbs. coke breeze or 550 cu. ft. of 500 B. t. u. gas will dehydrate 1 ton of tar at 260°. On the av. 15 tons of light oil are obtained per 100 tons of tar, the light oil being condensed in a worm cooled by the incoming cold tar. F. L. G.

"Hird" tar-dehydration plant at Tottenham. R. WARDELL. *J. Gas Lighting* 132, 375-7(1915); *Gas World* 63, 487-9(1915).—The dehydration of tar for surfacing roads is accomplished by a continuous distn. process as follows: The crude tar is pumped

directly from the wells into pipes which serve as a condenser for the still vapors where it receives a certain amt. of heat before entering the heat "interchanger." In the "interchanger" it is warmed to about 160° F. by the outgoing tar and from there moves into the still. Here, passing through a series of channels formed by baffle plates, the vapors are given off, passing through the still head into the condenser, and thence by gravity through a sight box to the receiving tank. Any H₂S is trapped at the sight box and is carried to a small oxide purifier. Owing to the shallow layer of tar in the still and the ample vapor space above, it readily accommodates either coal-gas or carbureted water-gas tar. In a test on the latter, 1410 gals. were treated at a cost totaling, 14 d. per gal. It is estd. that coal-gas tar containing 5 to 10% water can be prep'd. at 1/10 to 1/8 d. per gal.

R. H. SAWENS.

Partial distillation of tar in Wilton's continuous still. F. LIVESKY. *J. Gas Lighting* 132, 373-5(1915); *Gas World* 63, 485-7(1915).—A description of the plant is given together with a drawing showing elevation and plan. Many important points in working are discussed, including the influence of temp., making of motor fuel, toluene, precautions in shutting down, repairs and financial results.

M. L. T.

By-product coking and chemistry. D. R. WATTLEWORTH. *J. Gas Lighting* 132-321(1915).—W. deplores the lack of chemical control in by-product coking in England.

F. L. GROVER.

Report of special committee on specifications for preservative for wood paving blocks 20. Coke for the iron blast furnace (KURADO) 9.

Dust separation in dressing fine coal. F. JÜNGST. *Ger.*, 285,456, May 6, 1914. The non-settling dust is sep'd. entirely by removing it, upwards, together with a part of the sedimentary material (up to 1.5 mm. diam.). This dust is then led, for further treatment, to the surface of a liquid, where the impurities sink, while the coal (up to about 1.5 mm. diam.) floats.

Fuel; pitch. A. C. EVANS and P. J. MITCHELL. *Brit.*, 19,933, Sept. 18, 1914. A pitchy binding-material, applicable for coal briquets and roads, is obtained from coal-tar or mineral oil residues by distg. off the light oils, adding coal dust or hydrocarbon soot (containing volatile matter), again heating until the added material softens and gives off vapors, cooling below 100°, and thickening by means of H₂SO₄, or less preferably SCl₂ or the like. Coal tar is distd. at 270° in a still provided with a stirrer; the residue is cooled just below 250° to prevent combustion, before the coal dust, etc., is added through a man-hole. The amt. added varies between 2.5 and 15% for briquetting or up to 30% for road-making. Reheating takes place up to 270° or over; cooling may occur in the still or in a sep. tank with a stirrer. H₂SO₄ of 170° Tw., amounting to between 0.25 and 1%, is added slowly so that the temp. may not rise over 100° or fall below 49°. The product softens and melts at about the same temp. as medium pitch and has a higher volatilization point by some 70°, but is free from phenols. Shale oil or the like is distd. until of the same consistency as tar distd. at 270°.

Composition fuel. H. FARADAY. *Brit.*, 19,495, Sept. 7, 1914. A mixt. of 5 or 6 parts of NaCl and 2 parts of maize is incorporated while dry with enough coal to make 100 parts, the product being steamed in an agitator and molded hot. Bituminous coal may be used, or 15 parts of it may be mixed with the balance of anthracite before incorporation with the binder.

Gas producer. W. B. CHAPMAN. U. S., 1,165,569, Dec. 28.

Gas producer. J. M. RUSBY. U. S., 1,165,715, Dec. 28.

Gas producers. W. R. DEGENHARDT. Brit., 19,652, Sept. 10, 1914. In a producer fitted with a steam and air supply at the base of the feed-hopper, as described in 22,618, 1913 (C. A. 9, 858), the hopper is provided with a container for sawdust and other fine fuel, which is removed bodily when it is desired to charge large logs of wood. The container is formed with a bell-mouth of wire-gauze or perforated metal, so that air, etc., can circulate through and gradually char the fresh fuel and so prevent packing. Cf. C. A. 9, 1108.

Gas producers. W. CLIMIE and W. LEES. Brit., 19,954, Sept. 19, 1914.

Gas producers. H. KOPPERS. Brit., 20,016, Sept. 21, 1914. See Ger., 279,550 (C. A. 9, 1387).

Apparatus for making and burning producer gas. O. B. EVANS. U. S., 1,165,657, Dec. 28.

Gas manufacture. M. DE JONGH and A. PACCHIONI. Brit., 20,276, Sept. 28, 1914. Between the ascension pipes and hydraulic main of a gas plant intermediate rising and falling pipes are inserted which are sepd. by partitions and jacketed for cooling.

Washing gases. W. B. DAVIDSON and A. J. LIVERSEDGE. Brit., 19,028, Aug. 25, 1914. In gas-washing app. of the type comprizing a number of superposed chambers each containing a rotary sprayer, and provided with gas passages round the sides or between the sides and the center, a grid of substantially vertical baffles is mounted in each chamber to guard the gas passages from the sprayed liquid. Cf. C. A. 9, 2707.

Coal gas. H. A. CARPENTER. U. S., 1,166,183, Dec. 28. Coal is placed in retorts with walls through which the gas generated may pass and the retorts are heated to a gas-making temp. while a lower pressure is maintained outside than inside the retorts to avoid leakage of combustion gases into the retorts from the heating chamber in which they are placed.

Cooling and cleansing coal gas. H. A. CARPENTER. U. S., 1,167,149-50, Jan. 4. App. and method are specified.

Separating water gas into its constituents. BADISCHE. Ger., 285,703, Feb. 18, 1913. Gas mixts. with a like high content of H respond to this treatment. The cooling action resulting from the expansion of the gas mixt. is utilized for the liquefaction of the constituents other than H. External cooling is not required if, instead of water-gas of normal production, a gas mixt. be used containing a higher content of CO or other gas with a positive Thomson-Joule effect. The normal gas may be enriched with CO or the gas may be manufd. in such manner that the product contains the desired amt. of CO. The procedure recommended is to add the liquefied CO to the water-gas either before or after the compression. The liquefied portion may be rectified, and that portion containing H may be returned to the process. The advantage in this is that only two gases, of high purity, leave the app.

Recovering cyanogen and ammonia from distillation gases. P. VON DER FORST. Ger., 280,652, Oct. 22, 1913. The NH_3 gas liberated in the distn. of the sepd. wash H_2O which contains NH_3 together with Cu compds., is conducted into the $(\text{CN})_2$ washer, arranged before the NH_3 saturator and charged with Cu compds., so that it is converted into the complex Cu-cyanogen compds., and is obtained in the subsequent treatment of these compds. with dil. acid as a soln. of $(\text{NH}_4)_2\text{SO}_4$, which is placed in the saturator for the purpose of crystallizing out the salt.

Apparatus for extracting oils, spirits and gases from peat or other organic material. A. N. MACNICOL. U. S., 1,165,889, Dec. 28.

Distilling coal. F. C. BLYTHE. Brit., 19,750, Sept. 14, 1914. In the destructive distn. of bituminous coal, heavy hydrocarbon oil, such as petroleum, kerosene, shale oil, and heavy tar oil, obtained in some cases during the process, is added to the coal, which is then distd. under pressure and at a comparatively low temp. regulated so as to produce a large proportion of hydrocarbon oils and a small proportion of permanent gas. In one method, about 5 to 10 parts of hydrocarbon oil are mixed with 100 parts of crushed or ground coal, and the mixt. is heated in a closed vessel, provided in some cases with an agitator, under a pressure of about 60 lbs. to the sq. in., and the temp. may be gradually raised to 350° and thence to about 500°. The heating may be by means of superheated steam with or without external heat.

Disinfectants. G. T. MORGAN and G. E. SCHARFF. Brit., 19,253, Aug. 31, 1914. Highly germicidal acidic substances sol. in aq. solns. of caustic alkalis are produced from peat tar by distg. the tar until the distillate solidifies to a waxy consistence at normal temp., extg. the distillate with excess of aq. caustic alkali, treating the ext. with mineral acid to liberate the acidic substances, and fractionally distg. these substances under the control of bactericidal tests. The fractionated liquids may be used singly or in various combinations in the manuf. of antiseptics, etc., and may be dild. with org. solvents, or mixed with H₂O, or emulsified by admixt. with gum acacia, mucilage, castor oil soap, etc. They may also be made up in solid form by mixing with hard soap, cane sugar, milk sugar, dextrin, starch, gums, resins, fullers' earth, infusorial earth, gypsum, powdered chalk or whiting, slaked lime, animal or wood charcoal, etc.

Automatically operated car for charging coke ovens. E. HUNGER. Ger., 285,353, May 7, 1914.

22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

Presence of benzene homologs in the high boiling distillates of petroleum. BENJAMIN T. BROOKS AND IRWIN W. HUMPHREY. *J. Am. Chem. Soc.* 38, 393-400 (1916); cf. C. A. 8, 3360.—When a "reduced" Oklahoma oil (that part of the crude petroleum remaining after removing by distn. all that b. below 275°), d_4^{20} 0.877, is cracked by slowly distg. under 100 lbs. pressure, the temp. gradually rising during the distn. from 375° to 415°, and that portion of the distillate b. below 150° is extd. at -15° with liquid SO₂, the ext. yields 2.2 vol. % of the original charge and from this, on fractionation and nitration, are obtained *m*-C₆H₄(NO₂)₂, 2,4-(O₂N)₂C₆H₂Me and 1,3,2,4,6-C₆HMe₂(NO₂)₂. Similarly, 20 l. of reduced oil distd. with 6% anhydrous AlCl₃ yields 0.4 l. SO₂ ext. from which the above NO₂ compds. are obtained. Of natural gasolines distd. from various crude oils (Bristow, Muskogee, Mexican, California) 4.5-14% is sol. in SO₂, and of a Texas solar oil cracked with AlCl₃ 32.5%. Com. paraffin is more difficult to crack than light lubricating oil composed almost exclusively of naphthenes and polynaphthenes; in parallel expts. under 100 lbs. with reduced Jennings oil and paraffin, the temp. at 1 hr. intervals, beginning 10 min. after distn. commenced, was found to be 370°, 415°, 422°, in the case of the oil, and 417°, 432°, 437° in that of the paraffin. Similar results are obtained with AlCl₃; below are given, resp., the temp. when distn. begins and at the end of 4 hrs. and the yield of product b. below 150°: Jennings reduced oil, 200°, 355°, 22.2%; Texas solar oil, 175°, 210°, 24.5%; paraffin, 205°, 282°, 4.5%; phenylparaffin, 185°, 265°, 15.0%. A mixt. of phenylparaffins, prepared by treating 2 kg. melted paraffin with Cl until it gained 251 g. in wt., then treating with C₆H₆ and AlCl₃ in CS₂, when heated 3 hrs. with 7% AlCl₃ at 200-40°, yielded C₆H₆ and PhMe (55 and 11 cc., resp., from 500 g. phenylparaffin).

The formation of PhMe can be accounted for only by the splitting of the phenylparaffin into $\text{PhCH}_3 + \text{CH}_3\text{R}$. In this reaction the higher boiling portion of the material is converted into a mixt. of naphthenes: After pouring off the warm residue from the AlCl_3 and pitch and chilling the oil, 32 g. cryst. paraffin sepd.; the filtrate from this resembled light lubricating oil but possessed an intense green fluorescence, resembling very much the oil obtained by treating Mexican crude petroleum with a little AlCl_3 . From 2.5 kg. of the above phenylparaffin distd. 3 hrs. under 75 lbs. were obtained 112, 150 and 272 cc. b. $70-100^\circ$, $100-15^\circ$ and $115-45^\circ$, resp., the first 2 fractions yielding 25 and 41 g. $\text{C}_6\text{H}_4(\text{NO}_2)_2$ and $(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{Me}$, resp. The residue from the distn. of pure paraffin was not fluorescent.

CHAS. A. ROUILLER.

Equilibrium relations among aromatic hydrocarbons produced by cracking petroleum. W. F. RITTMAN AND T. J. TWOMEY. *J. Ind. Eng. Chem.* 8, 20-2 (1916).—The authors have studied these relations by cracking a Penn. fuel oil, d. 0.83, b. p. $300-400^\circ$. The cracking was done in a furnace consisting of a tube 10 ft. long and 8 in. in diam. and having a capacity of 15-20 gals. of oil per hr. Expts. were made at 200-250 lbs. per sq. in. pressure and at temps. varying from 550 to 700° . The resulting oils were analyzed for aromatic hydrocarbons. They conclude that there are definite relations between the % of aromatic compds. formed, the percentages being fixed by the degree of cracking. Toluene and xylene show the same variation in amt. formed, about $1/2$ as much xylene being formed as toluene. Benzene formation requires more strenuous cracking. Its max. formation is at a point at which the % of toluene and xylene have fallen off considerably. Naphthalene begins to form about where the toluene-xylene content possess its max., indicating that it is formed by the decompn. of monocyclic hydrocarbons. Anthracene behaves similarly to naphthalene and its formation requires still more strenuous conditions. Curves are given showing the relation between the % of the different aromatic hydrocarbons and the d. of the cracked oil.

F. M. ROGERS.

Thermal reactions of aromatic hydrocarbons in the vapor phase. W. F. RITTMAN, O. BYRON AND G. EGLOFF. *J. Ind. Eng. Chem.* 7, 1019-24 (1915).—The purpose of this investigation is to establish facts concerning the influence of temp. and pressure on inter-aromatic reactions. Cymene, xylene, toluene, and benzene were subjected to cracking, each at 3 different temps., and at each temp. under 4 different pressures. The app. consisted of an electrically heated furnace fitted at one end with an oil feed cup and a vaporizer, and at the other end with a condenser, receivers for the liquid reaction products, and a pressure-regulating device. The operation consisted in first connecting the system with a compressor and a natural gas supply until the proper pressure was obtained, after which the product to be cracked was introduced into the electrically heated furnace. The temps. used were 650° , 725° and 800° ; the pressures, 1 atm., 12 atms., 18 atms., and vacuum. The vol. per cent. of oil recovered, the % wt. of carbon, the sp. gr. and distn. of the reaction products were detd. From $\text{C}_{10}\text{H}_{14}$ it was found possible to obtain C_8H_{10} , C_7H_8 , C_6H_6 , C_{10}H_8 and anthracene. From C_8H_{10} , there were produced C_7H_8 , C_6H_6 , C_{10}H_8 and $\text{C}_{14}\text{H}_{10}$, but no $\text{C}_{10}\text{H}_{14}$. C_7H_8 yielded all of the above hydrocarbons except $\text{C}_{10}\text{H}_{14}$ and C_8H_{10} . C_6H_6 gave only C_{10}H_8 and $\text{C}_{14}\text{H}_{10}$. C_{10}H_8 yielded $\text{C}_{14}\text{H}_{10}$, but none of the monocyclic hydrocarbons. $\text{C}_{14}\text{H}_{10}$ produced only some tarry matter, carbon and gas.

O. E. BRANSKY.

Gasoline from heavier hydrocarbons. C. ELLIS AND A. A. WELLS. *J. Ind. Eng. Chem.* 7, 1029-33 (1915).—The purpose of this work was to det. the commercial feasibility of several methods of gasoline production. Still cracking under normal and atm. pressure, tube cracking, heating with reagents, and contact with molten metal were studied. Tube cracking was studied in a semi-commercial app. of 1000 gals. capacity, consisting of a still, a tubular decomposer, and a condenser. A 6 in. vapor

line connected the still with the decomposer, which consisted of 6 sections of 3 in. pipe, each section 75 ft. in length. The coils were surrounded by a furnace setting of bricks, and supported by iron pipe supports, through which water was circulated to prevent bending by heating. The condenser consisted of 1000 ft. of 2 in. pipe. Illinois crude, gravity 33° Bé., test distillate, gr. 42.5° Bé., gas oil, gr. 34°, and fuel oil, gr. 21 to 22°, were used in the expts. The vapors from the still were passed into the decomposer, where the cracking occurred, and the resulting vapors condensed in the condensing coils. At a temp. from 450° to 600° yields of gasoline varied from 18 to 28%; by re-running the residues from the distn. of the cracked products, yields as high as 26% were obtained. The loss as fixed gas and entrained vapor were const. at 16 to 18%. The I no. of the cracked gasolines ranged from 50 to 310, the lower boiling fractions giving the higher I values. On long standing the cracked products became darker, and a heavy residue was left on redistn. Hydrogenation improved the color, odor, and stability of the cracked oils. The olefin content of the fixed gases approached 40% in several cases, and was readily chlorinated.

O. E. BRANSKY.

Coal-tar colors, and the Hall process of manufacturing gasoline from "gas oil." C. F. CHANDLER. *J. Ind. Eng. Chem.* 8, 72-5(1916).—A lecture forming part of a symposium on the dyestuff situation.

F. M. ROGERS.

Examination of steam turbine oils. F. SCHWARZ AND J. MARCUSSEN. *Mit. kgl. Materialprüfungsamt.* 32, 496-502(1914); *J. Soc. Chem. Ind.* 34, 1235(1915).—For detg. the tar-forming value of mineral oils, S. and M. prefer to heat at 120° instead of 150° as recommended by Kissling (*C. A.* 1, 1770; 3, 712, 954). The subsequent treatment is then facilitated, as practically no coke is formed; and the tar-forming values thus detd. are just as valuable as the sum of the tar-forming and coke-forming values (Kissling) for characterizing turbine oils. Heat 50 g. of the oil in a 200 cc. Erlenmeyer flask (diam. of bulb 7.5 cm., height 12.5 cm.) for 50 hrs. continuously in an air-oven at 120°. The flask stands inside a shallow, thick-walled porcelain vessel which rests on a thick sheet of asbestos a few cm. above the bottom of the oven, the inner wall of the oven being preferably lined with asbestos. Treat the oil with 50 cc. of an aq. soln. containing 50% of alc. by wt. and 4% of NaOH, heat for 15 min. at 80° under a reflux condenser, shake vigorously for 5 min., and transfer to a sepg. funnel. Let stand overnight, filter, ext. with 30 cc. of light petroleum spirit, acidify with dil. HCl, and remove the tarry substances by extg. several times with C₆H₆. Wash the C₆H₆ soln. with H₂O evap., and dry the residue at 105° for 10 min. The portion of mineral lubricating oils sol. in acetone (*C. A.* 6, 3011), has a higher tar-forming value than the original oil, and if the acetone-sol. portion be dissolved in petroleum spirit and shaken with castor oil, the latter exts. a portion with a still higher tar-forming value. It is obtained in the form of a soft resinous mass, which can be sepd. by treatment with fullers' earth and extn. with petroleum spirit into about 15% of a solid resin and 85% of a viscous oil. Cf. *C. A.* 7, 3019.

F. W. SMITHER.

Tar and crude petroleum. A review of patents for the last eight years. R. M. WOLF. *Chem. App.* 2, 259-61, 284-5(1915).—German patents on distn., gasifying, removing paraffin, H₂O, salt solus., emulsions, etc.

J. H. MOORE.

The Trumbull system of topping plants. ANON. *Mining Eng. World* 43, 811-2 (1915).—A description, with drawings, of a new plant at Martinez, Calif., operating under the Trumbull topping system patents. A pipe line will connect the Coaling a field with the Shell Co.'s plant (5000 bbl. unit per day of crude oil) at Martinez.

F. W. SMITHER.

Note on ductility test of asphalt. T. LINSKY CROSSLEY. *J. Ind. Eng. Chem.* 8, 89(1916).—To differentiate between asphalts having a ductility of over 100 cm., the

usual length of a ductility machine, the author pulls the briquet apart at the rate of 10 cm. per min. instead of 5. The fast pull is a more severe test. F. M. ROGERS.

Effect of controllable variables upon the penetration test for asphalts and asphalt cements. PRÉVOST HUBBARD AND F. P. PRITCHARD. Office of Public Roads and Rural Engineering. *J. Agr. Research* 5, 805-18(1916).—The object of this investigation was to det. what effect apparently slight differences in temp., load and time produce in the results of tests and also to study the importance of other controllable variables. Melted samples should be cooled for not less than 2 hrs. prior to test, and should be tested upon the same day that they are melted, preferably after 2 or 3 hrs. Samples should be maintained at the testing temp. for not less than 1 hr., and preferably for $1\frac{1}{2}$ hrs. prior to test. Upon standing in the air, prepared samples show a decreasing penetration, but no definite end point or set is produced up to 28 days. In ordinary lab. work there is no apparent advantage in cooling samples in ice or ice water prior to detg. their penetration at higher temps. Cooling in ice water is, therefore, not recommended. Samples should be maintained and tested within 0.1° of the desired temp. for accurate work, as a variation in temp. of less than 0.5° may produce a decided difference in results. Tests at 4° are not the practical equiv. of properly made tests at 0° . When making tests at 0° samples should not be packed in crushed ice, but should be immersed in a brine bath. The increase in penetration of a material detd. under given conditions of temp. and time is, within certain limits, almost proportional to the increase in load. For the 100- and 200-g. loads variations of as much as 1 g. do not as a rule seriously affect detns. It is, however, recommended that in all cases the load should not vary more than 0.2 g. from that desired. In any test, proportionally the greatest number of points penetration is obtained during the first sec. In the 5-sec. tests approx. $\frac{1}{2}$ the total penetration is obtained during the first sec. A variation of $\frac{1}{2}$ sec. may, however, produce an appreciable variation in results. A carefully calibrated metronome is recommended for securing the proper time control. Aside from possible variations in needles, it is believed that variations in results obtained upon the same material by different labs. are more probably due to unobserved variations in the methods of prepg. the sample and to the control of temp. than to any other cause. It is believed that a study of the penetration of various types and grades of bituminous materials under a variety of conditions of temp., load, and time may throw considerable light upon their other physical and chem. characteristics, and may serve as a possible means of identifying their origin and method of manuf. W. H. FRY.

Evaporation tests with wood refuse. H. WINKELMANN. *Papier Fabr.* 13, 680-1, 694-8(1915).—Records of several boiler tests using wood waste as fuel. V. N.

Origin of petroleum and asphalt (RICHARDSON) 8. Lubricating-oil testing machine (SLAUGHTER) 1.

Distilling tar, oil, pitch and other frothing liquids. K. I. CROSSLEY and H. W. BRIGHTEN. *Brit.*, 19,392, Sept. 3, 1914. In the app. for this purpose the fluid issuing from the still is allowed to expand through a restricted passage into a chamber in which the unevapo. liquid is deposited. The invention consists in (1) controlling the restricted passage by means of an adjustable valve, which is set, prior to the distn., by a hand-wheel and locked in position, (2) fitting the valve with a pointer and a graduated scale, (3) lagging the upper part of the still, the neck, and the expansion chamber, (4) fitting a safety-valve on the expansion chamber, the valve being set to lift at a very low pressure. The expansion chamber is fitted with a vapor-outlet pipe and with pipes for returning unevapo. liquid to the still.

Distilling oils. R. NEUMANN. Brit., 20,353, Sept. 30, 1914. Petroleum, tar, etc., comprizes a condenser in which a vacuum is maintained. The device is fitted with a device for discharging distillates at regular intervals. The device consists of a chamber which is placed alternately under vacuum and pressure. While under vacuum, the chamber receives distillate through an inlet valve. When under pressure, the chamber discharges through an outlet valve and a reversed siphon.

Apparatus for refining petroleum by distillation. R. G. JONES. U. S. Pat. 1,165,877, Dec. 28.

Refining petroleum. S. W. WHITMORE. Brit., 19,884, Sept. 19, 1914. Naphthalene is added to crude petroleum prior to distillation, or is added to the distillates or residues of distillation, to improve the color and odor, and the illuminating properties of the distillates and the lubricating properties of the distillates and residues.

Refining petroleum. H. HENNEBUTTE. U. S., 1,165,877, Dec. 28. Oil is prepared from mazout containing a large % of unsaturated hydrocarbon by passing a current of air through the material at a temperature of 100-350° and distilling with refining.

Distilling heavy saturated hydrocarbons. H. HENNEBUTTE. U. S. Pat. 1,165,877, Dec. 28. Heavy hydrocarbon oils such as petroleum or coal tar are heated to a temperature above their boiling points. Hydrocarbons such as petroleum distillate boiling at 170° are introduced in liquid form into the heated heavy oil while the temperature of the latter is above the boiling point of the lighter hydrocarbon so that the latter is immediately vaporized and serves as a carrier for the heavier hydrocarbon.

Apparatus for cracking petroleum. C. J. GREENSTREET. U. S. Pat. 1,165,877, Jan. 4.

Apparatus for making gas from crude oil. F. M. RITES. U. S. Pat. 1,165,877, Jan. 4.

Gasoline substitute for use in internal combustion engines. W. L. RAY. U. S., 1,165,462, Dec. 28. Crude petroleum 1 gal. is mixed with gasoline 2 oz., pulverized alum 2 dram and oil of citronella 1 dram.

Lubricating oils. J. ROSEN. U. S., 1,165,909, Dec. 28. Cylinder lubricating products are prepared by heating petroleum residue to about 320° and introducing the heated material, solar or cracked oil at a lower temperature so that it is immediately vaporized and acts as a carrier to facilitate the distillation.

Oil burner. J. HOWALDT. Ger., 285,434, June 22, 1913.

23. CELLULOSE AND PAPER.

A. D. LITTLE.

Tabular review of nitrocellulose substitutes in the manufacture of paper. SCHALL. *Kunststoffe* 5, 287-8 (1915); cf. *C. A.* 9, 3129.—Patents.

Sizing and coloring paper. E. FUES. Brit., 19,816, Sept. 15, 1914. Paper of 13,970, 1914, is now applied to paper and other absorbent material having different absorptive capacities at different parts of its surface. In so far as it relates to coloring paper of other kinds, and other absorbent material, it is also applied for coloring paper of other kinds, and other absorbent material simultaneously sizing.

Paper pulp. R. A. MARR. U. S., 1,166,848, Jan. 4. Oak, hemlock or other wood is digested with a soln. containing ZnSO_4 2-4, ZnCl_2 1-2, tannic acid 1-2 and glycerol 1-2%, under 50-150 lbs. pressure per sq. in.

Obtaining fiber and by-products from cotton stalks, cane, etc. M. W. MARSDEN. U. S., 1,165,689, Dec. 28. Short lengths of cane, straw or cotton stalks are satd. with H_2O , shredded, digested with H_2O under 10-40 lbs. steam pressure per sq. in. to saccharify the starch and invertible carbohydrates and after the resulting liquor is drawn off the fibrous residue is agitated and scoured with steam and converted into paper pulp. Cf. C. A. 9, 2311.

Recovering alkali from wood-pulp black liquor. A. B. AYERST and C. N. WAITE. U. S., 1,166,509, Jan. 4. The liquor is evapd. to thicken it, mixed with granular charcoal, the mixt. calcined while it is agitated to keep the constituents commingled and the calcined product is leached to remove the alkali. The residual charcoal is dried and used for treating another portion of the liquor.

24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

An apparatus for the study of gases and vapors liberated by explosives at ordinary temperatures. D. CHIARAVIGLIO AND O. M. CORBINO. *Rend. accad. Lincei* 24, 120-6(1915); through *Ann. chim. applicata* 4, 289.—With this app., which gives a very attenuated vacuum, expts. were conducted on the progressive liberation of occluded gases by pulverulent bodies, like P_2O_5 , and of explosive substances, like fulminating cotton. In the case of the latter, there was detected a slow decompn. at the ordinary temp. as the app. permitted an accurate measurement of the gas continually set free. S. LEVY.

"Adobe" as a material for the construction of explosives buildings. A. F. SAVINON. *J. Soc. Chem. Ind.* 34, 1039-40(1915).—Adobe, consisting of a mixt. of clayey earth, H_2O and straw, the latter being replaceable by manure or grass is recommended as a building material on account of the fact that it is a good heat insulator and also that buildings made of it are easily pulverized in case of an explosion. In discussion it was stated that such buildings should be coated with a cement wash or better a coat of blood and lime in order to stand the weather and further that buildings made of saw-dust concrete or a 1-10 cement sand mortar would be more serviceable.

A. J. PHILLIPS.

Military explosives. OTTO MYRIN. *Svensk Kem. Tid.* 27, 118-27, 149-57 (1915).—Résumé and discussion. A. R. ROSE.

Investigation of a hostile aerial incendiary bomb. A. WELLENSTEIN. Trier. *Chem. Zig.* 40, 9-10(1916).—The bomb was charged with yellow P surrounded by a non-inflammable, molasses-like fluid. J. H. MOORE.

Explosions-in-Mines Committee. VII. Effects of inhaling dusts applicable for stone dusting in mines. J. S. HALDANE. *Colliery Guardian* 110, 1181-4(1915). Experiments on the inhalation of different varieties of dust. A. MAVROGORDATO. *Ibid* 110, 1184.—The use of stone dust in mines for preventing coal dust explosions (cf. C. A. 9, 1393) raises the question of its physiological effects when inhaled. The breathing of dust in moderate quantity is not necessarily deleterious; expts. on guinea pigs show that powdered clay, shale, chalk, or other soft inert materials are harmless. Flue dust consisting largely of fused silicates, crushed granite, flint, ganister and similar

gritty media are dangerous, giving rise to chronic inflammation of the lungs. Any shale used for dusting should be free from them.

Liquid explosive. O. REUTER. U. S., 1,166,546, Jan. 4. Toluene is nitrated beyond the dinitrotoluene stage to form mainly trinitrotoluene, the liquid is separated out from alc., the alc. is evapd. from the mother liquor and the residue is further nitrated at 85–100° by the action of 15% HNO_3 and 85% H_2SO_4 , the product solidifying at 14° and containing 16.6–17.2% N.

Explosives. H. H. STOCKFELD. Brit., 19,267, Aug. 31, 1914. The explosive consists of a mixt. of nitroglycerin, nitrocellulose, nitrated Australian grass-tree gum, Ca picrate, KNO_3 , wood meal, and castor oil. The Australian grass-tree gum is nitrated by dropping fuming HNO_3 onto the gum in a bath of a mixt. of turpentine, and petroleum, then decanting and draining. The nitrated Australian grass-tree gum are purified by washing with an alk. soln. containing 96 parts of H_2O , 2 of borax, 1 of sugar, and 1 of lime; and the gum is further purified by boiling in a similar alk. soln., and then washing for about 24 hours with running H_2O .

Explosives. SOC. ITALIANA PRODOTTI ESPLODENTI and F. QUARANTA. 19,565, Sept. 9, 1914. Molding fusible explosive charges for projectiles in a mold with molten explosive, shaking or agitating it until solidification, and then adding at this moment a head of molten explosive, and maintaining this condition until solidification of the whole original charge, no pressure being applied, the wt. of the added charge being used. This process is carried out by means of an app. comprizing a mold for the pasteboard case to be filled, a steam-jacket for the molten explosive, and a valve. The mold is closed at the bottom and held in the closed position by a screw.

Explosives. SOC. ITALIANA PRODOTTI ESPLODENTI and F. QUARANTA. 19,566, Sept. 9, 1914. In the manuf. of trinitrotoluene, crude solid dinitrotoluene is subjected to a partial liquefaction to sep. the liquid and solid intermediate products. The solid product is nitrated, and the nitration mass slowly filtered to give trinitrotoluene, which is filtered, washed with H_2O , melted *in vacuo* to drive off the water, granulated, and dried. The liquid product is nitrated to give dinitrotoluene, which is treated as described above.

Ammunition; explosives. F. QUARTIERI and E. MOLINARI. Brit., 19,268, Aug. 31, 1914. High explosive charges are provided with a cushion in front of the main charge to absorb the stress of impact, this cushion being made of high explosive rendered insensitive to shock.



As shown, the main charge of high explosive is contained in a cardboard casing, *b*, and is sep'd. by a layer of high explosive rendered insensitive to shock, *c*, from the cushion *d* of high explosive rendered insensitive to shock, *e*. High explosive rendered insensitive to shocks, as follows: (1) by an addition of 2 to 20% of camphor, paraffin, or ceresin; (2) by an addition of 1 to 10% of camphor, paraffin, or ceresin to dinitrotoluenes, nitrobenzenes, and their homologs by nitration; (3) by gelatinization, by treatment with an alk. soln. of nitrobenzene, by treatment with a 30–35% soln. of NH_3 in H_2O . In some cases, insensibility may be increased by the addition of 1–12% of resin or India rubber.

Ammunition. W. H. BUELL. Brit., 20,307, Sept. 9, 1914. Bullets producing a flash of light on impact with a target, point hit, are charged with a compn. containing A

Several compns. are described: 1 example contains 40% Al, 30% KClO_3 , 20% trinitro toluene, 6% $\text{Sr}(\text{NO}_3)_2$, and 4% glass.

Molding explosives. SOC. ITALIANA PRODOTTI ESPLODENTI and F. QUARTIERI. Brit., 19,645, Sept. 10, 1914. In hydraulic reciprocating mold table machines for molding explosives, means are provided for ensuring the registration of the molds with the compressing piston and ejectors.

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Dianisidine blue. JOSEF POKORNY. *Chem. Ztg.* 40, 10(1916).—The Cu salt of dianisidine- β -naphthol is violet if formed in the absence of a fatty acid, but in the presence of the latter different shades of blue are formed on cotton goods. It is probably a triple lake of dianisidine-diazo- β -naphthol with Cu and a fatty acid. J. H. M.

Aniline oxidation black on hosiery. ERNEST C. T. BICK. *Text. World J.* 4, 33-5.—Directions are given for dyeing with aniline black as a substitute for sulfur black or developed black, the steps in the process being (1) impregnation with aniline-HCl in the presence of an oxidizing agent, an O carrier and NH_4Cl ; (2) extn. of the surplus liquid by means of a "whizzer;" (3) oxidation of the dyed goods first in revolving drums and finally with dichromate, the latter being carried out at a temp. between 55 and 80°. The lising process is described and various formulas are given. L. W. R.

Tin phosphate weighting of silk. II. HERM. LEY. Elberfeld. *Chem. Ztg.* 39, 973-5, 986-7(1915); cf. C. A. 7, 895.—L. tabulates part of the tests on wash H_2O after the Sn and phosphate baths and of the alk. bath in a series of factory runs. The degree of acidity and alkalinity and the Cl tests are recorded. He concludes that only the washing after the Sn bath is of importance chemically, part of it serving to remove the excess of mechanically adhering SnCl_4 and part to decompose the absorbed salt into insol. $\text{Sn}(\text{OH})_4$. Washing after phosphating has no chem. influence on weighting, contrary to his former belief, but simply serves to remove the excess of Na phosphate. Insufficient washing results in the most varied changes in weighting, as, for example, the SnCl_4 may not be sufficiently decomposed or the NaCl not properly removed after phosphating. Thorough removal of the decompn. products by centrifuging after each step is of even greater importance than washing, and to the neglect of this may be attributed many of the dyer's troubles. No evidence was found of the formation of NaOH, as required by Heermann's theory of weighting. J. H. MOORE.

Dyes; dyeing. FARBW. v. M. L. & B. Brit., 19,272, Aug. 31, 1914. Stable sol. leuco preps. of the vat dyes obtained by condensing benzoquinone, α -naphthoquinone, or their homologs or substitution products, with aromatic amines, or the sulfurized derivs. thereof described in 19,599, 1912 (C. A. 8, 429), are prepd. by adding to the alkali salts of the leuco compds. of such dyes, during or after formation, soaps, e. g., monopole soap or turcone oil, or glycerol. The solns. obtained may be used directly for dyeing, either alone or mixed with solns. of reduced indigo or other vat dyes. According to examples: a vat soln. is obtained by heating di-*p*-chloroanilidobenzoquinone with NaOH lye, hyposulfite, and turcone oil; the same dye is reduced to its leuco compd. by means of hyposulfite and NaOH lye, the product is acidified, and the filtered-off leuco compd. is mixed with turcone oil, and NaOH lye; the dye obtained by treating dianilinodichlorobenzoquinone with Na_2S in alc. is heated with monopole soap, hyposulfite, and NaOH lye to give a vat soln.

Dyeing. E. LODGE and J. M. EVANS. Brit., 19,473, Sept. 5, 1914. In substantive dye processes, animal fibers, fur, feathers, union goods, and artificial silks are dyed with S dyes in alkali sulfide baths with addition of Na or K sulfite and a neutral NH_4 salt, such as the chloride, sulfate, or acetate. Examples are given of dye-baths containing cross dye black BX, thionol blue RB, and katigen blue black R.

Dyes; catalytic processes. A. BROCHET. Brit., 19,848, Sept. 16, 1914. Leuco compds. of vat dyes are obtained by treating the dyes with H in the presence of a catalyst, such as Ni; the process may be effected by suspending the dye in H_2O with the addition of an alkali and the catalyst, and introducing H or a gas containing H while violently agitating the mixt.; inorganic salts, such as chlorides or sulfites, may be added, and the reaction mixt. may be heated or the process conducted under pressure. An example is given of the production of indigo-white; algol, ciba, helindrone, hydrone, and indanthrene dyes are also specified as suitable.

Yellow disazo dye. H. GELDERMANN and F. HAAS. U. S., 1,166,346, Dec. 28. A yellow dye easily sol. in warm H_2O is made by combining 2 mol. proportions of diazotized 2-aminosulfodiphenyl ether with 1 mol. proportion of dipyrazolone derived from 4,4'-dihydrazino-3,3'-dimethyldiphenylmethane and Et acetoacetate. Similar dyes, dyeing wool yellow fast to washing, are obtained by using other dipyrazolones, *e. g.*, those produced from toluidine, 4,4'-diamino-3,3'-dichlorodiphenylmethane, 4,4'-diamino-2,5,2',5'-tetramethyldiphenylmethane or 4,4'-diamino-3,3'-dimethylbenzophenone.

Brown sulfur dyes. C. MÜLLER and W. STÖBER. U. S., 1,165,531, Dec. 28. 2,7-Dimethyl-3,6-diaminoacridine is heated with S and Na_2S and air is blown through an aq. soln. of the product to ppt. it. The resultant dye is insol. in H_2O and ordinary org. solvents, but gives a brown soln. with hot H_2SO_4 or hot Na_2S soln. and a reddish brown soln. with hot NaOH soln. and dyes cotton fast brown from the Na_2S soln. 2,7-Dimethyl-3,6-dihydroxy-9-phenylacridine or 2,7-dimethyl-3,6-diamino-9-hydroxy-phenylacridine or other methylaminoacridines give similar dyes.

Vat dyes of the benzanthrone series. BADISCHE. Ger., 284,700, Dec. 28, 1913. Addition to 267,418 (C. A. 8, 1016). These products are obtained either by employing halogen-substitution products in carrying out the parent process, or by subsequently halogenizing the prepared dyes free from halogen or already containing halogen. The products are in general clearer and in part materially redder in shade. Cf. C. A. 9, 2455.

Metal leuco compounds of the vat dyes. R. WEDEKIND & CO. Ger., 284,888, Dec. 21, 1912. Addition to 270,520 (C. A. 8, 3242). The parent process is extended to apply the treatment of alkali leuco compds. of vat dyes (excepting indigo) to other metal salts, as well as Mg salts. The products serve as initial materials in the manuf. of other dyes, as well as in dyeing and printing.

Aniline black. CHEM. FABRIK GRIESHEIM-ELEKTRON. Ger., 285,955, Dec. 13, 1913. A product which does not turn green is obtained by oxidizing, to blackness, the textile material impregnated with the chlorates of aniline and its homologs, at a temp. higher than usual, *e. g.*, 90-100°.

Dye lakes. BAYER & CO. Ger., 285,614, Aug. 1, 1913. Addition to 281,422 (C. A. 9, 2153). The sulfonic acids of quinizarin (1,4-dihydroxyanthraquinone) yield alumina lakes of much bluer shades than the purpurinsulfonic acids; the lakes have great clearness and fastness. *E. g.*, Na quinizarin- β -sulfonate 5 is dissolved in 10 to 15 times its amt. of hot H_2O , boiled with 1000 parts of $\text{Al}_2(\text{SO}_4)_3$ soln. 1:10, and then the alumina lake is pptd. with 400 parts of calcined soda soln. 1:10, filtered, washed,

and dried. For the production of blanc fixe for calcimining, 1000 parts of BaCl_2 soln. of 1:10 are added to the above.

Dry leuco compounds of dyes. BADISCHE. Ger., 285,322, Jan. 17, 1914. Herebefore the leuco compds. of dyes have been dried by evapn. in an indifferent gas current or *in vacuo*. A preferred procedure is to atomize the solns. or pastes of the leuco compds., with which other substances may be mixed (e. g., molasses), to a fine mist, and then to direct this counter to a current of hot air.

Sulfur-containing derivatives of aromatic amino compounds. KALLE & Co., AKT.-GES. Ger., 285,501, Dec. 31, 1913. Two mols. of a sulfinic acid of the aromatic series are allowed to act on 1 mol. of a *p*-hydroxy- or an amino-azo dye, whereby the reaction proceeds more smoothly.

Indigoid vat dyes. BAYER & Co. Ger., 285,864, Dec. 7, 1913. If the reactive α -derivs. of halogen-substituted isatins or naphthisatins are condensed with 3-Ph-1-indanon as well as its substitution products, homologs or analogs, intensely colored indigoid vat dyes are obtained.

Derivatives of indirubin. FARBW. v. M. L. & B. Ger., 284,317, Oct. 23, 1913. Addition to 283,726 (C. A. 9, 3368). Indirubin derivs. are obtained by the parent process when hydroxylamine is allowed to act upon indirubin. Instead of indirubin itself, its leuco compds. may be brought into reaction, in alk. soln., with hydroxylamine. The end products are the same as those of the principal patent.

Apparatus for dyeing. W. INMAN. U. S., 1,166,989, Jan. 4.

Dyeing machine. K. CALLEBAUT and J. DE BLICQUY. Brit., 19,062, Aug. 25, 1914. In a dyeing machine comprizing a removable cage or receptacle for the material, the receptacle is arranged to hold the material in a single horizontal layer above or below the usual liquor inlet chamber, or in one layer above and one below. The walls of the receptacle are preferably conical or inclined, the inlet chamber being at the base or between the bases of the cones.

Textile conditioning and storage apparatus. I. E. PALMER. Brit., 19,201, Aug. 28, 1914. The progress of the material through a storage receptacle, in which treatment of various kinds may or may not be carried on, is controlled by the material itself. The app. is adapted to receive material in rope or chain form, or in the condition of flat goods of suitable width, such material being treated in the app. or previous to its entrance thereto, with any suitable conditioning liquor, such as a bleaching, dyeing, or finishing liquor. The storage receptacle or shoot is fitted with a positively operated conveyer, which is automatically controlled by the material itself to facilitate the passage of the material through the receptacle in such a way as to prevent tangling, the material being arranged in folds preferably extending across the shoot and normal to the walls thereof.

Waterproofing rope. R. A. MARR. U. S., 1,166,847, Jan. 4. Rope is immersed in a bath of C_{10}H_8 and paraffin at a temp. of $115\text{--}125^\circ$ and allowed to remain in the mixt. until its temp. has fallen somewhat. Cf. C. A. 9, 382.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

Coumarone resins. M. BOTTLER. *Kunststoffe* 5, 277-80(1915).—A review and discussion of the patented processes for the production of artificial resins as polymerization products from cumene and indene. (Generally by the action of H_2SO_4 on crude

benzene.) B. describes some of these products and tests made on them. The use of these materials in the varnish and lacquer industry will be discussed in a later paper.

F. W. SMYTH.

Pigment. L. BLANGEY. U. S., 1,166,808, Jan. 4. "3,3'-Dinitro-4,4'-diamino-sulfobenzid" is combined with $\text{Al}(\text{OH})_3$. The pigment thus obtained has a yellow color and is fast to the action of H_2O , $\text{Ca}(\text{OH})_2$, alc. and light. 3,3'-Dinitro-4,4'-diaminobenzophenone, 3,3'-dinitro-4-chlor-4'-aminobenzophenone, "3,3'-dinitro-4-amino-4'-chlorsulfobenzid," 3,3'-dinitro-4-aminobenzophenone, 3,4'-dinitro-4-aminobenzophenone, 3-nitro-4-amino-4'-methoxybenzophenone, 3-nitro-4-amino-4'-chlorobenzophenone, and 3-nitro-4-amino-2,4-dichlorobenzophenone give similar pigments.

Varnish resin. B. T. BROOKS. U. S., 1,167,264, Jan. 4. Melted colophony is treated with H, using Ni as a catalyst, until it has an I no. of not more than 20. This renders it stable against oxidation even in thin films.

Lacquer. O. SCHMIDT, T. EICHLER and O. ALLEMAN. U. S., 1,166,790, Jan. 4. A lacquer for use on wood or metal or other materials is made by dissolving nitrocellulose or dammar, copal or other resins (with or without linseed oil to reduce the brittleness of the lacquer film) in a mixt. of methyleyclohexanone, and benzene or ligroin.

Furniture polish. H. S. THORPE. U. S., 1,166,494, Jan. 4. A mixt. is formed from vinegar 1 gal., paraffin oil 2 qts., kerosene 2 qts., alc. 2 qts., glycerol 8 fl. oz., butter of Sb 8 fl. oz. and oil of mirbane 8 fl. oz.

27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

The separation of the saturated and unsaturated fatty acids by means of their ammonium salts. HENRIK BULL AND MIKAL FJELLANGER. *Tidskrift Kem. Farm. Terapi* 12, 366-8(1915).—Acetone soln. of the acids is warmed to 40° and treated with a few cc. concd. NH_4OH . This is allowed to stand 3 hours at 17° after which 10 cc. acetone is added and the soaps are filtered by aid of suction and washed 5 times with 5 cc. acetone. The acetone and excess NH_3 are driven off on a water bath. When the acetone is all removed the residue is covered with 5 cc. 80% alc. and warmed 15 min. This material may be used for acid and iodine nos.

A. R. ROSE.

Conservation of lubricants. D. HOLDE. *Seifenfabr.* 35, 982-4(1915).—Discussion of substitutes and measures for regulating the use and consumption of the various lubricants.

E. SCHERUBEL.

Hydrocarbons in fish-liver oils. D. HOLDE. Zehlendorf. *Chem. Ztg.* 40, 14 (1916).—H. thinks that Mastbaum (C. A. 10, 285) failed to supply sufficient tests to prove that the unsapond. oils are not higher alcohols.

J. H. MOORE.

Alfalfa. VI. Alfalfa seed oil. C. A. JACOBSON AND AUGUST HOLMES. *J. Am. Chem. Soc.* 38, 480-5(1916); cf. C. A. 8, 3827.—The seeds showed 3.43% ash, 11.39% Et_2O ext., 10.52% crude fiber, 6.35% moisture, 32.43% carbohydrates, etc., and 35.88% crude protein. For extn. of large amts., gasoline, $b_{\text{m}} 65-95^\circ$, was used instead of Et_2O , the yield of ext. being only 1.92% less. The oil thus obtained showed n_D^{20} 1.4783 to n_D^{20} 1.4587, d_4^{20} 0.9117, sapon. no. 172.3, I no. 154.2, acid no. 2.85, acetyl value 19.8, Reichert-Meissl no. 0.40, unsaponifiable matter 4.40%, glycerol 1.97%, sapon. no. of acetylated oil 192.2. There are practically no volatile fatty acids and no lactones in the free acids; 92.5% of the oil consists of insol. fatty acids (from lauric

upwards) with a neutralization value 191.5, mean mol. wt. 293, sapon. no. 189.9, I no. 169.5, giving 17% solid bromides by the Hehner-Mitchell test. They consist of 90.4% liquid and 9.6% solid acids. The liquid acids consist of oleic, linoleic and linolenic acids (in the proportion of 3.3, 73.2 and 23.5%, resp., calcd. from the oxidation products) and the solid acids of carnaubic, daturic and possibly behenic acids.

CHAS. A. ROULLER.

Fish oil stearin and olein. M. TSUJIMOTO. *J. Chem. Ind. Japan* 18, 1062-72 (1915).—These products are obtained by the distn. of the fatty acids of Japanese herring oil. A mixt. of the two is used for soap purposes. The lathering nos. as detd. according to Stiepel are smaller than those for tallow soap. The consts. for stearin, olein, and soap-stock fatty acids are, resp., as follows: titer, 52°, —, 39.5°; neutralization no., 214, 170, 197; sapon. no., 214, 191, 210; I no., 17, 63, 38; unsapon. matter, —, 4.7, 1.8%.

E. SCHERUBEL.

Detection of vegetable oil in animal fats. J. MARCUSSEON AND H. SCHILLING. *Mitt. kgl. Materialprüfungsamt.* 32, 506-9 (1915); *Chem. Ztg. Rep.* 39, 377; *J. Soc. Chem. Ind.* 34, 1152-3.—Vegetable oils may be detected by a simple combination of the digitonin reaction and phytosteryl acetate test. The oil or fat is shaken with a hot alc. soln. of digitonin, and the resulting digitonide sepd., washed with Et₂O and converted into the acetate by heating with Ac₂O. In the presence of pure vegetable oils the crude acetate will have a high m. p. approximating that of phytosteryl acetate, while in the presence of animal fats the m. p. of the cholesteryl acetate will be const. after 2 recrystns. and will not exceed 114°. Should the m. p. exceed 116° the presence of vegetable oil is certain. Mineral oil does not interfere with the test, and 0.5% of vegetable oil may be detected in mixts. contg. mineral oil.

E. J. C.

Tortelli-Jaffe's color reaction for marine animal oils. M. TSUJIMOTO. *J. Chem. Ind. Japan* 18, 3168 (1915).—The reaction is negative with vegetable and terrestrial animal oils. Marine animal oils mostly give the reaction. With fresh oils the green color has been obtained but old and inferior samples showed negative or indistinct color. By refining, however, the coloration can usually be produced. The fatty acids of marine animal oils, as well as their distillates, also give the reaction, but this is not the case with old oils. Unsataponifiable matter and highly unsatd. fatty acids do not appear to have any relation to the reaction. With hardened fish oil indistinct colorations have been obtained which were not decisive for the detection of fish oil.

E. SCHERUBEL.

Custom-house investigation of fatty vegetable oils by means of the hydrometer. ERNST FISCHER. *Chem. Ztg.* 39, 975-7 (1915).—Owing to surface tension a given hydrometer will not give correct readings even with oils of the same d. The amt., S , by which the instrument is lowered by the meniscus, expressed in units of d., is calcd. by the formula $S = s^2(U \cdot a^3/G^2)$, in which s = density of the oil, U = circumference of the spindle, G = wt. of hydrometer, and a^3 = the capillary const. In order to det. the proper corrections a series of careful detns. was made at 10, 20 and 30° with pure olive, almond, peach seed, peanut, flaxseed, cottonseed, sesame, rape, hemp, poppy and walnut oils, and the results tabulated. The conclusions are that for practical purposes the surface tension is sufficiently const., the av. capillarity const. at 18° is 3.58, and the correction of the d. for each degree above or below 15° is 0.0007. A brief bibliography is given.

J. H. MOORE.

Catalytic bleaching of palm oil. S. G. SASTRY. *J. Chem. Soc.* 107, 1828-31 (1915).—The method employed by S. consists in blowing air through the oil at a temp. of 80-90° in the presence of catalysts. These consisted of the oxides and salts of Mn, Co, Ni, Fe and Pb. No attempt has yet been made to study the chem. changes that

take place. The best catalysts were found to be the salts of Co and Mn; borates were better than other salts. The amts. used were 0.01 to 0.02% and the time required from 2 hrs. in the case of Co borate to 10 hrs. in the case of Ni borate. At the end of 15 months no color had appeared in any of the oils which had been bleached. Two tables of results are given. E. SCHERUBEL.

The ability of colophony to combine with its solvents, especially with the hydrocarbons of petroleum. L. PAUL. *Seifensieder-Ztg.* 42, 393-5, 412-3, 434-5(1915).—Rosin freshly pptd. from its Na soap when stirred with 90% alc. absorbs some alc. and forms a substance which gives off the odor of alc. and is plastic. This plasticity is lost after a time. By distg. a soln. of rosin and petroleum most of the latter is removed but a small portion remains combined at 300-340°. Good evidence of the ability of colophony to combine with hydrocarbons is shown in the behavior of its Ca salts. These are almost completely sol. In distg., rosin oil is formed only at a high temp., and the residue forms a dark brown mass which dissolves in 15 to 20 times its vol. of the fraction of petroleum b. 275-300° and which upon cooling forms a rubbery mass. When $C_6H_5NO_2$ is used as the solvent a substance similar to vaseline is formed. The Na salt of rosin behaves in a similar manner. By heating it to 120° with 10 parts of petroleum a transparent mass is formed which gives off the odor of petroleum. By using the fraction of petroleum b. 170-250° to dissolve the Na soap and heating to 115° a sepn. of the above mass takes place and when this sepd. mass is distd. at a high temp. the combined petroleum is given off. The NH_4 salt of rosin is also sol. in 10 vol. of petroleum with heating but there is no sepn. at 115°. Upon cooling, however, there is one. E. SCHERUBEL.

Manufacture and cost calculations of soaps and washing powder during war time. J. *Seifensieder Ztg.* 42, 1014-5(1915).—Formulas and costs of washing powders contg. from 2 to 30% of fat. E. SCHERUBEL.

Talc in soap manufacture. P. ROHLAND. *Seifenfabr.* 35, 997-9(1915).—Discussion of the use of talc as filler in place of potato flour both in laundry and toilet soap. Several formulas are given. Cf. C. A. 9, 2322. E. SCHERUBEL.

A biochemical reaction for rancid fats (VINTILESCU) 12. Lubricating-oil testing machine (SLAUGHTER) 1.

Rendering carbon tetrachloride miscible with dilute soap solutions. L. FRANK and G. FENDLER. U. S., 1,165,498, Dec. 28. CCl_4 (or other halogen derivs. of hydrocarbons) is emulsified with an aq. soap soln. containing not more than about 10% its wt. of soap, calcd. as fatty acid. This emulsion may be dild. with 200 times its vol. of 0.5-1.0% soap soln. as a detergent.

Cleansing composition. J. T. FREESTONE and W. & F. WALKER. Brit., 19,229, Aug. 29, 1914. A tablet for washing clothes, etc., is composed of an alkali perborate, a washing alkali such as soda ash, and a liquid hydrocarbon such as petroleum spirit, with or without borax. The ingredients are mixed as powder with the hydrocarbon absorbed therein, and pressed to form the tablet, which is encased in paraffin or like wax. Cf. C. A. 9, 1257.

28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

Report on sugar and molasses. W. E. CROSS. *J. Assoc. Official Agr. Chemists* 1, 314-7(1915).—A number of chemists detd. the % of H_2O in a sample of raw sugar

by the official method (Bur. Chem. Bull. 107, Rev., p. 64), by use of the Abbé refractometer and the immersion refractometer. Their results indicate that the refractometric methods are not entirely satisfactory. H_2O in 1 sample of centrifugal molasses and 1 of blackstrap molasses was detd. by the official method (*loc. cit.* p. 65), and with the immersion refractometer. The results are too meager to warrant definite conclusions, but indicate that the quick, more convenient refractometric method may be made satisfactory. Results of 5 chemists on the official (*loc. cit.* p. 40) and a proposed "direct" polarization method for the detn. of the % of sucrose in molasses are given, with the recommendation that all these methods receive further study. H. S. BAILEY.

Determination of sucrose in beet molasses by the double polarization method, using invertase as hydrolyst. E. SAILLARD. *Circ. hebd. Fabr. Sucre France* 27, No. 1371, 4(1915); *J. Soc. Chem. Ind.* 34, 1023; cf. *C. A.* 9, 1404.—Commenting upon the invertase process of double polarization for the detn. of sucrose in beet molasses, used by Ogilvie (*C. A.* 5, 1686; 6, 1073) S. suggests that it may give inexact results on account of the commencement of alc. fermentation. It is preferable, he claims, to use an aq. soln. of the enzyme rather than to add yeast directly to the sugar soln. E. J. C.

The relation between the crystal content of raw sugars and ash rendement according to the methods of Herzfeld and Koydl. L. RADLBERGER. *Oesterr.-ung. Z. Zuckerind.* 44, 97-103(1915).—By the observance of exact working conditions, especially the maintenance of const. temp. and satisfactory satn. of wash soln., values may be obtained for the crystal content of raw sugars as detd. by Koydl's method (*C. A.* 1, 112) which are quant. The method of Herzfeld-Zimmermann (*C. A.* 6, 1548) also gives useful values if exact working conditions are maintained. R. finds in using this method that the crystal content is a function of the time of centrifuging. Insofar as the relation of the detn. of crystal content to rendement is concerned, it was found that sugar of medium grain size shows very good agreement. When the crystal content values according to both methods agree exactly, it follows that in this case the value five for the rendement is correctly chosen. In other words, that here five parts of non-sugar really prevent one part of sugar from crystallizing out. Sugars of large size grain gave a figure, according to both methods, which was smaller than the rendement, while those of small size grain, gave a greater value. It was, therefore, necessary in the first case to choose a larger, and in the latter, a smaller factor for the rendement in order to bring about an agreement of both detns. E. A. TSCHUDY.

The value of the relation between ash rendement and crystal content in sugar refining. T. KOYDL. *Oesterr.-ung. Z. Zuckerind.* 44, 265-72(1915).—A detailed discussion of the various points covered by the work of Radlberger. Cf. preceding. E. A. TSCHUDY.

The making of sugar in Louisiana with special reference to white sugar. VII. CHARLES E. COATES. *Louisiana Planter* 56, 60-2(1916); cf. *C. A.* 9, 3375.—A discussion of the coloring matter of cane juice and methods for its removal. A. G.

Cane juice clarification. MAX SCHNELLER. *Louisiana Planter* 56, 44-6(1916).—The amt. of Na phosphate usually employed removes only a small part of the lime salts; 50 times the amt. used would be required for complete removal. The pptn. at slight acidity is incorrect as $Ca_3(PO_4)_2$ is sol. in dil. acids, even in AcOH. When using large quantities of Na phosphate, the color of the clarified juice was much improved. The color was not restored upon the addition of large amts. of Ca or Mg salts which sometimes cause discoloration of juices. The addition of an amt. of ferric salt found in a dark-colored juice did not materially affect its color. Ferric salt added to sucrose or glucose solns. produced no darkening. It was thought possible that the darkening is due to some organic coloring matter which might have been pptd. by the voluminous

ppt. of $\text{Ca}_3(\text{PO}_4)_2$. As a large amt. of Na phosphate would be too expensive in actual practice Na aluminate was used as the clarifying agent. The clarified juice in this case was affected by a small amt. of iron giving a noticeable darkening when slightly alk. and a dark brown coloration when reacidified to 0.02-0.1 N cc. The color effect of the juice was found to be due to the presence of compds. belonging to the polyphenols or the phenolcarboxylic acids, usually classified as "tannins" because of the delicate iron reaction. A wide range of literature is cited in connection with the occurrence of these substances in sugar cane. By heating at higher alkalinity invert sugar solns. are colored dark by glucinic acid, apoglucinic acid and other humin-like decompn. products, so that a second source of polyphenol compds. occurs in processes in which the destruction of reducing sugar by heating with lime is practiced, that is, in the beet sugar carbonatation process and the Batelle process. The danger to the color of juices arising from the formation of such polyphenol compds. is at first concealed by the pptn. of Fe in the double carbonatation process, but the dark color reappears gradually as the metal is redissolved on evapn. in iron containers. Alkalinity should be avoided when evapg. in iron. The care employed in removing iron by double carbonatation or a similar process would not only be wasted, but more harm may be done by formation of glucinic acid, the amt. of which is likely to be far in excess of the small quantities of phenol compds. naturally present in juices. The Fe content of the liquors becomes comparatively harmless after elimination of the objectionable polyphenol compds. Lead subacetate is a pptnt. of most polyphenols while hide powder, specially prepared Al oxide and animal charcoal used in the analysis of tanning materials absorb besides tannin all the other polyphenols. The only practical method noted is the charcoal process sometime ago discarded in the beet sugar industry and now limited to refineries.

A. GROSS.

White sugar manufacture by the Battelle process. E. E. BATTELLE. *Intern. Sugar J.* 17, 357-9(1915).—B. claims that while the Steffen process has given excellent results in the beet-sugar industry, it has given no evidence of successful application in the cane-sugar house. This is due to the large quantities of glucose which combine with the caustic lime used and then decompose to sol. lime salts reducing the purity to such an extent that the latter is of but little higher purity than the original molasses under treatment. B. removes the glucose from the cane juice or molasses by previous treatment. The juice is heated to, or nearly to, the b. p. with from $1\frac{1}{2}$ to $3\frac{1}{4}\%$ of lime in carbonatators. This constitutes the fundamental principle of the process; from this stage onwards, the procedure is precisely the same as that of the beet-sugar factory.

A. GROSS.

The sulfur utilized in the sulfitation of thick-juice and run off sirups. C. L. BRUNINGS. *Intern. Sugar J.* 17, 365-7(1915).—A calcn. of the extent to which SO_2 introduced for the neutralization of the free alkali of thick juices and run off sirups is utilized. Data were obtained from five Holland beet-sugar factories. It was found that the factories sulfiting only thick juice obtain a higher utilization than those treating the run off sirups, while the utilization when both thick juice and run off sirups are treated is more unfavorable than with thick juice sulfitation alone. The sulfitation of thick juice is continuous whereas that of run off sirups is intermittent, in which latter case at intervals more S is burned than is necessary, the efficiency value being thus decreased. By the regulation of the air and by varying the amt. of the charges according to the SO_2 required, the utilization can be raised.

A. GROSS.

History of the beet sugar industry in Germany during the early stages of its development. C. SCHEIDLER. *Z. Ver. Zuckerind.* 65, 447-513(1915). W. L. B.

Drying beets. H. CLAASSEN. *Z. Ver. Zuckerind.* 65, 331-42(1916).—A lecture

and discussion. Much of the information has appeared elsewhere (see 3 articles, C. A. 10, 128). W. L. BADGER.

The extraction of sugar from molasses by lead oxide and baryta. DAUDE. *Z. Ver. Zuckerind.* 65, 346-68(1915).—A digest of patents. W. L. BADGER.

The colloidal clay process for purification of the waste waters of sugar factories. P. ROHLAND. *Oesterr.-ung. Z. Zuckerind.* 44, 112-3(1915).—By treating the total effluent of a sugar factory, composed of beet-wash, diffusion, condenser and filter-press waste waters, with colloidal clay, it was possible completely to clarify and deodorize the water. The colloidal clay after adsorption of the colloid matter (albumin, carbohydrate, etc.), in the waste waters, can be utilized as fertilizer. E. A. TSCHUDY.

Determination of reducing sugars (SCALES) 7. Lead nitrate as a catalytic fertilizer for sugar beets (GREISENEGGER) 15. Flameless combustion (Pokorny) 21.

KOPFESCHAAR, E.: *Evaporation in the Cane and Beet Sugar Factory.* New York: Van Nostrand Co. 126 pp. \$2.50.

29. LEATHER AND GLUE.

LLOYD BALDERSTON.

Contribution to the knowledge of adsorption (in leather). I. V. KUBELKA. *Collegium* 14, 389-408(1915).—K. states the importance of the study of the adsorbent properties of hide, both to the theoretical explanation of the process of tanning and to the practical control of the process. An abstract of the work of previous investigators is given. K. used as the adsorbent unchromed Freiberg hide-powder, and as liquids to be adsorbed, solns. of formic, acetic, propionic and butyric acids. Water for diln. was distd. in special app., and was free from CO₂. For titration, Ba(OH)₂ soln. of normality from 1/10 to 1/100 was used, with phenolphthalein indicator. In a 200 cc. flask, 5-6 g. of hide-powder was shaken with 100 cc. of the acid soln., the amt. of acid adsorbed being detd. by titrating the soln. before and after contact with the hide. With each acid, the time of the reaction and the concn. of the soln. were varied between wide limits. Results are tabulated and shown graphically. K. concludes (1) that when the 4 acids act on hide-powder, changes of concn. take place, which quickly proceed to an equil. condition, these reactions being reversible within the whole range of the series of expts.; (2) the speed of reaction is great (more than 1/2 of the whole change taking place in the first 5 sec.), diminishing with increase of concn.; (3) the equil. proportions of the reacting substances may be expressed by the general adsorption formula, whose const. for each acid is detd.; (4) the proportionality of the dissociation const. and the adsorption const. were shown except in the case of formic acid, and for this, it was shown that with increasing diln. the two const. became more nearly proportional. L. B.

Boric acid for deliming. ANON. *Shoe and Leather Reporter* 121, No. 2, 77-9 (1916).—Boric acid may be used for heavy or light classes of leather. An excess would not injure the pelt. A skin delimed with H₂BO₃ has a soft silky grain which is present in the final leather. All the lime may be removed by 1% boric acid calcd. on the drained wt. of the limed pelts. Viewed from the point of chemical strength, or deliming power, boric acid is one of the cheapest deliming agents. J. S. ROGERS.

Modern methods of blacking chrome leather. ANON. *Shoe and Leather Reporter* 121, No. 1, 65-6(1916).—Logwood imparts fullness to the leather when used in conjunction with direct blacks. Any free acid in the logwood should be neutralized

by adding ammonia, sal soda or borax, changing the original brown tinge of the liquid to a violet-red. A full black may be obtained by simply drumming chrome leather with a soln. of black dye, but if the flesh side is desired blue, the whole may be dyed blue with a soln. of acid color adding a little ammonia and logwood or gambier, and then the grain side dyed black by brushing on a soln. of basic black feebly acidified with acetic acid. Chrome leather should always be neutralized before blacking it. With direct dyeing chrome blacks, the leather may be fat-liquored either before, after, or during the dyeing. In the case of direct blacks which are not fast to alkali, the fat-liquoring should precede the dyeing. In this case the leather should be rinsed before drying. Acid blacks dye chrome leather a rich lasting black and the color penetrates well. A proper amt. of gambier used with or before an acid black gives a desirable fullness to the leather. Good penetration is obtained by combining an acid black and a direct chrome black. A satisfactory and durable black depends on proper dyeing and not on coloring matter in the finish. However a finishing material may be added to the dye when the grain side is dyed after the leather is dry. Egg yolk is one of the best materials for fat-liquoring light chrome leathers. Some of the processes are described in detail.

J. S. ROGERS.

Waterproofing leather. R. A. MARR. U. S., 1,166,845, Jan. 4. Leather is immersed in a mixt. of paraffin, rosin and diatomaceous earth, the temp. of which is first maintained at about 101° and then allowed to fall as impregnation is effected. The diatomaceous earth is used to fill the pores of the leather and make it more resistant to organic acids.

Waterproofing leather. R. A. MARR. U. S., 1,166,846, Jan. 4. $C_{10}H_8$ is added to the impregnating mixt. of the preceding pat. and the process is carried out in the same manner.

Flexible waterproof leather. J. W. BARBER. U. S., 1,167,326, Jan. 4. Leather impregnated with petrolatum and paraffin, with a larger % of the paraffin in the superficial than in the body portion, is prepd. by successive immersion in mixts. of the petrolatum and paraffin, containing successively increasing amts. of the latter.

Flexible waterproof leather. J. W. BARBER. U. S., 1,167,327, Jan. 4. Leather is treated successively with different mixts. of viscous and solid H_2O -proofing substances, each of which contains a larger % of the latter than the preceding bath used, so that it is impregnated with a blended compn. with a larger proportion of solid wax or the like near the surface. This filling prevents passage of H_2O through needle holes made in sewing the leather.

30. RUBBER AND ALLIED SUBSTANCES.

R. T. STOKES.

The rubber industry. I. ANDREW H. KING. *Mel. Chem. Eng.* 14, 23-9(1916).—An historical review of the natural and synthetic rubber industries. Theories of the structure of the rubber mol. and of vulcanization are discussed. II. *Ibid* 71-7.—An outline of factory practice in such processes as washing, drying, compounding, mixing, calendering, frictioning, vulcanizing and the manufacturing of various rubber articles.

E. H.

The future of Para rubber. N. H. WITT. *Gummi-Ztg.* 30, 199(1915).—The commercial future of wild S. American rubbers is discussed. It is doubtful if the production of *Castilloa* rubber will remain profitable, because of the increased production, and the lowering of the cost of plantation rubbers. By educating the natives

and lowering the tariffs in Brazil, Para rubber should be able to hold its own in the markets on account of its superiority in some respects over plantation rubbers. The advantage of Para rubber over plantation rubber is due to the youth of the plantation trees, the methods of collecting and coagulating the latex, and the difference in climates. The main reason for the lower quality of plantation rubbers is probably the fact that Wickham did not bring the proper seeds to the east. WILLIAM F. ZIMMERLI.

New simplified Schadt process for the preparation of rubber. J. G. C. VRIENS. *Mededeelingen van de Adviseur der A. V. R. O. S.* 1914, 51-2; *Bull. Agr. Intelligence* 6, 1064.—According to Schadt's new process, already used in several places in the Dutch East Indies, a thin layer of latex is spread on tin plates with recurved edges. After some time, the water having evapd., there remains only a thin coating of rubber. The films thus obtained are smoked by revolving them in a drum covered with perforated sheet-iron, and are subsequently compressed into blocks. On the second day after tapping, the rubber is ready for dispatching. The rubber thus retains the original latex elements, while the cost of production is reduced to a minimum. It appears that this process is a step in the right direction towards obtaining uniformity of the product. E. J. C.

The acetone extraction of gums and products of rubber. A. HUTIN. *Ann. chim. anal.* 20, 212-3(1915).—Unless the acetone extract is dried *in vacuo*, it increases in wt. constantly, to even more than 20%. Drying *in vacuo* gives const. wt.

P. M. GIESY.

Determination of total sulfur in the products of the rubber industry. A. HUTIN. *Ann. chim. anal.* 20, 214-6(1915).—"Total sulfur" is not an exact term; its meaning should be specified in any contract. H. gives the following method for its detn.: Place 1-2 g. of the sample, milled to 1 mm. thickness, in an 80 mm. crucible, and cover with a funnel. Add 30 cc. S-free HNO_3 in the cold in portions of 2-3 cc. The action is very violent, and if the rubber catches fire, the detn. is lost. Evap. the soln. to a sirupy consistency on the H_2O bath; add 2-4 cc. S-free NaOH soln., drop by drop, to neutralize the acid, then pure calcined magnesia to make a very thick paste. Evap. the paste to dryness, at first on the water-bath and then in an oven or air-bath at 140° ; when well dried, calcine over a small Bunsen flame. Since the mixt. is explosive, too rapid heating is dangerous. Take up the mass with H_2O , heat on the water-bath, filter, and wash, taking care to crush all lumps. From a 1 g. sample 300 cc. soln. should be obtained. Conc. this to 100 cc., acidulate with HCl , boil and ppt. with BaCl_2 . The soln. should be colorless; if it is not, the calcination has been incomplete.

P. M. GIESY.

Observations on the subject of the determination of total chlorine in rubber substitutes. A. HUTIN. *Ann. chim. anal.* 20, 241-2(1915).—0.2-0.5 g. of the substitute is covered in a porcelain crucible with the usual mixt. of Na_2CO_3 and KNO_3 and the mixt. heated slowly until quiet fusion results. When cold, the melt is dissolved in H_2O to which HNO_3 has been added, and the Cl detd. by titration. P. M. GIESY.

Sterilin (rubber substitute). E. MARCKWALD AND F. FRANK. Berlin. *Chem. Ztg.* 39, 927-8(1915).—An account of tests made to show the resistance of this substance to H_2O , acids, alkalis and salts, in order to det. its value as a protector for the hands in chem. industries and surgical operations. The results show it to be a valuable substitute for rubber gloves in many cases. J. H. MOORE.

Molding bakelite. G. PONCHT. *Am. Machinist* 43, 1113(1915).—The manufacturing advantage of bakelite over hard rubber is that all subsequent machining operations, such as threading, milling and drilling, are eliminated. G. G. F.

Vulcanizing rubber. P. I. MURRILL. U. S., 1,166,777, Jan. 4. Rubber cured by treatment with S_2Cl_2 and gasoline which has been freed from olefins by treatment with Cl_2 , Br_2 , I_2 or S_2Cl_2 and distn. The absence of olefins avoids injury from malodorous compds. which shorten its life and which are formerly commonly present in gasoline.

Revulcanizing rubber. R. B. PRICE. U. S., 1,166,784, Jan. 4. Vulcanized rubber is heated slightly under a pressure of about 3000-4000 in., after exhausting the gases from it, then vulcanized by heating and cooling to check surface vulcanization. Cf. C. A. 9, 2823.

Devulcanizing rubber. H. J. MAYERS. U. S., 1,167,359, Jan. 11. Devulcanized by heating with oil of pine which has been deresinated and purified by redistg. the oil (obtained originally by distg. pine wood, an oil of 0.88-0.96) at about 100° with H_2O and $NaCl$, amyl acetate and oil of citronella.

Vulcanizing rubber tires on cores and stretching the sides and edges. J. H. COFFEY and J. H. COFFEY, JR. U. S., 1,166,326, Dec. 28.

Uniting metals with hard rubber. G. C. KNAUFF. U. S., 1,165,755, Dec. 28.

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CHEMICAL ABSTRACTS

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No. 6

I. APPARATUS.

L. C. JONES.

A new pyrometer protector. FINK. *J. Gasbel.* 58, 595-6(1915).—Into the space whose temp. is to be measured is inserted a tube, closed at the end and larger in inside diam. than the outside diam. of the thermocouple. A flange on this tube and another on the pyrometer tube are connected by bolts, and the pyrometer is only inserted part way into the space. It seems to be intended that the pyrometer should be placed to measure a temp. less than the full temp. in the app., and a correction factor applied. It is claimed that temps. up to or over 1200° can be measured with base metal couples by only inserting them so far that they will not be exposed to temps. over 600°. The flanges are supposed to increase the usefulness of the device by directing currents of hot air away from the cold junction.

W. L. BADGER.

Space models for introduction into the study of eruptive rocks. PAUL NIGGLI. Leipzig. *Centr. Min. Geol.* 1915, 449-65.—The desirability of constructing space-models so as to gain an accurate idea of the field relations in ternary and more complicated systems is pointed out and descriptions given of a number of models designed by N. for this purpose.

E. T. WHERRY.

Structure models according to W. H. and W. L. Bragg. O. MÜGGE. Göttingen. *Centr. Min. Geol.* 1915, 545.—A brief description of models which have been constructed by Bartels, of Göttingen, to bring out the structures which have been demonstrated by B. and B. and others to exist in crystals of diamond, sphalerite, halite, pyrite and calcite. The simplest cube is multiplied by 8 so as to show the relations in neighboring portions of space, and the calcite structure is also extended in certain directions to bring out the relations more clearly.

E. T. WHERRY.

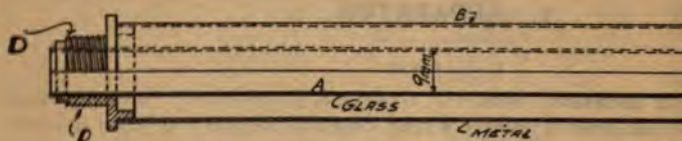
A new polarization instrument. MAX BAUER. Marburg. *Centr. Min. Geol.* 1915, 513-6.—A description with figures of a special microscope, using a Norrenberg polarizer, which has the advantage that observations can be made in parallel light and in convergent light without the many changes in the lens system necessary in the usual form. The main portion of the microscope tube, comprizing stage, objective and eyepiece, is pivoted so that it can be swung into two different positions; in one of these the parallel polarized light enters as in the ordinary microscope, while in the other a condenser beneath the stage and an accessory eyepiece above the standard one, yield convergent light and permit the observation of interference figures. The apparatus is made by Leitz.

E. T. W.

Pipets especially adapted for use with alkaline pyrogallol. R. P. ANDERSON. *J. Ind. Eng. Chem.* 8, 133-5(1916); cf. *C. A.* 10, 728.—A modified Orsat pipet is described which can be used with a concd. pyrogallol soln. (25 g. of pyrogallol in 100 cc. of KOH of 1.55 d.), and in which the formation of the ppt., characteristic of alkaline pyrogallol, is not objectionable until the reagent is nearly exhausted. The specific absorption of the above reagent in the new pipet is greater than in the Hempel pipet, and the new form is more convenient to manipulate.

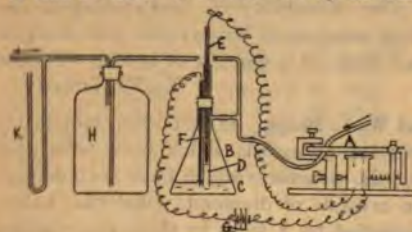
E. W. BOUGHTON.

Design of a polariscope observation tube. D. W. ROCKEY. 33(1915).—The design (see fig.) consists essentially of a metal-cased glass tube *A* makes possible the better cleansing, using acid if des corrosion. The metal casing *B* protects the glass from breakage. flattened sufficiently to prevent rolling. The tube *A* should be a



diam. to avoid the bad effects of capillarity. The threading of the tube should be a quadruple thread with at least 1 cm. pitch, which allows the tube to be turned one turn. The casing should have a shoulder extending out from the end at *E* for about 5 mm. The casing *B* being attached to both shoulders, it can be working loose and out over the end of the glass tube.

Note on a gas-pressure regulator. ALFRED F. JOSEPH. P. 254-55(1914).—The regulator was designed for use with high and low pressures. It can be used to reduce to any desired pressure. The gas enters



enters through a walled rubber tube which carries the armature of a telegraph. When the armature is pulled down, the pressure is nearly shut off. The regulator is made of glass tubes and a solenoid. When the pressure increases, the acid is forced up the tube and completes the circuit and causes the armature to move.

The large vessel *H* acts to take up small variations of pressure. *K* is a weight. A weight may be used to advantage on the bar *A*. The apparatus is in use for over a year, keeps the pressure at 5 cm., the amplitude of variation being only about 1 mm.

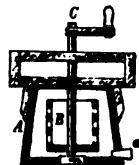
The modification of the Lunge shaking flask. A new gas buret. *Chem. Ztg.* 40, 39-40(1916).—The modified nitrometer is designed for the measurement of the substance in H_2SO_4 by shaking. It consists of 2 parts connected by a joint held in place by a steel spring. The upper part is a double-bored glass cup for adding the H_2SO_4 and tube for connecting with any suitable apparatus. The lower part is like the reaction bulb of du Pont's nitrometer. When lowered to the bottom cock which is closed, the substance introduced into the wide mouth, the slip-joint closed and secured by the spring, the H_2SO_4 is hastened by shaking, the lower cock opened and Hg allowed to enter the bulb and the gas measured as usual. The buret resembles a Bunte buret except that the bulb is graduated. The rest of the buret is graduated in both directions, in and out of the bulb, so that if the meniscus is in the bulb the app. may be in either direction.

Evaporating apparatus. OSKAR NAGEL. *Chem. App.* 2, 2(1914).—A brief outline of the principles underlying the Yaryan, Zaremba and Ordway app., and a description of a new app. for the

from potash and soda manuf. It consists of a stack, in the center of the base of which is a nozzle through which the soln. to be evapd. is forced with compressed air. This acts as an injector to draw in the fuel gas through openings in the stack just above the nozzle. The flue gas and steam pass out at the top, the soln., concd. to the solidifying point when cooled, falls to the base and flows out into a trough in which is a revolving cooler to which it adheres as a crust which is removed by a suitable scraper. The absorption of heat is so rapid that with MgCl_2 solns. the temp. never rises above $125\text{--}30^\circ$. Cf. Schröder, *C. A.* 10, 297.

J. H. MOORE.

A centrifuge. A. GAWALOWSKI. *Z. anal. Chem.* 54, 549(1915).—The app., devised for preps. to be kept out of contact with metal, is shown in the accompanying sketch. The removable, perforated wooden drum *B* is rotated in the wooden vessel *A* by means of the hand crank *C* or an air, gas, or H_2O motor. Gauze, linen, filter paper, etc., may be used as a lining for *B*. The removed soln. runs out at *a*.



F. W. SMITHER.

Apparatus for rapidly testing substances used against poisonous gases. E. KOHN-ABREEST. *Compt. rend.* 161, 310-3(1915).—K. describes, with a sketch, a simple piece of app., by means of which a definite vol. of a mixt. of air and poisonous gases can be slowly aspirated over a plug of cotton-wool impregnated with a soln. of the absorbing agent to be tested. A table is given showing results of tests of mixts. of Cl and air with dry and moist cotton, Na_2CO_3 , NaHCO_3 , $\text{Na}_2\text{S}_2\text{O}_3$, NaI or KI , $\text{KI} + \text{Na}_2\text{CO}_3$, $\text{Na}_2\text{S}_2\text{O}_3 + \text{Na}_2\text{CO}_3$, $\text{NaHCO}_3 + \text{Na}_2\text{S}_2\text{O}_3$, $\text{Na}_2\text{S}_2\text{O}_3 + \text{Na}_2\text{CO}_3 + \text{glycerol}$, $\text{Na}_2\text{S}_2\text{O}_3 + \text{NaHCO}_3 + \text{glycerol}$. In each case 250 cc. of the mixt. used was slowly aspirated at about the same rate as the inspiration of air during breathing. For mixts. containing 1 in 1000 or less of Cl , cotton-wool alone, either wet or dry, absorbed all of the Cl ; only when the Cl rose to above 1% was any difference noted among the absorbents. With concns. greater than 1% a satd. soln. of Na_2CO_3 absorbs the Cl very energetically; NaHCO_3 soln. does so only moderately. When $\text{Na}_2\text{S}_2\text{O}_3$ is used, SO_2 is liberated, necessitating the use of Na_2CO_3 for its absorption. The addition of glycerol to the solns. serves mainly to prevent evapn., and to render more uniform the absorption of the Cl . KI soln. (30%) acts very energetically as an absorbent, the I formed being fixed on the cotton, probably as ICl .

F. W. SMITHER.

Power briquetting press. ANON. *Iron Age* 97, 372-3(1916).—The press, described in detail with illustration, will be used by the Wickwire Steel Co., Buffalo, for briquetting waste material not suitable for use in the blast furnace on account of its fineness. The design closely resembles that of the Breuck-Kretschel press; it is of the lever, power-actuated kind, known as the toggle type of press. Power is applied by means of a belt. The noteworthy features are the manner in which the safeguarding against breaking or unduly stressing the principal members of the press has been provided for, the absence of registering holes or plungers, and the automatic character of the movements, from the filling of the molds to the discharge of the finished briquet, which require the least intelligent class of labor.

F. W. SMITHER.

The Ferranti water heater. ANON. *Electrician* 76, Suppl. 106.—This is an elec. heater so constructed as to be inserted into a tube or pipe line, there being a pipe connection at either end of the heater. The heater is particularly useful in exptl. work requiring a constant supply of heated H_2O of a definite temp. The small size heater shown consumes 350 watts maximum. With this wattage it will heat 3.55 l. H_2O per half. hr. from 10° to 45° .

C. G. F.

A tailings sampling device. A. M. SHAW. *Eng. Mining J.* 101, 223(1916).—An auger for taking samples from depths not exceeding 8 to 10 ft. comprizes the following material: one $1\frac{1}{2}$ -in. Snell ship auger with screw; upset stem, cut off to 18 in. over-all,

and thread upset end for $\frac{3}{8}$ -in. standard pipe; one length $\frac{3}{8} \times 6$ (thread both ends); four lengths $\frac{3}{8}$ -in. $\times$ 2 ft. galvanized pipe; two lengths $\frac{3}{8} \times 3$ in. galvanized pipe (thread one end); eight $\frac{3}{8}$ -in. couplings; one $\frac{3}{8}$ -in. galvanized Fe tee; two 8-in. Cochran or St. All pipe threads should be cut full standard depth, rubbed free from greased. The tee with the two 3-in. lengths of pipe forms a handle use the auger is shoved down, without turning, to the elevation from is desired, a few turns are made with a slight pressure on the stem and drawn. In use the steel plunger is screwed to the 18-in. length of $\frac{1}{2}$ to the bottom of the brass "core barrel." The instrument is for dump and successive lengths of the $1\frac{1}{4}$ -in. and $\frac{1}{2}$ -in. pipe added until is reached, when the plunger is withdrawn far enough to insure clearing the core barrel. Care should be exercised to see that the slot is free of plunger until ready to take a sample. Soil samples have been taken of 40 ft. with a device of this nature.

Gas-washer. T. McDONALD. U. S., 1,167,909, Jan. 11.

Apparatus for cooling and scrubbing gas. L. A. ZÖHE. U. S.,

Acetylene generator. J. A. McCLAIN. U. S., 1,168,893, Jan.

Carbonating liquids. A. A. PINDSTOFFE. Brit., 19,769, Sep. for impregnating liquids with CO_2 . Cf. C. A. 9, 2333.

Etching hollow articles. DEUTSCHE MASCHINENFABRIK AKT.-G. Jan. 10, 1914. A suitable app. is specified.

2. GENERAL AND PHYSICAL CHEMISTRY

WILLIAM D. HARKINS AND E. B. MILLARD.

Revision of the atomic weight of neodymium. II. G. P. BAILEY, COMB. O. J. STEWART AND H. C. CHAPIN. *J. Am. Chem. Soc.* 38, C. A. 5, 645.—After 158 series of crystals of $\text{Nd}(\text{NO}_3)_3$ from HNO_3 material was tested spectroscopically. From the photographs and known amounts of Sm and Pr had been added the amount of each of the elements, and a correction applied. In the material finally used the ratio between 0.6% and 0.0%, the Pr was between 0.2 and 0.0%, the amount of one element accompanying the smaller of the other. The mean ratio $\text{NdCl}_3:\text{Ag}$ and 15 determinations of $\text{NdCl}_3:\text{AgCl}$ gave the atomic weight. The average of this result and that found in the earlier work is 144.26 and $\text{Cl} = 35.457$. Since the ratio $\text{Ag}:\text{AgCl}$ which could be calculated was 0.752632 and that found by Richards and Wells (1908) was 0.752632, inclusion by the AgCl or from loss of AgCl were probably absent.

Stoichiometry. ROBERT KREMAN. *Fortschritte Chem.* 11, 8. Progress in this field for the second half of the year 1914 is reviewed. Subjects: General properties of unary systems, surface tension, viscosity and osmotic phenomena.

Effect of pressure on polymorphic transitions of solids. P. W. BRIDGMAN. *Nat. Acad. Sci.* 1, 513-6 (1915); cf. C. A. 9, 2479, 2617, 3000.—Pressure on 30 substances, for pressures up to 12000 kg. per sq. cm. The experiments described before.

Supposed allotropy of copper. G. K. BURGESS AND I. N. KENNEDY. *Nat. Acad. Sci.* 3, 657-62 (1915).—A series of experiments by an electric resistance

to that previously used on Fe (*C. A.* 9, 194) except that a calorimeter was used in place of the furnace. The expts. did not show any evidence of the existence of an allotropic modification of Cu such as has been postulated by Cohen and Hulderman (*C. A.* 8, 1223, 2514), and the expts. of C. and H. do not show the existence of such an allotropy. The change in zero value of elec. resistance which they claimed as evidence of allotropy is common to all metals and is related to the hardness of the metal. However, the resistance of Cu in the range from 0 to 100° varies continuously, showing no break at about 70°, and ordinary Cu is most probably not in a metastable condition.

E. B. MILLARD.

Densities and cubical coefficients of expansion of the halogen salts of sodium, potassium, rubidium and cesium. G. P. BAXTER AND C. C. WALLACE. *J. Am. Chem. Soc.* 38, 259-66(1916).—The method employed was the displacement of toluene, and in order to reduce the errors of expt. a very considerable quantity of salt (about 25 g.) was employed. The pycnometer itself was merely a 25 cc. graduated flask with the neck constricted to about 2.5 mm. Especial pains were taken in drying the salts and freeing them from entangled air when immersed in the toluene. The vol. of the flask was found by weighing it with H₂O after the liquid had been set at the mark in the thermostats used for finding the ds. of the solutions in the preceding paper (*C. A.* 10, 303). Data have been computed for the d. of the salts referred to H₂O at 4° for 0°, 25°, 50° and 70° and for the cubical coeffs. of expansion over each of the 3 intervals.

E. B. MILLARD.

Densities and cubical coefficients of expansion of certain substances: arsenious oxide, lead chloride, lead bromide and neodymium chloride. G. P. BAXTER AND C. F. HAWKINS. *J. Am. Chem. Soc.* 38, 266-71(1916).—Two forms of pycnometer were used, one of which is described in *Am. Chem. J.* 31, 220(1904), and is a modification of the T. W. Richards pycnometer for solids; the other was a 50 cc. flask used as described in the preceding abstr. Data are given for 0°, 25° and 50°. E. B. M.

Solidification curve of the system lead nitrate and ammonium nitrate. B. BOGRRCH. *Compt. rend.* 161, 790-1(1915).—NH₄NO₃ has a m. p. of 158°; Pb(NO₃)₂ decomposes. Addition of NH₄NO₃ to Pb(NO₃)₂ greatly increases its stability, though the soln. of the Pb salt takes place very slowly in the melt. The temp. of solidification of mixts. contg. 9 to 55% Pb(NO₃)₂ has been detd. An eutectic point was found at 131° and about 33% Pb(NO₃)₂. Extrapolation of the m. p. curve gave 450 to 470°, as a probable value for Pb(NO₃)₂, assuming the curve does not change slope.

E. B. MILLARD.

Contradictions between calculated and observed solubilities of certain sodium salts. A. COLSON. *Compt. rend.* 161, 787-90(1915).—Solubilities calcd. from the calorimetric expts. of *C. A.* 10, 304, for NaCl do not agree with directly detd. ones. The calcd. values show a max. soly., and the same discordance was found to exist for Na₂CO₃. No explanation has been found.

E. B. MILLARD.

The melting points of "pressed" crystals. MEINHARD HASSELBLATT. Göttingen. *Z. anorg. allgem. Chem.* 93, 75-83(1915).—H. attacks the theory of the melting of solids under non-uniform pressure as developed by Ostwald, Niggli and others. If a cylinder of material be pressed in a bomb with a loose-fitting plunger, there will result an excess of pressure on the solid above that on the liquid. Then, calling π this excess pressure, T the abs. melting temp., v the sp. vol. of the solid, and q the latent heat of fusion, the relation $dT/d\pi = -vT/q$ may be easily obtained by performing an imaginary isothermal cycle. As H. points out, however, the necessary cyclic process is in one sense not reversible, for it is not possible to cause pressed crystals to separate out from the liquid and thereby lift the plunger. Nevertheless the whole cycle may be considered as made up of a number of equil. changes and therefore the thermodynamic

equations are applicable and the formula as given is correct if it be process really takes place in the manner indicated. The validity of is challenged by H., who endeavors to show that crystals under pressure in direct contact with the unpressed liquid. But an indirect equilibrium phase is possible, and a mathematical investigation of such a formula identical in form with that used by Niggli.

The nature of flow in crystalline substances. G. TAMMANN *anorg. allgem. Chem.* 92, 37-46 (1915).—T. discusses the phenomenon of cryst. substances and especially the "local melting" theory of the (cf. preceding abstract). The ordinary formula for the change of form pressure is stated by T. to have been derived from faulty assumption an expt. with ice which shows that the formula does not apply to it under a loose-fitting plunger. The final conclusion reached is that plasticity of cryst. solids lies in the formation of "gliding planes" and this thesis renders unnecessary the postulation of a partial melting during

A theory of chemical reaction and reactivity. Further note. *J. Am. Chem. Soc.* 38, 227-8 (1916); cf. *C. A.* 10, 301.—Polemical (*A.* 10, 300).

The quantum of action. WM. WILSON. Univ. London. *Phil.* (1916).—Polemical (cf. *C. A.* 8, 1535; 9, 2481; and Ishiwara, *F. Physic. Soc.* [2] 8, 106 (1915)).

The possibilities of chemical combination in the light of a new KUEMMELL. *Pharm. Ztg.* 60, 698-9 (1915).—The paper is a discussion on the work of P. John Mueller: "Die Weltraetsel im Lichte der neu u. astronomischen Forschung."

The evidence in favor of the existence of molecules. C. A. CROCHEM. *Weekblad* 12, 714-29 (1915).—An address. GEORGE

New relation derived from Planck's law. PAUL D. FOOTE. *U. Sci. Papers* No. 259, 479-82 (1915).—Any number of displacement laws from the Planck equation. This paper concerns the relation that exists between abs. temp. and the λ component of the center of gravity of the spectrum is a const. The math. treatment cannot be briefly abstracted.

Theory of emulsification. VIII. W. D. BANCROFT. *J. Phys.* (1916); cf. *C. A.* 9, 1567, 2171.—All solids show selective adsorption of vapors. The film of condensed gas shows itself in the abnormal mechanical properties of powders, in a resistance to the passage of an elec. spark between solids in the fact that 2 pieces of a broken object do not reunite when pressed together. Liquids also show selective adsorption of gases and vapors, and the gas shows itself in the behavior of fountains, jumping jets, rolling bubbles; it causes errors in the detn. of mol. wts. by the air bubble method. Adsorption of gas on the surface of Hg is not sufficient to account for the surface tension with time.

Vapor pressure of gelatin-water mixtures. KURT GERIKE. *Kolloid* (1915).—The vapor pressures of gelatin-water sols of varying concentrations were detd. by a static method. The vapor pressure is slightly higher than that of pure water and the difference increases with increase of concn., and is a measurable temperature effect. These facts together with variations in the melting point indicate that the mixt. has the character of a solution. The small decrease in vapor pressure is due to a slight soly. and the

gelatin. With water-gelatin gels the vapor pressure lowering was less the higher the temp. This seems to depend on the previous history of the gel. " β gelatin" acts the same as α except that with increasing temp. there seems to be a slight decrease in the vapor-pressure lowering. The vapor pressure of KBr soln. is increased by the addition of gelatin, that of NaCl is decreased, while LiCl and NH_4NO_3 solns. show varying effects at varying temps., probably due to adsorption of the salt or water by the gelatin. The vapor pressure of gelatin gel was detd. by the same static method, but since the concn., temp., and vapor pressure all varied the results only give the projection of a surface on a plane with temp. and vapor pressure as axes. In this case the vapor-pressure lowering of the gel over that of pure water increases with rising temp., probably because of increasing concn. To overcome this difficulty of changing concn. a method was devised for bringing the gel into equil. with air of a fixed vapor pressure, then detg. the concn. of the gel; by this method it was found that at fixed temp. the concn. of the gel varies greatly for small variations in vapor pressure if the original concn. of the gel is low. At about 70% a coagulation occurs and from that point on the water is held more firmly. Another change indicating a second coagulation occurs at 94%; beyond this the water is held very firmly. The difference between low and high concn. is marked, the former showing only slightly lower vapor pressure than that of water, the latter showing very markedly lower vapor pressure, the difference increasing with increasing concn. The change in compn. with the temp., vapor pressure remaining const., shows a regular curve with two breaks, at 39% and 90%. The rate of evapn. of water from gel does not indicate the presence of any hydrates, but rather confirms van Bemmelen's view that the water is held by adsorption. The fact that gelatin when allowed to swell in liquid water loses water on being brought into satd. air was found to be dependent upon the condition of the surface. Unsized paper shows just the opposite property, absorbing more water from satd. air after being soaked in water. If the gel be provided with a rough surface, either by covering with paper fiber or by brushing the gel surface, the effect is reversed or decreased. If paper is provided with a smooth surface by dissolving in Schweitzer's reagent and repptg., it acts like gel. Theoretically, this is explained as due to the form which liquid water pressed out from the interior of the gel assumes at the surface. If the surface is smooth the water remains in small drops with convex surface, therefore high vapor pressure, but if the surface is rough the water is evenly distributed over it, giving a flat surface of normal vapor pressure.

H. I. MATTILL.

The density and index of refraction of colloidal solutions. R. WINTGEN. Bonn. *Kolloidchem. Beihefte* 7, 251-82(1915).—On the assumption that in a dispersed system the density and the coeff. of refraction of the dispersed phase and of the dispersing agent are independent of the compn. it is shown mathematically that the density and coeff. of refraction of dispersed systems are linear functions of the concn. (g. dispersed phase in 100 cc. of the system) and that the specific vol. and product of the specific vol. and coeff. of refraction are linear functions of the percentage compn. (g. dispersed phase in 100 g. of the system). Measurements of colloidal solns. of As_2S_3 , Sb_2S_3 , silicic acid, molybdic acid, $\text{Fe}(\text{OH})_3$, and tannin confirm this conclusion. A linear interpolation formula obtained by the method of least squares gives variations between the calcd. and observed values which in no case exceed the limits of experimental error. Earlier measurements, made by other experimenters, on colloidal solns. confirm this conclusion if proper consideration is given to the question as to whether the compn. is given by weight or by volume. By the interpolation formula the calcd. density of water averages 0.99707, the product of specific volume and coeff. of refraction 1.33640. The corresponding experimental values are 0.99707 and 1.33642. The values for the dispersed phase obtained from the interpolation formula do not, however, agree

with those found for the materials in undispersed form. The sp throughout smaller in the dispersed than in the undispersed condition has been predicted on theoretical grounds by W. Gibbs, W. Ostwald, and Veimarn. Any dependence of density or refraction on degree of dispersion can be established. No comparison between the molecular refraction in colloidal and non-colloidal condition is possible, because of insufficient data on the non-colloidal materials and because anomalous effects occur in the colored solns.

Contraction produced by solution of salts. ALBERT BOLEY. *Pharm. Assoc.* 5, 38-9 (1916).—A review briefly summarizing the comments on volume changes produced by the soln. of salts. The data for six of the more common salts in various soln. strengths are presented in a table.

Diffusion of iodine in potassium iodide solutions. GRAHAM DIGGS. *J. Am. Chem. Soc.* 38, 253-9 (1916).—Solns. of 0.05 N KI, 0.25, 0.5, 1.0, 2, 3, and 4.5 N were covered with a layer of KI of the same concentration as that in the lower layer in each case, and the rate of diffusion of the iodine was determined using a 2-layer method. Fluidity detns. of the KI solns. were also made. "Increase in the concn. of KI causes, in general, an increase in the rate of diffusion of the I, and no satisfactory explanation of the influence of the KI concentration on the rate of diffusion of the iodine can be given. The results bear out the work of Van Name and others on the rate of diffusion of the iodine under the conditions of their expts."

Density and viscosity of aqueous solutions, with special reference to HNO₃. II. Viscosities. W. R. BOUSFIELD. *J. Chem. Soc.* 107, 1781-97 (1915).—A somewhat complicated gravity-flow viscosimeter is described. The vol. of liquid to be used is automatically measured out. In place of the usual observation when a meniscus crosses a mark, the liquid starts level in a very short capillary on the top of the bulb. The instrument has been used to det. the viscosity of 6 concns. of HNO₃ below N at 4, 11, and 18°C. Increasing the concn. of acid diminishes the viscosity through the change of its constitution with the solute, and to the fact that the mol. dimensions of HNO₃ and H₂O are different. The av. mol. radius of HNO₃ (including both dissociated and undissociated) is always slightly greater than that of H₂O, as shown by calcns. When the acid is completely depolymerized, the effect of increasing diln., and consequently hydration and dissociation, is to increase the av. radius of the molecules.

Vapor pressures of some saturated aqueous solutions. M. W. HUGHES. *J. Chem. Soc.* 107, 1798-1814 (1915).—The method of the Landsberger-Sakurai b. p. method. Steam was blown through the solution until a satd. soln. was obtained in equil. with the steam passing through the mixture of steam, crystals and satd. soln. was measured with and (later) with Pt resistance thermometers. A high degree of accuracy was attained with the method except in the case of very sol. salts, since it is difficult to establish equil. before all of the salt has disappeared. Data for satd. Na₂SO₄ and TiNO₃ have been taken for temps. near their b. ps., and for other salts, the results were in agreement with those obtained by Berkeby by a dynamic method. The low b. p. of TiNO₃ soln. is not due to the salt, but probably to its association.

Influence of glycerol, dextrose, alkali nitrates and sulfates, and ammonium salts on the solvent power of water. J. C. PHILIP AND A. BRAMLEY. *J. Chem. Soc.* 107, 1831-7(1915); cf. *C. A.* 9, 1572.—Expts. have been made on the distribution of EtOAc between C_6H_6 and aq. solns. of 11 compds. at 0.5, 1, 1.5 and 2 *N* concn. at 20°. The influence of the 2 nonelectrolytes was larger than expected. Na salts had the greatest effect and Li salts the least; sulfates were more efficient salting-out agents than chlorides and nitrates less so. The relative lowering of solvent power seems to depend somewhat on the substance used for measuring it. E. B. MILLARD.

Hydrates in solution. GERTRUD KORNFIELD. *Monatsh.* 36, 865-97(1915).—From f. p. detns. of C_5H_5N in aq. solns. an abnormally high mol. wt. was calcd. which increased with increasing concn. This pointed to the existence of several hydrates of pyridine which were investigated by further f. p. expts. with C_5H_5N and H_2O together in various solvents. The cryoscopic measurements in C_2H_5Br indicated the existence of a hydrate, $(C_5H_5N)_3 \cdot H_2O$. It was shown that in pure H_2O this hydrate could exist only at very small concns. of C_5H_5N , and between 7 and 17% C_5H_5N the hydrate contained 5 mols. of pyridine and 1 of H_2O . Another series of f. p. detns. with mineral salts in formamide showed the existence of hydrates of Na_2SO_4 and $CaCl_2$ even in the presence of an excess of 100 mols. of formamide. E. B. MILLARD.

Chlumsky's solution in the light of the phase rule. R. KREMMANN, F. WISCHO AND R. PAUL. *Monatsh.* 36, 911-21(1915).—The soln. is used in treating local surgical infections; it consists of a mixt. of camphor and C_6H_5OH always contg. less than 50% C_6H_5OH , and in which the latter has lost its corrosive action. It produces no irritation on sound tissues and may even be used in open wounds. No eutectic was found for the system camphor- C_6H_5OH , and at -20° the curves were falling so rapidly that none seemed probable for some distance. The system camphor- β -naphthol probably has a single eutectic at about -25°, and the system camphor-resorcinol shows the formation of a compd. between 50 and 75% camphor at about room temp. E. B. M.

Effect of dissolved substances on the velocity of crystallization of water. J. H. WALTON AND ALBERT BRANN. *J. Am. Chem. Soc.* 38, 317-30(1916); cf. *C. A.* 9, 168.—An L-shaped tube containing the soln. to be undercooled was placed in the low-temp. bath previously described and, after the tube had attained the temp. of the bath (3 or 4 min.), the soln. was inoculated and the time for the crystal growth to proceed one meter was detd. with a stop-watch. Detns. at -9.1° on the same soln. were reproducible to within a few tenths of a sec. Solns. of 0.1 *M* concn. of 18 inorg. substances and 12 org. substances were studied at -9.1°, together with solns. of 8 substances of high mol. wt. at 0.02 *M*. Expts. were also made with colloidal substances and at other temps. The dissolved substance decreases the velocity of crystn. in each of the 45 cases studied, but solns. of different substances at the same concn. show different effects. For substances with more than 8 atoms to the mol. there was a rough parallelism between this number and the inhibition of crystn., but for compds. with less than 8 atoms the retarding effect seemed to be a sp. property. Marc's theory of adsorption inhibition is untenable, since sugars, which are not much adsorbed, produce a marked effect on the velocity of crystn. Gelatin, colloidal $Fe(OH)_3$, and dyes decrease the velocity of crystn. The stability of the soln. toward spontaneous crystn. varies with the solute, 0.1 *M* HCl being exceptionally stable. Solns. of 0.00125 *M* brucine sulfate do not affect the velocity of crystn. E. B. MILLARD.

Anisotropic aqueous solution. HAKAN SANDQVIST. *Ber.* 48, 2054-5(1915).—Solns. of 10-bromophenanthrene-3- or -6-sulfonic acid in H_2O show a clouding at a temp. which is definite for any single concn. and is the same whether measured with rising or falling temp. The mol. wt. detd. from f. p. is about 1300. No supersatn.

is connected with the clouding of the soln., and no marked effect accompanied the phases. It was shown in an ultramicroscope that the soln. was a magnification of 300 the liquid showed the rounded drops and structural liquid, and there was a color play when the analyzer was rotated. The properties and the existence of a critical point establish the presence of in the soln. Measurements of the elec. cond. and viscosity are in progress.

E. J.

Velocity of ionic reactions. GERTRUD KORNFIELD. *Monatsh.* 36.—From measurements of the cond. of solns. by the method of Benec (1406), in which it was possible to det. the cond. of a mixt. 0.004 sec. was found that the reactions were complete as soon as measurements were made. The reactions studied were the neutralization of C_4H_5N with C_4H_5OH with H_2O . No data are given.

E. J.

Indirect determination of the velocity of hydrolysis by the polarimeter. J. C. CROCKER. *J. Chem. Soc.* 107, 1762-3 (1915).—The method is the velocity of hydrolysis of *N* formamide by *N* acid in the presence of sugar. The hydrolyst acted simultaneously on the formamide and the sugar, and the change of the rotation the extent to which the main reaction had proceeded. If the hydrolyst is gradually used up in the principal reaction is not affected by the secondary reaction, the change of this concn. is deduced from the speed of the secondary reaction. The rotation of sugar by the presence of formamide. In the expts. here given the velocity of the reactions were practically equal. Both of them increased somewhat with 13.8 to about 14.3. The principle is applicable to any reaction in which a reaction changes its concn. in the main reaction and is able to act as a catalyst in a secondary reaction proceeding in the same soln.

E. J.

General equations for the neutralization of dibasic acids, and their application to the acidity of dilute carbonate solutions. E. B. R. PRIDEAUX. *Proc. Roy. Soc. (A)* 91, 335-43 (1915).—Mathematical discussion, first of the general application to solns. of CO_2 and to dil. carbonate solns. No new data are given.

E. J.

Dynamics and kinetics. ROBERT KREMAN. *Fortschritte Chem.* 11 (1915).—Progress in this field during the second half of the year 1914 under the following heads: homogeneous equilibria, heterogeneous equilibria.

Thermochemistry. H. VON WARTENBURG. *Fortschritte Chem.* 11.—A review for the period April, 1914, to April, 1915. The subject is under the following heads: temp. measurement, sp. heat, heat of reaction, at high temps.

Electrical theory. GEORGE GIBLHOF AND HANS RUCK. *Fortschritte Chem.* 11, 43-51, 77-88 (1915).—A review of progress for the period Oct., 1913, to

The velocities of the photoelectrons emitted in the normal and the selective effects. A. L. HUGHES. Rice Inst., Houston. *Phil. Mag.* 3.—In spite of the 16-fold greater photoelectric effect in the "selective" effect, than in the normal, there is only a slight difference in the number of the two cases, this being due either to slightly smaller velocity of the photoelectrons or to their being emitted relatively more in a direction normal to the surface. This indicates that there is no fundamental difference between the two

G.

Reflection of slow moving electrons by copper. A. W. HULL. *Phys. Rev.* 7, 1-17(1916).—The electron reflection from a Cu surface roughened by prolonged heating at 350° *in vacuo* is, like that of electrolytic Ag, very small, being only 10% for electrons having a velocity of 0.4 v. This is due to the extreme ultramicroscopic roughness of these surfaces, which should make excellent "black bodies" for receiving electron currents. The scattering of a beam of slowly moving electrons is due to deflection by strong elec. field. Delta rays have been produced by Hg ions which have fallen through only 12.4 v. The energy of the fastest of these rays is approx. the same as that of the ions, suggesting that the energy exchanges between ion and electron are governed by quantum relations.

E. B. MILLARD.

Einstein's photoelectric equation and contact electromotive force. R. A. MILLIKAN. *Phys. Rev.* 7, 18-32(1916).—The following tests of Einstein's equation have been considered and, except the last, subjected to exptl. proof: the existence of a definite and exactly determinable max. energy of emission of corpuscles under the influence of a given wave length; the exact appearance of Planck's h in the slope of the potential-frequency line; and the agreement of the long wave limit with the intercept of the p. d., ν line, when the latter has been displaced by the amt. of the contact e. m. f. Contact e. m. f.'s are accurately given by $(h/e)(\nu_0 - \nu_0') - (V_0 - V_0')$ and are independent of temp.

E. B. MILLARD.

Electrostatic basis for the law of mass action in electrolytic solutions. R. A. LATTEY. *Chem. News* 111, 135-6(1915).—A math. derivation of the law of mass action from considerations of the forces exerted by a charged sphere of given radius when introduced into a soln. contg. positive and negative ions. The product of the positive and negative ion concns., $C^+ \cdot C^-$, was a const. depending on the concn. of the soln.

E. B. MILLARD.

Long direct current arcs. WALTER GROTRIAN. *Ann. Physik* 47, 141-96(1915); *Chem. Zentr.* 1915, II, 60.—The relations between current strength and voltage have been measured for very long arcs between various electrodes in air, N, O, CO₂, H and H₂O vapor. The atm. in which the arc is formed, but not the materials of the electrode, may exert an influence on the characteristics of the arc. Detns. in the air arc showed that the potential drop along the arc was the same in all parts of the light column and, entirely independent of the arc length, increased along a hyperbola with increasing current. The cathode drop was about 20 v., independent of the current, arc length and (nearly) of the material of the electrodes. The anode fall was independent of the length of arc, but changed from 130 to 30 v. with change of current from 0.1 to 3 amp. and was influenced by the compn. of the electrodes. By cross-measurements in the CO₂ arc it was shown that the c. d. increased linearly with the field strength. A theory of the processes in the arc based on impact ionization by electrons is given.

E. B. MILLARD.

Anodic relations of passive iron, with notes on polarization potentials as influenced by gas pressures. H. G. BYERS AND S. C. LANGDON. *J. Am. Chem. Soc.* 38, 362-74 (1916); cf. *C. A.* 8, 3738.—Extension of the previous work to electromotive behavior of polarized passive electrodes. A calomel cell has been made which contains no air space and is suitable for pressure work. On application of gaseous pressures, anodes of passive Fe, or any other metal anode from which O was being evolved, became more electropositive and cathodes more electronegative. The change was a function of the mechanical pressure and not of the degree of satn. of the electrolyte with dissolved gas. From the variations of polarizing current and anodic potential during the process of passivation curves were constructed which indicate that passivation is here a 2-process operation. There is no general explanation of passivity, each case requiring an explanation according to conditions.

E. B. MILLARD.

Potentials at the junction of salt solutions. D. A. MACINNES. *Proc. Nat. Acad. Sci.* 1, 526-30(1915); see C. A. 9, 2834. E. B. MILLARD.

Double salts in standard cells. G. F. LIPSCOMB AND G. A. HULETT. *J. Phys. Chem.* 20, 75-82(1916).—Solns. of a K salt of varying concn. were rotated with excess of the corresponding Zn or Cd salt in tubes for several days after equil. seemed to be established. The diagram of the 3-component system K_2SO_4 , $ZnSO_4$, H_2O had 3 branches corresponding to K_2SO_4 , $ZnSO_4 \cdot K_2SO_4 \cdot 6H_2O$, and $ZnSO_4 \cdot 7H_2O$; the 3-component system $ZnCl_2$, KCl , H_2O also showed the existence of a double salt. Detns. of e. m. f.'s of cells contg. double salts were made as follows: $Zn \text{ amalgam} | (K_2SO_4 \cdot ZnSO_4 \cdot 6H_2O), Hg_2SO_4 | Hg, v \text{ (at } 25^\circ) = 1.46965$; $Zn \text{ amalgam} | \left\{ \begin{matrix} K_2SO_4 \cdot ZnSO_4 \cdot 6H_2O \\ K_2SO_4 \end{matrix} \right\}, Hg_2SO_4 | Hg, v \text{ at } 25^\circ = 1.48680$. Satd. solns. of the double salt alone or K_2SO_4 seemed to hydrolyze the depolarizer, but the difficulty of hydrolysis is overcome in the combination $Zn \text{ amalgam} | \left\{ \begin{matrix} K_2SO_4 \cdot ZnSO_4 \cdot 6H_2O \\ ZnSO_4 \cdot 7H_2O \end{matrix} \right\}, Hg_2SO_4 | Hg$, and the e. m. f. at 25° was 1.41976 with a negative temp. coeff. of 0.00133. Reproducible cells were obtained with the combination $Cd \text{ amalgam} | (2KCl \cdot CdCl_2 \cdot 6H_2O), Hg_2Cl_2 | Hg$, with an e. m. f. at 25° of 0.70505 and a temp. coeff. at 18° of +0.00015. A cell was made with the double salt $2KCl \cdot ZnCl_2 \cdot 6H_2O$, but the salt was unstable when brought into soln.

E. B. MILLARD.

Electromotive forces. W. D. BANCROFT. *J. Phys. Chem.* 20, 64-74(1916); *Trans. Am. Electrochem. Soc.* 28, 357-70(1916).—The treatment of Nernst is adapted to historical development, but is not a logical one for teaching purposes. It is suggested to develop all e. m. f. equations from the van't Hoff formula $E = (RT/nF) \log K \Sigma p_i / \Sigma P_i$, where Σp_i refers to the substances which are consumed during the reaction and ΣP_i to the substances which are formed. Five types of cells are recognized, all of which are to be treated in the same general manner. E. B. MILLARD.

Studies in conductivity. III. Further studies of the behavior of the alkali metal formates in (anhydrous) formic acid. H. I. SCHLESINGER AND CLYDE COLEMAN. *J. Am. Chem. Soc.* 38, 271-80(1916); cf. C. A. 8, 3259.—Formates are highly ionized in soln. in $HCOOH$ and obey the mass law if the degree of dissociation is calcd. from the cond. ratio without taking into account the viscosity effect; however, they do not obey this law if the degree of dissociation is calcd. with a viscosity correction. In most details the exptl. method was the same as that formerly used, but a viscosimeter such as that of Washburn and Williams (C. A. 7, 2873) was used. Conds. have been measured for several concns. at 18 and 25° of the formates of Li, Na, K, Rb and Cs, together with viscosities and ds. for these solns., and the values of the equil. consts. have been calcd. from the data obtained. The equil. const. increases with increase in at. wt. of the cation, as does the cond. at infinite diln., though in this latter there is a marked exception in the case of Cs. The former work has been repeated, and found to be correct. Again no constancy of the equil. expression was found if the degree of dissociation was calcd. with the use of a viscosity correction, and this is thought to prove that the true degree of dissociation may be calcd. from the cond. ratio, since it is so improbable that the agreement could be due to a cancellation of errors for so many substances and at 2 different temps. E. B. MILLARD.

Photochemistry. M. BLASCHKE. *Fortschritte Chem.* 11, 147-69(1915).—Progress in this field is reviewed for the second half of the year 1914. Theoretical investigations, optics of photochemistry, fluorescence, phosphorescence, luminescence, photoelec. phenomena, photochem. reactions and phototropy are covered. L. H. A.

The production of light by the recombination of ions. C. D. CHILD. *Colgate Univ. Phil. Mag.* 31, 139-43(1916).—A restatement of a former suggestion (C. A. 8,

2522) that the light from the luminous vapors in the arc is due to recombining ions, and a criticism of the theory of Strutt (*C. A.* 9, 550) that the luminosity persists in the positive ions.

G. L. WENDT.

Phosphorescence. K. SCHERINGA. Alkmaar. *Chem. Weekblad* 12, 1106-9(1915).—A short discussion of phosphorescence and allied phenomena, in which thermoluminescence and fluorescence are ascribed primarily to the effect of impurities. *E. g.*, incident light sets up vibratory disturbances in a substance; the natural period of the impurities differs from that of the mass of the substance, and the resulting collisions are the cause of the luminescence. Phosphorescence is ascribed to a substance having taken up, under, *e. g.*, the influence of high temp., a structure peculiarly favorable to certain atomic or molecular vibrations which emit light; on cooling the structure persists, and the substance prolongs incident vibrations by a resonance-like process.

GEORGE W. MOREY.

Absorption spectra of organic and inorganic compounds. H. LÉY. *Fortschritte Chem.* 11, 11-28(1915).—A review for the year 1913.

L. H. A.

Emission of spectral lines. M. PLANCK. *Sitzb. kgl. preuss. Akad. Wissenschaften* 1915, 909-13.—Mathematical.

E. B. MILLARD.

Absorption spectra of the blue solutions of sodium and magnesium in liquid ammonia. G. E. GIBSON AND W. L. ARGO. *Phys. Rev.* 7, 33-48(1916).—The absorption spectrum was measured with a spectrophotometer of the Grünbaum-Martens type (*Ann. Physik* 12, 984(1903)) in a quartz cell capable of holding NH_3 at room temp. A soln. of Mg and a soln. of Na of the same intensity of color at -33.5° were found to have the same absorption spectrum. This is strong evidence that the coloring principle is the same in both cases. Approx. measurements of the concn. of Na solns. make it probable that Beers' law holds for the total dissolved Na. The evidence is in favor of the assumption that the absorption is due to unsolvated electrons, but the measurements cannot be interpreted quant. in terms of Drude's theory of metallic dispersion.

E. B. MILLARD.

Construction of sensitive photoelectric cells. JAKOB KUNZ AND JOEL STEBBINS. *Phys. Rev.* 7, 62-5(1916).—A thin mirror of alkali metal was distd. into the cell while the Ag mirror was cooled with ice, and an atm. of H was then introduced. Efforts to use C_2H_2 , NH_3 or C_2H_4 were not successful. The best results were obtained with Rb and an atm. of Ne. These cells show a very small dark current; if it exists at all it can be compensated by the application of a small potential between the electrodes. Na cells were difficult to make. Cs was liquid at 28° and could not be used directly. A solid Cs amalgam was of weak sensitiveness. The cells are applied to stellar photometry.

E. B. MILLARD.

The arc and spark spectrum of silver referred to the international normals. JOSEPH FRINGS. *Z. wiss. Phot.* 15, 165-82(1915).—The arc and spark spectra of Ag were measured in reference to Fe normals from $\lambda 5670$ to 2220 . The results are tabulated with intensities and measurements by other investigators. The lines of the impurities are listed and many of the Ag lines are correlated in series.

PAUL D. FOOTE.

Theory of the Zeeman effect in relation to lines of force at an angle. W. VOIGT. *Ann. Physik* 47, 245-69(1915); *Chem. Zentr.* 1915, II, 64; cf. *C. A.* 9, 13, 1002.—V. has developed the theory of the Zeeman effect on the assumption that the magnetic sepn. of the characteristic absorption lines of the substance under consideration is completely general. A complete numerical calcn. has been carried through for the case in which an absorption line has been decomposed into a triplet by the magnetic field.

The conception of the Reimann surface has been used in the calcn., v to brief review.

Influence of catalyzer poisons on the photoelectric sensibili
KRÜGER AND E. TAEGER. *Z. Elektrochem.* 21, 562-9(1916).—A Do was used to measure the photoelec. sensibility to light from a qua plates, a special app. being used. The photoelec. sensibility (P. E. S) typical catalyzer poisons such as CO, HCN and H₂S, especially the la with H₂S the P. E. S. was not wholly restored after repeated admissio tion again. Perhaps a film of a Pt sulfide was formed, as has bee cases of poison. It was uncertain whether a film formed from the o In this case the P. E. S. was rapidly restored and there was a kind usual in such cases, and which is in agreement with the smallness o vacua. A part of the effect may be due to penetration of the g film; this makes it difficult to get reproducible results. Bomba with N was without effect, showing the electrochem. indifferenc Bombardment with CO₂ caused a small increase in the P. E. S.; NH₃ It appears that the easy emission of electrons (which corresponds is closely connected with some catalytic process which cannot be further knowledge of the catalytic process itself.

Thermomagnetic properties of various compounds and the W
netons. KÔTARÔ HONDA AND TÔRAJIRO ISHIWARA. *Sci. Reports* 4, 215-60(1915); cf. *C. A.* 8, 618, 1385, 2648, 3751.—The same exp magnetic susceptibilities has been used as in the previous papers. compds., mostly of Fe, Ni and Co, for several temps. are reported, an in tables and plates. The susceptibility of paramagnetic compds. ha value, which is different from that which can be obtained from of the constituents by the additive law. Curie's law for param is only applicable to a very limited number of substances. For paramagnetic substances the hyperbolic law of Onnes and Perrier b approximately, for the whole interval of temp. in which the substa gle phase. Any abrupt change of susceptibility at a certain ter change in a certain range of temps., is in many cases a consequen chem. change. For the diamagnetic substances here investigated is const. for all temps. so long as the substance exists in the same state is accompanied by change of susceptibility. Water of crystn. ceptibility in different amts. for different compds. Even in the : mols. of H₂O of crystn. which escape from the crystals at different ent effects on the susceptibility. The thermomagnetic investigat affords a good means of detecting changes of structure at high t

Registration of rapidly changing pressures. W. NERNST. *Abh. Wissenschaften* 1915, 896-901.—A membrane manometer s by Pier (*C. A.* 3, 2898) and used by Bjerrum (*C. A.* 6, 3048) in th O₂ shows rapid vibrations which sometimes interfere with the mea them impossible. This paper is a theoretical math. discussion of vibrations.

Molecular weight determination of some vegetable oils (Bac viscosity (HOLGATE) 21. Unstable states in arc and glow (CAY).

3. RADIOACTIVITY.

WILLIAM H. ROSS.

Recent progress in the physics of the Röntgen ray. A. SOMMERFELD. München. *Naturwissenschaften* 4, 1-8, 13-8(1916).—This review is classified under several headings such as "Polarization of the X-ray," "Crystals used as diffraction gratings," etc.

C. G. F.

Transformation of chemical elements. II. W. P. JORISSEN AND J. A. VOLLGRAFF. Leiden. *Z. physik. Chem.* 90, 557-60(1915); cf. *C. A.* 9, 886.—It is pointed out that, if Tl in Bi is produced by spontaneous transformation, not only must Tl always be present in Bi, but also in Bi and Bi minerals there must be a const. ratio between the quantities of the 2 elements.

H. JERMAIN CREIGHTON.

Density of lead from radioactive minerals. T. W. RICHARDS AND CHARLES WADSWORTH. *J. Am. Chem. Soc.* 38, 221-7(1916).—Pb from Australian radioactive minerals was recrystd. as nitrate from hot H₂O with the addition of HNO₃, or pptd. and recrystd. as PbCl₂. The d. of ordinary Pb (at. wt. 207.2) was detd. in a modified Ostwald-Sprengle pycnometer adapted for use with solids, and was found to be (reduced to vacuum standard) 11.337 at 19.94°. At the same temp. the d. of radioactive Pb (at. wt. 206.3) was found to be 11.288. Continued fractionation of the material produced no change in this low d., and it could not have been due to any irregularity in prepg. the metal, since the samples of both kinds of Pb were made in the same way. The difference in d. almost exactly parallels the difference in at. wt., so that the at. vol. for radioactive Pb is almost exactly equal to that of ordinary Pb, the figures being in each case very nearly 18.28.

E. B. MILLARD.

Interaction of hydrogen and chlorine under the influence of alpha particles. HUGH S. TAYLOR. *J. Am. Chem. Soc.* 38, 280-5(1916); cf. *C. A.* 9, 412.—The 4 series of expts. previously reported are recalcd. to remove an error in the original, and a 5th series is added. No change was made in the exptl. method. Details are given of the correction for the incomplete absorption of the α -particles by the gas. Emanation from 10 mg. RaBr₂, under certain assumptions, would cause the radiation of 4×10^{18} ions per sec. into the reaction mixt., and in the most favorable case 7×10^{16} mols. of Cl per sec. were converted into HCl. That is, 4000 mols. of gas react for each pair of ions entering the gas, which as regards light sensitivity was considerably inferior to that employed by Bodenstein and Dux (*C. A.* 8, 452). The original theory of Bodenstein explaining the reaction under the influence of light is applicable to the reaction under α -particles.

E. B. MILLARD.

The effect of magnetization on the opacity of iron to Röntgen rays. A. H. FORMAN. *Phys. Rev.* [2] 7, 119-24(1916).—An increase of 5 per 1000 in the opacity to X-rays of a thin sheet of Fe, magnetized in the direction of the rays by a field of 3500 gauss, was detected by a differential method. More complete orientation of the mols., in a stronger field, should give a larger effect. Since no such effect was detected when the magnetization was perpendicular to the path of the X-rays (*C. A.* 8, 2108), the plane of max. absorption of the rays is the plane of the electronic orbits which make up the elementary magnets, and it shows its max. effect when it is parallel to the direction of the cathode ray stream, *i. e.*, perpendicular to the direction of the X-rays. It is suggested that the failure of X-rays to ionize all the mols. of a gas through which they pass is due to the mol. having only one plane in which it can absorb sufficient energy for ionization.

G. L. WENDT.

The radioactive deposits from the atmosphere on an uncharged wire. S. J. M. ALLEN. Univ. Cincinnati. *Phys. Rev.* [2] 7, 133-8(1916).—Radioactive deposits of the Ra series, with periods varying from 8 to 50 minutes, were collected on a long

uncharged wire exposed to a smoky atm. No Th was detected. The smoke nuclei act as carriers, for it was found that the activity was roughly proportional to the amt. of soot deposited; that a "smoke fog" or a rainstorm was followed by a great decrease in collected activity; that winds from the smoky quarter increased the activity; and that the annual max. in November corresponds with the max. of smoke in the air.

G. L. WENDT.

Radioactive fluctuations accompanying the use of unsaturated currents. A. ERNST. Tübingen. *Ann. Physik* 48, 877-906(1915).—Schweidler's percentage fluctuations in the ionization current due to a radioactive substance should equal the inverse sq. root of the number of atoms disintegrating per sec., and should be independent of the voltage used. Kohlrausch found a decrease in the percentage fluctuation with decreasing degree of satn. of the current. This E. now confirms over a wider range and shows that the fluctuation is const. as long as the ionization current obeys Ohm's law. Campbell's theory (*C. A.* 5, 3004) explains the decrease in the fluctuations by a decrease in the capacity of the electrometer system accompanying an increase in the resistance of the ionization chamber. The explanation is accepted, and the true fluctuations are held to be independent of the voltage.

G. L. WENDT.

Occupational injuries due to radium (ORDWAY) 11H. Structure models according to W. H. and W. L. Bragg (M'CGG) 1.

Tungsten anticathodes for Röntgen tubes. O. A. SIMPSON. U. S., 1,167,532. Jan. 11. W powder is pressed and fused into an integral plate. A hole is made in the plate through which a W rod is inserted with its end projecting beyond the surface of the plate. The rod and plate are fused together and chilled while the surface of the plate is curved under the surface tension of the metal.

4. ELECTROCHEMISTRY.

COLIN G. FINK.

Inorganic electrochemistry. K. ARNDT. *Fortschritte Chem.* 11, 1-10, 1915 —A review of progress in this field during 1914. (*C. A.* 10, 4271). L. H. A

The thermal insulation of high-temperature equipment. P. A. BOWEN. *Trans. Am. Electrochem. Soc.* 28, 24-60 1916.—While an air space is an effective insulator at low temps., as in refrigeration, it is not so at high temps., for there the loss by radiation is large, being proportional to the 4th power of the absolute temp. It is much better to use a solid wall, which may be backed with some insulating material, or may contain a layer of insulating material. See *C. A.* 9, 25-7. SHERMAN EASTMAN.

Operating characteristics of lead storage batteries. J. H. TRACY. *Eng. J.* 13, 17-20, 1916.—High rates of discharge are in no way detrimental to modern lead battery plates. Data are given, showing variation in available capacity of a battery when discharged continuously at a constant rate. If a battery be discharged intermittently during periods of rest, the acid in the pores of the plates is being removed by diffusion, and an operative advantage may be taken of this. A general rule for determining the max. permissible rate of charging a battery is: The charging rate in amp. must never exceed the amp.-hrs. out of the battery. Curves are given which show that the max. charging rates are not functions of the size of the battery or its relative rate of discharge. A battery is fully charged only when all the sulfate has been driven out of the plates into the electrolyte; this is most easily indicated by the ϵ of the electrolyte; data and curves of charging rates are given. E. W. BUCHHEIM

Charging Edison storage batteries. E. J. ROSS, JR. *Elec. J.* 13, 25-7(1916).—The "constant current" and "tapering current" methods of charging are described and the chem. reactions which occur during discharge and recharge are given. Either method of charging is satisfactory if properly used. In the "tapering current" method the condition of charge can be accurately detd. by the ammeter reading.

E. W. BOUGHTON.

Cells with aluminium electrodes (aluminium rectifiers). ELENA FREDA. Rome. *Nuovo cimento* 10, 169-222(1915).—Metals other than Al, in certain electrolytes, behave analogously. Examples are Mg, V, Nb, Ta, Zn, Cd, Bi, Sb. If a current of electricity passes through certain electrolytes having Al as anode, the intensity of the current at first decreases rapidly, then more slowly till it becomes practically a const. This same const. is also soon reached if the intensity of the current is increased to begin with or if the circuit is opened and then closed again. If the Al electrode so formed is made cathode, an intense current will instantly pass through the cell. The formation of the Al electrode may also take place, more slowly, with an a. c. If the semisoidal e. m. f. is of period T , there is a continual component of the current obtained, towards the Al, according to the formula $i_s = (1/T) \times \int_0^T idt$. If the circuit is closed, and an e. m. f. continues of value V , less than the tension of formation but of the same sign, the p. d. between Al and electrolyte takes a value practically equal to V . If now, the Al and the other electrode are short-circuited, a quantity of electricity Q passes through the short circuit, proportional to V . The ratio $c = Q/V$ depends on the tension of formation. The cell accordingly behaves like an imperfect condenser. The most complete explanation of the behavior of the cell agrees with Schulze's theory, according to which a layer of non-porous oxide forms on the Al, then at different spots layers of O and of porous oxide. F. has detd. that inverse currents do not uniformly reduce the layer of O that covers the formed electrode of Al, but only at some points, and this with small quantities of electricity. F. detd. the conditions which were necessary to give the best valve effects (rectification). Polarization has no noteworthy influence upon the characteristic behavior of the oscillatory discharge which discharge has the same characteristics even when the electrodes of the cell are very small. When Al functions initially as a + electrode, there are no appreciable phenomena of reduction during the oscillatory discharge, from which F., studying the discharge of the cell through a large resistance, deduces the existence of a limiting inverse e. m. f. This is true even when there is substituted for the Al other metals that have an analogous behavior with respect to a d. c., but which, towards an a. c., do not allow of any inferences as to the existence of a limiting inverse e. m. f., since the — half wave of such currents produces reduction phenomena with these electrodes. These ideas were confirmed on substituting Zn for Al. A study was made of the properties of formed Al electrodes in Hg. F. concluded (1) that the electrolytic cond., met with by Corbino and Maresca (*Nuovo cimento* 1906, 29), through the layer of oxide that covers a formed Al electrode, is probably a common property of thin solid layers that are deposited during the formation of metal electrodes having a similar behavior to that of Al in their proper electrolytes; (2) a formed electrode, immersed in Hg, can be made to serve as a coherer. Cf. Schulze, *C. A.* 8, 2652.

S. LÆVY.

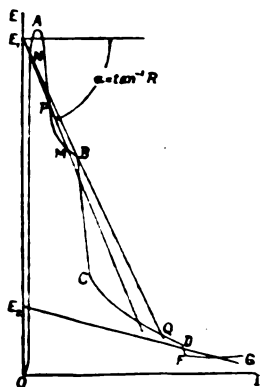
Nickel plating aluminium. J. CANAC. *J. Ind. Eng. Chem.* 8, 190(1916); cf. *C. A.* 8, 2529; 9, 1169, 1583.—A method for obtaining a firmly adhering coat is briefly described. The Al is first cleaned in boiling KOH soln., next in milk of lime and then in KCN bath for a short time. Finally the Al is dipped into a bath of FeCl_2 soln. (*C. A.* 9, 292). After each operation the object is washed in clean H_2O . The plating bath consists of 50 g. NiCl_2 + 20 g. H_2BO_3 in 1 l. H_2O . C. d. = 1 amp. per sq. dm.; v. = 2.5.

C. G. F.

Electrolysis and its mitigation. E. B. ROSA AND B. MCCOLLOM. Bur. Standards, *Tech. Paper* 52, 143 pp. (1915).—General considerations regarding electrolysis, methods of mitigation applicable to pipes and to railway negative return, and regulations regarding electrolysis mitigation are included. It is stated that the application of paints, wrappings, etc., to positive areas is of no value and may do harm, but on negative areas such application may be used to afford protection of an auxiliary character against corrosion. Protection by chem. means or by cement coatings is only of a temporary nature. Cathodic protection is complicated and expensive and is practically worthless. Placing pipes as far as possible from railway tracks affords a certain measure of protection. Pipe drainage is sometimes useful (for instance in isolated pipe systems without insulating joints), but should be used with proper restriction and with due precaution. The problem is more serious in the U. S. than in those European countries which have applied government regulation. Electrolytic damage to concrete structures is to be feared only where voltage conditions are exceptionally severe, or, in the case of comparatively low voltage, when salt has been added to the concrete. The principal reliance for the mitigation of electrolysis should be on proper construction and maintenance of the railway return circuit. Insulating joints in pipes are useful when new pipes are being laid. When pipe drainage is used the drainage should be through the medium of insulated feeder systems, so adjusted as to take the minimum possible current from the pipes at all points. For railways the following are essential: adequate maintenance of track bonding, the use of a proper number and location of power houses and sub-stations, and, in some cases, the use of insulated negative feeders for return of current. The three-wire system has proved effective in relieving electrolysis. Experience indicates that limitation of voltage drop is necessary for a satisfactory solution of the problem. For defining such limitation an all-day average is recommended and the use of the zone system or similar plan. Under most conditions over-all voltage in railway tracks should be limited to about 2-4 volts, and the potential gradients to 0.3-0.4 volt per 1000 ft. (all-day averages). For detn. of voltage drops potential wires should be installed. Regulations should apply not only to railways but should define the responsibilities of owners of underground utilities.

E. W. BOUGHTON.

Unstable states in arc and glow. W. G. CADY. Wesleyan Univ. *Trans. Am. Electrochem. Soc.* 29 (advance copy); *Mct. Chem. Eng.* 13, 866-9 (1915).—This is a very clear exposition of the various forms of discharge through gases. C. carried out a large number of expts.; the results are best summarized in the accompanying fig. The curve OACG shows qualitatively the relation between current and voltage in the discharge



between 2 fixed electrodes. The nature and pressure of the surrounding gas are supposed to be constant, except as modified by conditions at the electrodes themselves. In the fig. *OA* is the saturation current; this current is carried by the few free ions that are always present. *AB* is the glow discharge proper in which the rate of ionization is so great that the voltage across the gap begins to drop. As *B* is approached the cathode rapidly becomes incandescent and the emission of electrons commences. The discharge quickly resolves itself into an arc and the current is carried chiefly by the vapor from the cathode. The portion *BC* of the curve cannot be observed. Over *CD* the discharge is an arc as far as the cathode is concerned, but since less energy is expended at the anode, at the latter a glow discharge may still be had. The positive base of the discharge is

still diffuse and faintly luminous. This is the first stage of the arc. With increasing current the anode is brought to the b. p. This causes a decrease in the anode drop and a further increase in the cond. of the gas, so that the portion *DF* is quickly passed over. *FG* is then a full arc or second stage arc. Cady obtained a glow discharge between C electrodes at 460 v. in N gas at reduced pressure. With pure Ag electrodes and currents as high as 1.3 amp. the discharge is still a glow though the molten metal is white hot and vaporizes rapidly. This is important evidence that incandescence and vaporization of the cathode are not enough of themselves to cause the formation of an arc. The admission of a little O caused an arc to form at once (between the Ag electrodes). In the Fe arc in free air the discharge normally takes place between globules of molten oxide. The bright spot at the positive end of the arc is in rapid rotation, describing a minute circle (cf. *C. A.* 8, 455). The concluding paragraphs of the paper are devoted to the singing arc. C. G. F.

Flushing storage batteries. ANON. *Elec. Rev. West. Elec.* 68, 245 (1916).—A method of flushing is shown diagrammatically. C. G. F.

The production and properties of electrolytic copper (WILBOURN) 9. The application of electricity to the heating of metals (BISHOP) 9.

Ductile alloys of high melting point. H. KAISER. U. S., 1,167,827, Jan. 11. The addition of about 0.05% of Pt or other metal of the Pt group to an alloy of W with 1% Th increases the toughness and ductility of the alloy. The product is suited for making filaments for incandescent lamps. Various alloys of Cr, V, Cb, Ta, Os, Ru, Zr, Th and W may be improved by the addition of very small amts. of Pt or a similar metal.

Storage battery. T. A. EDISON. U. S., 1,167,485, Jan. 11. A positive electrode for alk. storage batteries is formed of a perforated tubular receptacle packed with Ce oxide and flake Ni in alternate layers. Fe or Fe oxides are used in the negative electrodes.

Nickel hydroxide. T. A. EDISON. U. S., 1,167,484, Jan. 11. Ni(OH)_2 for use in alk. storage batteries is produced by pptn. from a soln. of NiSO_4 or other sol. Ni salt, by the addition of a considerable excess of alk. hydroxide. The pulpy ppt. is evapd. to dryness together with the excess of alkali and then washed and dried to purify it. The use of excess alkali in this manner serves to increase the porosity of the ppt.

Primary electric battery. W. E. HOLLAND. U. S., 1,167,499, Jan. 11. Structural features of Zn electrodes.

Electrolytic cell. L. E. PORTER. U. S., 1,167,594, Jan. 11. The pat. covers structural features of a cell especially adapted for extg. metals directly from ores. Cf. *C. A.* 9, 1434.

Graphite plate cathode for electrolytic cells. F. McDONALD. U. S., 1,167,705, Jan. 11. Structural features of diaphragm cells for electrolysis of NaCl, etc.

Amalgamating ores. L. ST. D. ROYLANCE. U. S., 1,168,678, Jan. 18. Ores of Au and other metals are simultaneously subjected to electrolysis in a NaCl soln. and scoured and then amalgamated.

Determining amount of suspended matter in gases. W. A. SCHMIDT. U. S., 1,168,227, Jan. 1. A current of flue gas or other gases carrying suspended solids is passed between electrodes between which a silent discharge of high potential is maintained and the amt. of discharge is measured to indicate indirectly the amt. of solids carried by the gas.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

Experimental inorganic chemistry. F. SOMMER. *Fortschritte Chem.* 11, 51-63 (1915); cf. *C. A.* 9, 1284.—A review of progress for the second half of the year 1913.

L. H. A.

Hydrolysis of alkali salts; and reaction to litmus. F. FICHTER. *Naturforsch. Ges. Basel* June 16, 1915; *J. Soc. Chem. Ind.* 34, 1008.—The view that alkalinity of solns. of alk. salts of weak acids increases with increasing diln. is not correct, for although the degree of hydrolysis increases with the diln., the rate of increase is lower, so that the abs. concn. of OH ions decreases with increasing diln., until finally alkalinity can no longer be detected with sensitive litmus paper. With Na_2CO_3 soln. alkalinity can be detected down to $N/512$, with KCN down to $N/256$, with NaNO_3 to $N/8$, with $\text{C}_6\text{H}_5\text{COONa}$ to $N/4$, and with $\text{KNaC}_4\text{H}_4\text{O}_6$ not distinctly even at $N/2$. Statements as to the reaction to litmus paper of salts of weak acids should always be accompanied by precise data as to the concn. of the soln.

L. W. RIGGS.

Polyiodides. III. System cuprous iodide-iodine. R. KREMANN AND V. BORJANOVICS. *Monatsh.* 36, 923-7 (1915); cf. *C. A.* 7, 737, 945.—The existence of polyiodides in soln. is not to be expected, since CuI_2 decomposes spontaneously into CuI and I . Mixts. of CuI and I of various compns. were heated together at 200 to 240° for several hrs., and the cooling curves followed. The breaks in the cooling curves, when plotted against % CuI , gave a smooth straight line, whose projection ended at the m. p. of CuI , and showed no indication of the existence of any compd. contg. more I than CuI . Further expts. were carried out in which the vapor pressures of mixts. of CuI with various amts. of I were detd., but the vapor pressure was in every case identical with that of pure I , and again showed no indication of the existence of a compd. contg. more I than CuI .

E. B. MILLARD.

The reactions between solutions of sodium silicate and aluminium sulfate or chloride. W. GORRWALD. *Dissertation Erlangen* 1913, 43 pp.; *Neues Jahrb. Min. Geol.* 1915, II, Ref. 51-3.—When Na silicate solns. react with $\text{Al}_2(\text{SO}_4)_3$ or AlCl_3 , a gelatinous, finely flocculated ppt. forms. In the presence of Cl ions this ppt. settles more rapidly than in that of SO_4 ions, and can also be more easily filtered. Beside Al silicate, the ppt. contains alkali compds. Silicic acid and Al compds. were also found in the filtrate, in addition to the alkali sulfate or chloride. At first the reaction of the ppts. is weakly acid, but soon becomes neutral. A rise in temp. of the solns. is observable during the reaction. The reaction is rapid at first, but the velocity soon decreases. Even after standing several months a complete quant. change does not occur, but the reaction seems to have reached a state of equil. The filtrates hold only very little Al . In general, the influence of the specific anion upon the mechanism of the reaction is small. A comparison of the analyses of the gels obtained with $\text{Al}_2(\text{SO}_4)_3$ with those obtained by using the chloride showed the ratios: SO_4 gels, alkali: $\text{SiO}_2 = 1:2$; Cl gels, alkali: $\text{SiO}_2 = 1:1$.

E. A. TSCHUDY.

Series of hydroxypentamminoplatinic salts. L. CHUGAEV AND V. KHELOPINE. *Compt. rend.* 161, 699-700 (1915).—By passing a current of ozone through a soln. of 1 g. Peyrone's chloride and 2 g. $(\text{NH}_4)_2\text{CO}_3$ containing excess NH_4OH , a ppt. of hydroxypentamminoplatinic carbonate, $[\text{Pt}(\text{NH}_3)_5(\text{OH})_2(\text{CO}_3)_2]$, was obtained, insol. in H_2O . By dissolving this compd. in AcOH the acetate was obtained, from which the chloride, rhombic tablets with 1 H_2O , and the nitrate, needles, were obtained. Many similarities exist between the soly., etc., of the derivs. of the above base and those of derivs. of $[\text{Pt}(\text{NH}_3)_5\text{Cl}]^{+++}$ and $[\text{Pt}(\text{NH}_3)_6]^{++++}$, on the one hand, and those of Ba^{++} on the other hand.

GEORGE W. MOREY.

The reactions between cobalt oxide and other metallic oxides at high temperatures. J. A. HERDVAL. Upsala. *Z. anorg. allgem. Chem.* 93, 313-9(1915); cf. *C. A.* 9, 2844, 3039.—The constitution of Rinman's green is discussed, and it is concluded that the evidence in favor of the components of the solid soln. being $\text{CoO} \cdot \text{ZnO}$ and ZnO outweigh those in favor of their being CoO and ZnO (cf. *C. A.* 8, 1715). Expts. with CoO and the following oxides were made at 1100° and at 1300° , to see if compds. were formed. With Cu_2O , Ag_2O , CuO , BeO , CaO , SrO , BaO , CdO , PbO , Bi_2O_3 , La_2O_3 , ZrO_2 , ThO_2 , CeO_2 , no compds. are formed. Cr_2O_3 gives octahedra of the spinel $\text{CoO} \cdot \text{Cr}_2\text{O}_3$. Fe_2O_3 and Mn_2O_3 both give cryst. products, but the melts were too opaque for microscopical examn. Ignition of CoO with SiO_2 gave crystals imbedded in a glass; ignition with TiO_2 gave $\text{CoO} \cdot \text{TiO}_2$, but no orthotitanate could be obtained. Compds. were also obtained with V_2O_5 , Cb_2O_5 and Ta_2O_5 . GEORGE W. MOREY.

The explosibility of uranium nitrate. ARNO MÜLLER. Magdeburg. *Chem. Ztg.* 40, 38-9(1916).—M. investigated the nitrate prep'd. by extg. 2 aq. solns. with Et_2O , 1 soln. containing little HNO_3 , the other much; the amt. influenced the compn. of the nitrate, but not the phenomena. The Et_2O soln. was evap'd. under vacuum, the residue cooled and poured on ice and the crystals dried by pressing. Analyses are given. Occasional triboluminescence was observed when the crystals were moistened with H_2O , but in only 3 cases out of 20 were there signs of decrepitation. Small amts. of gas were evolved, probably consisting of Et_2O and oxides of N. These phenomena appeared only with crystals from Et_2O soln. extd. from aq. soln. containing free HNO_3 , disappearing on recrystg. from H_2O . M. considers the phenomena due to the formation of an unstable compd. of a lower oxide of N with an $\text{U-Et}_2\text{O}$ addition compd. which is decomposed under certain chem. and physical conditions, among which is internal friction, but in which radioactivity has no part. Cf. *C. A.* 5, 1885; 6, 2368, 2577; 7, 702, 1449; 8, 1715. J. H. MOORE.

Oxidation of hydrazine. VII. Alleged role of nitrous acid in the formation of hydronitric acid. A. W. BROWNE AND O. R. OVERMAN. *J. Am. Chem. Soc.* 38, 285-302(1916); cf. Hale and Kunez, *C. A.* 6, 45.—No indication of the formation of appreciable quantities of HNO_2 or HNO could be obtained by treatment of $(\text{NH}_4)_2\text{SO}_4$ in H_2SO_4 soln. with oxidizing agents such as H_2O_2 , KClO_3 , $\text{K}_2\text{S}_2\text{O}_8$, KMnO_4 , hydrated Fe_2O_3 , KIO_3 , HgO and HgCl_2 under the conditions prevailing in the expts. of Browne and Shetterly on the oxidation of hydrazine (*C. A.* 2, 235). $(\text{NH}_4)_2\text{SO}_4$ in a soln. strongly acid with H_2SO_4 is but slightly affected by prolonged treatment with H_2O_2 , KClO_3 and $\text{K}_2\text{S}_2\text{O}_8$ at boiling temp. Addition of $(\text{NH}_4)_2\text{SO}_4$ to a reacting mixt. of N_2H_4 — H_2SO_4 , H_2SO_4 and H_2O_2 does not increase, but rather serves to decrease the yield of HN_3 . KNO_2 oxidizes $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{SO}_4$ in H_2SO_4 soln. with the formation under comparable conditions of larger yields of HN_3 and of much smaller yields of NH_3 than are obtained by the action of H_2O_2 upon $\text{N}_2\text{H}_4 \cdot \text{H}_2\text{SO}_4$. The theory of F. Sommer (*C. A.* 8, 306, 1932) in explanation of the formation of HN_3 and of NH_3 by the oxidation of N_2H_4 by means of oxidizing agents contg. no N is untenable. E. B. MILLARD.

7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Analytical and inorganic chemistry. E. KINDSCHER. *Fortschritte Chem.* 11, 119-131(1915).—A review of progress in this field for the year 1914. The subjects treated are: volumetric analysis, gravimetric analysis and colorimetry. L. H. A.

Potassium hydrogen carbonate as an acidimetric and alkalimetric standard. G. INCZE. *Z. anal. Chem.* 54, 585-602(1915).—A general discussion of the physical

and chem. properties of KHCO_3 , together with analytical and expt detail. I. concludes that KHCO_3 possesses all of the properties necessitating reagent for volumetric analysis. The salt has been used in the Hungarian labs. for over 30 yrs. Pure KHCO_3 is most readily converted into an alc. soln. of KOH ; recrystn. and purification are best carried out from aq. solns. with alc. The salt is not hygroscopic and undecomposed in the air; it is best preserved in crystals in a glass-stoppered vessel. *C. A.* 9, 2747.

Reagents for use in gas analysis. III. The specific absorption of pyrogallol in various pipets. R. P. ANDERSON. *J. Ind. Eng. Chem.* 10, 433 and following abstract.—The specific absorption of O by pyrogallol (cf. *C. A.* 9, 2199) in different forms of pipets was detd. The results showed that modified alkaline pyrogallol for use in pipets that are designed for the absorption of O without loss can be readily adapted for use in such pipets without loss in specific absorption. The modified pyrogallol soln. was prepd. from alkali of 1.50 d. was substituted, the drop time was pronounced except with the Dennis pipet. Cf. *C. A.* 10, 2199. E.

Reagents for use in gas analysis. IV. Phosphorus in solution. J. Ind. Eng. Chem. 8, 135-6(1916); cf. preceding abstract.—With a reagent oil, as proposed by Tzentnershver (cf. *C. A.* 4, 2081) absorption of O was in no case complete in a reasonable length of time. A Hemmick reagent is not suitable for detn. of O at ordinary temps. and a soln. is to be preferred. E.

Analysis of alkaline earth metals. C. REICHARD. *Pharm. Ztg.* 27, 877-9, 895-6, 913-4, 1035-6(1915); cf. *Chem. Ztg.* 27, 877-9, 895-6, 913-4, 1035-6(1915).—Freshly pptd. carbonates of Ca , Sr and Ba to oxides. (1) Triture a small portion with cold H_2O until the H_2O is satd., filter, and heat to dryness, moistened with H_2SO_4 and ignited until only the metal remains. (2) Residue is hygroscopic— Sr is present. (3) Residue remains, Ba is present.

Solubilities of the sulfates of barium, strontium, calcium and magnesium in acetate solutions at 25° and a criticism of the present methods for these substances by means of ammonium acetate solution. J. W. CHEM. SOC. 38, 310-6(1916).—Expts. have been made on the solubility of NH_4OAc solns. contg. between 0 and 21.37 g. of salt per l. by shaking an excess of solid sulfate in a thermostat for 12 to 16 hrs. Weighed sample to dryness, moistened with H_2SO_4 and ignited until only the metal remains after which this was weighed. Detns. of the d. have been made for vol. calcs. could be made. BaSO_4 and SrSO_4 dissolve slightly more in NH_4OAc solns. than in H_2O , so that a sep'n. from Ca is possible. Addition of 1% of $(\text{NH}_4)_2\text{SO}_4$ to the acetate soln. reduces the solubility and still allows the soln. of considerable amts. of Pb and Ca as sulfate. Procedure is suggested for detg. qualitatively any of the 4 elements immediately after the removal of the HCl group; boil the soln. down to dryness, add 1 cc. of H_2SO_4 (3 N) and an equal vol. of alc., filter and wash with i

Pb and Ca from Ba and Sr with 3 *N* NH_4OAc , sep. Ca and Pb with NaOH after evap. the acetate soln. with H_2SO_4 and gently igniting, acidify the NaOH soln. with HOAc and test for Pb with K_2CrO_4 . Ba and Sr are converted into carbonates by boiling with Na_2CO_3 and tested in the usual way. A small amt. of Ca will not appear in this test, but will be detd. after the $(\text{NH}_4)_2\text{S}$ group in the usual way. A large amt. of Ca may be detected in the residue after the NaOH treatment. Basic mercuric sulfate, if it forms a yellow ppt. when the alc. is added, may be dissolved with a few drops of HCl.

E. B. MILLARD.

Electrometric titration of vanadium. G. L. KELLEY AND J. B. CONANT. *J. Am. Chem. Soc.* 38, 341-51 (1916).—Vanadates may be titrated with FeSO_4 , using the change in the e. m. f. of a suitable cell as indicator. The conditions best suited to an accurate titration were low temp. (preferably 10°), high acid concn., small rather than large amts. of V, and low concn. of chromic and ferric salts. A comparison of the method here developed with 4 others in common use for detg. V showed that the new method agreed with the other ones except with the method of reduction with HCl and subsequent titration of the reduced V with KMnO_4 after removing the HCl with H_2SO_4 and evap. Oxidation of V to the pentavalent condition by HNO_3 was not satisfactory for quantitative purposes, but oxidation with KMnO_4 or $(\text{NH}_4)_2\text{S}_2\text{O}_8$ was satisfactory in the absence of Cr. The method has been applied to Fe-V alloys, and could be adapted to ores.

E. B. MILLARD.

Titrimetric determination of cadmium and zinc. H. ENELL. *Z. anal. Chem.* 54, 537-46 (1915).—**Iodometric detn. of Cd:** E. used solns. of pure $\text{CdSO}_4 \cdot \frac{8}{3}\text{H}_2\text{O}$ (minute trace Fe) which showed on gravimetric analysis 101.7-102%. A series of expts. in which the washed CdS ppt. was put in a glass-stoppered bottle with 50 cc. of H_2O and an excess of 0.1 *N* I soln., shaken, let stand some hrs., and titrated with 0.1 *N* $\text{Na}_2\text{S}_2\text{O}_3$ soln. gave (pptn. and washing at room temp.): 99.3, 100.4, 100.8, 99.3, 99.3%. Filtration of CdS is facilitated by warming to $40-50^\circ$ and washing with H_2O at $40-50^\circ$, but the I reaction is retarded, requiring 14-24 hrs. for completion. Results generally high, expts. showing 102.4, 103.9, 103.9, 101.9, 101.9%. CdS is pptd. by means of $(\text{NH}_4)_2\text{S}$ and heating on the water bath till the mixt. assumes a colloidal appearance, let cool somewhat, 10% HCl added dropwise till pptn. is complete, filtered, washed with H_2O at $40-50^\circ$ till washings are neutral, ppt. treated with I soln. as above, let stand 36 hrs., and titrated with $\text{Na}_2\text{S}_2\text{O}_3$. Results 101.9 and 101.3%. It is probable that the addition of a few drops of HCl, after the CdS-I mixt. has stood some hrs., would facilitate the action of the I on the small residue of CdS; then let stand a while, and titrate with $\text{Na}_2\text{S}_2\text{O}_3$. E. considers the iodometric method uncertain. **Titration of Cd with AgNO_3 :** To CdSO_4 (0.192 g.) soln. in a beaker, add excess of H_2S water, heat on the H_2O bath 15-20 min., cool to $40-50^\circ$, add 1 g. $(\text{NH}_4)_2\text{SO}_4$, and stir. Let settle, filter on a 9 cm. paper, wash with a 2% $(\text{NH}_4)_2\text{SO}_4$ soln., containing 20 drops of 10% H_2SO_4 to 250-300 cc. and warmed to $40-50^\circ$, till filtrate has no H_2S odor and gives no color with AgNO_3 . Place filter and ppt. in a 200 cc. glass-stoppered bottle, add 50 cc. H_2O , and shake till paper is pulped, add 20 cc. (an excess) of 0.1 *N* AgNO_3 soln., and shake. Add 5 cc. of 25% HNO_3 , shake, let stand some minutes, filter through a plug of cotton, wash with H_2O till washings give no test for Ag, add Fe'' alum, and titrate with 0.1 *N* NH_4CNS . Results: 101.66-101.86%. Not more than traces of Fe should be present; Cl ions must be avoided. **Titration of Zn with AgNO_3 :** Pure ignited ZnO was dissolved in 10% H_2SO_4 for expts. To 100 cc. of the ZnSO_4 (0.0814 g. ZnO) soln. add 10 drops of 10% NH_4OH and stir (soln. should be alk. and have NH_3 odor), add 2 cc. of 25% AcOH , and then H_2S water in excess. Let stand on H_2O bath 12-15 mins., let cool somewhat, add 1 g. NH_4NO_3 (contained less Fe than other salts tested), let ppt. settle, filter on 9 cm. paper, wash with 2% NH_4NO_3 soln. (previously made alk.

with NH_4OH and then mixed with 5 cc. of 25% AcOH) at $40-50^\circ$ till (test with AgNO_3). The detn. is completed as given under Cd, except of 0.1 N AgNO_3 are added. Results: 99.5 to 99.99%. E. believes that of analysts relative to the rapid decompn. of ZnS in the air are exaggerated the cause of error is probably due to minute amts. of FeS . To a soln. containing wts. of ZnSO_4 and FeSO_4 was added 10 cc. of 10% NH_4OH (the calcd. amt. the H_2O_2 , the mixt. heated gently, and 30 drops of 25% NaOH added ppt. was filtered off and washed with warm, very dil. NaOH . Filtrate were evapd. to 50-60 cc., excess AcOH added, then H_2S , etc., as above. was Fe-free, but Zn loss was between 7 and 8%. F. W.

The application of the paper pulp filter to the quantitative estimation of calcium and magnesium. S. L. JODIDI AND E. H. KELLOGG. U. S. Dept. Agr. *Inst.* 181, 217-32 (1916).—The Ca and Mg content of chestnut bark is determined with the aid of the paper pulp filter. The ash was dissolved in dil. HCl moved by the basic acetate sepn. *Ca determination:* A Gooch crucible is used, a somewhat larger, covered Pt crucible and the two are heated, cooled together. Ppt. the Ca as oxalate in an aliquot of the filtrate from the sepn.; collect the ppt. on a paper pulp filter in the gooch, wash with boiling water, dissolve the filter with hot dil. HCl , followed by hot H_2O , reppt. with NH_4OH and $(\text{NH}_4)_2\text{C}_2\text{O}_4$; after $1/2$ hr. on the steam bath, collect the ppt. on a paper-pulp filter and wash with hot H_2O . Transfer the gooch to the Pt crucible, over a burner, dry the contents, carbonize, ash and ignite to CaO , weigh together with the 2 crucibles. Or the final CaC_2O_4 ppt. and its pulp filter transferred to a beaker and the gooch washed with a hot soln. of 10 cc. in 350 cc. H_2O , which is collected in the same beaker; the oxalate is titrated at 70 to 80° . For satisfactory results, the concn. of the Ca, when ppt. should lie between 0.01 and 0.10 g. CaO per 200 cc. *Mg determination:* Dryness the combined filtrate and washings from the Ca detn. and ignite up the residue in dil. HCl , filter, and wash the insol. matter. Ppt. the combined filtrate and washings as MgNH_4PO_4 , collect on a pulp filter in the gooch with 2.5% NH_4OH . The prepn. of the gooch and its treatment after ppt. are as outlined under Ca. The Mg is weighed as $\text{Mg}_2\text{P}_2\text{O}_7$. This method greatly reduces the time factor, and is more economical in the use of filter than ordinary filtration. Also in *Chem. Eng.* 23, 60-5 (1916). JOSEPH S.

Detection of iron in filter paper purified with hydrofluoric acid. A. Z. *anal. Chem.* 54, 547-9 (1915); cf. *C. A.* 10, 322.—The Fe in impure filter papers is present mainly as a cellulose compd. (Fe^{++} cellulosate) and not as an oxide. On acidifying with HCl or H_2SO_4 and treating with KCNS the color only after oxidation by the air; the rose-red color after some time fades, and finally a permanent yellow, due to the formation of $\text{C}_2\text{N}_2\text{H}_2\text{S}_8$; Fe first forms $\text{Fe}(\text{CNS})_3$, which with HCl gives FeCl_3 and HCNS , the latter giving HCN and $\text{C}_2\text{N}_2\text{H}_2\text{S}_8$, while HCNS would remain colorless and decompose in the presence of H_2O into volatile products ($\text{HCNS} + \text{H}_2\text{O} = \text{COS} + \text{NH}_3$). If HNO_3 is used the red color results immediately with KCNS ; the permanent color does not form as the HCNS by the action of the air decomposes into NH_3 , H_2O , and CO_2 . G. concludes that for the immediate detection of Fe, dil. HNO_3 should be used for a permanent record HCl or dil. H_2SO_4 . Control detns. should be made. P. V.

Differential iodometry. I. Determination of periodates, iodates, chlorates in the presence of each other. O. L. BARNEBEY. *J. Am. Chem. Soc.* 38, 330-41 (1916).—Periodates in neutral soln. react with KI and yield I_2 .

titrated with Na_2AsO_3 in the presence of excess NaHCO_3 . Attempts to titrate this I with $\text{Na}_2\text{S}_2\text{O}_3$ gave erratic results unless a weak acid was added to remove the alkali formed. H_3BO_3 and borax together eliminate the difficulty and allow the titration with $\text{Na}_2\text{S}_2\text{O}_3$ at room temp. The periodate should be allowed to react completely with the KI before the titration is commenced, since periodates react with thiosulfates themselves. Iodate could be detd. in the presence of bromate and chlorate by adding 0.1 N iodide in 0.125 N HOAc at temps. of 3 or 4°, but it was necessary to det. and apply a slight correction for interfering bromate. Periodate, if present in this titration, would be detd. with iodate. Bromate could be detd. in the presence of chlorate with much less acidity, though weak acids will not cause the bromate to react completely. Dil. HCl was satisfactory for this detn. Chlorate in the presence of perchlorate could also be detd. by converting the former into iodate and titrating the iodate by liberating I (from the interaction of chlorate and iodide) in strong acid soln. and then dissolving the I in alkali. Various inducing agents were tried without success. Several detns. were made for each of the methods, and the checks obtained were usually good. The results for chlorate in the presence of perchlorate were always low unless the HCl was about 6 N. By a suitable combination of these methods all of the substances mentioned in the title could be detd. in the presence of each other and in the presence of perchlorates.

E. B. MILLARD.

Determination of oxy-acids of sulfur in admixture. O. BILLETER. *Schweiz. chem. Ges.; Chem. Ztg.* 39, 500(1915).—For the detn. of sulfites in the presence of thiosulfates B. uses a titrimetric method (with N Na_2S_2 soln.) based on the reaction: $\text{Na}_2\text{S}_2 + \text{Na}_2\text{SO}_3 = \text{Na}_2\text{S}_2\text{O}_3 + \text{Na}_2\text{S}$. Titrate the soln. at b. p. in a current of CO_2 till the yellow color of the Na_2S_2 appears on the addition of NH_4OH ; add AcOH, expel H_2S by vacuum pump, and det. the total $\text{Na}_2\text{S}_2\text{O}_3$ with I soln. Trithionate behaves toward Na_2S_2 like a mixt. of sulfite and thiosulfate; I oxidizes it to trithionate: $\text{Na}_2\text{S}_2\text{O}_6 + \text{I}_2 + \text{H}_2\text{O} = \text{Na}_2\text{S}_2\text{O}_8 + 2\text{HI}$. Trithionate can be detd. by conversion to thiosulfate by the action of K_2S . After oxidation of the total S to SO_3 by means of Br, the SO_3 originally present may be obtained by difference.

F. W. SMITHER.

Purification of the residue from evaporating the ether and chloroform extracts in the forensic detection of alkaloids. A preliminary paper. A. CARDOSO PEREIRA. Lisbon. *Chem. Ztg.* 40, 39(1916).—The Et_2O ext., prepd. according to Otto, is freed from Et_2O , made alk. with NaOH soln., treated with a few cc. H_2O_2 , boiled a few min., cooled, and the tests applied in the usual way. Some alkaloids, as strychnine, nicotine, coniine, are not altered by this treatment; others, as morphine, form unidentified oxidation products.

J. H. MOORE.

Colorimetric determination of acetylene. E. R. WEAVER. *J. Am. Chem. Soc.* 38, 352-61(1916).—The gas to be investigated is conducted into ammoniacal CuCl contg. gelatin and EtOH, and the red colloid so obtained is compared colorimetrically with a standard, which may be a dye or a piece of ruby glass. Definite conditions have been worked out for concn. of the reagents. A soln. of chromanilbraun R, carmoisine B and gum arabic was used as color standard. The method is very sensitive, amts. of 0.03 mg. may be detected and amts. of 2 mg. detd. to better than 0.05 mg. H_2S and large amts. of O and CO_2 interfere with the test and have to be removed first.

E. B. MILLARD.

A chemical paradox. O. DE VRIES. *Chem. Weekblad* 12, 1000-1(1915).—When methyl orange is added to a satd. ZnCl_2 soln., its color changes to a deep reddish purple. An addition of dil. HCl, e. g., 0.1 N, changes this color to orange and yellow (neutral tinge), an excess of dil. HCl turns it to reddish orange. Congo paper behaves in a similar paradoxical manner; it gives with ZnCl_2 soln. a blue color, which changes to red on the addition of H_2O and even of dil. HCl; an excess of HCl is required to pro-

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Since the normal acid color (a bluish purple). The behavior of other chlorides, however, is quite normal. V. presents the following explanation: The red color of methyl orange in the presence of ZnCl_2 is not the real "acid" color but is caused by the formation of deep red compds. with ZnCl_2 , which are decompd. by H_2O . That the addition of dil. HCl at first causes a yellow color can be explained by the diminishing of the ionization of the HCl mol. through the large amt. of ZnCl_2 present, an excess of HCl being necessary to overcome this effect and to produce the real "acid" color of methyl orange.

J. T. FLOHL.

Color reactions (RUDDIMAN) 17.

8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

Mineralogical and geological chemistry. B. GOSSNER. *Fortschritte Chem.* 11, 107-18 (1915).—A review for the period Mar., 1914, to Mar., 1915. L. H. A.

Studies on asterism. PAUL KAEMMERER. Dresden. *Centr. Min. Geol.* 1915, 524-42, 546-53.—The theoretical and mathematical basis for Kalkowsky's conclusion (*C. A.* 9, 3192) that asterism in opalescent quartz is due to ultramicroscopic inclusions is discussed. The nature of the inclusions cannot be detd. and they may be merely hollow spaces of cylindrical outline, but the observations as to the light phenomena they produce are shown to be in accordance with the orientation inferred by K. and others. E. T. WANDTKE.

The crystals of maleic anhydride. O. MÜGGE. Göttingen. *Centr. Min. Geol.* 1915, 481-2.—Crystals of maleic anhydride are described crystallographically and optically, the results agreeing in most respects with those previously obtained. Two interesting phenomena are exhibited: in the air deliquescence occurs, crystal faces developing etch-figures, while conchoidal fracture surfaces become completely dulled much more rapidly; a similar relationship is shown by quartz when attacked by HF . In addition gliding ("Schiebung") occurs parallel to {101}, and the action of the moisture of the air on the resulting lamellas causes a scar-formation ("Vernarbung") similar to that observed on natural twinned minerals calcite, rutile, etc.. A. W.

Bismuthinite from Brosso. E. ARTINI. *Rend. accad. Lincei* 24, 249-51, 1915; *Ann. chim. applicata* 4, 280-90.—This mineral, discovered by A. at Brosso, is very rare in Italy, having been found heretofore only at Booccheggiaro. It occurs in bacillary aggregates or in fine, bright prisms. In the same mineral deposit A. found a member of the lepto-chlorite group, its observed characters pointing to its being probably cronstedtite. S. LEVY.

Hematite from Kakuk Mountains. KARL ZIMANTL. *Friedrichs Künig* 43, 150, 1915; continuation of *C. A.* 2, 1106.—A very full crystallographic description. E. T. W.

Review of publications on hematite. FERDINAND GOSKARD. *Bull. soc. franc. min.* 37, 115-24, 1914.—A resumé of article of preceding abstract. E. T. W.

The separation of calcium carbonate from solutions resembling sea water in composition. JOHANNES PERNE. *Dissertation Jena* 1913, 41 pp., *Neues Jahrb. Min. Geol.* 1915, I. Ref. 300-12.—At ordinary temps. calcite separates from solns. of pure NaCl , but the presence of other salts in soln. favors the formation of the unstable modifications of CaCO_3 . At 17-24°, in salt solns. having a compn. resembling that of sea water, vaterite separates out predominantly in spherulites and needles, together with some aragonite. This is caused by the NaCl salts, which being present in considerable

amt., increase the soly. of the CaCO_3 , and are thus responsible for the formation of the unstable modification. Ammonium salts when present tend to decrease the soly. of the CaCO_3 , and thus counteract the action of the Mg salts. The presence of a large amount of CaSO_4 in sea water leads to the sepn. of calcite. Conc'n. and, to a much greater extent, temp. of the soln. affect the sepn. of the unstable modifications. At $18-24^\circ$, when vaterite separates out, the conc'n. of the soln. only affects the amt. of the ppt. From solns. of pure CaSO_4 , at the same temps., calcite, as well as aragonite, separates out. At $8-11^\circ$, using a more conc'd. pptg. medium, these solns. ppt. vaterite. By treating solns. of pure CaSO_4 with Na_2CO_3 at this temp. calcite is formed. At 0° , hydrated CaCO_3 separates out. Above 30° aragonite alone is formed. The conditions of formation of the different modifications are not very well defined, since, when one form separates out predominantly, the next most stable modification also forms in considerable quantity. The formation of the natural forms of CaCO_3 , especially the oölites, is discussed in detail.

E. A. TSCHUDY.

Manganese-bearing albite from California. E. H. KRAUS AND W. F. HUNT. Univ. Michigan. *Centr. Min. Geol.* 1915, 465-7.—A black and a yellow mineral from the Caterina mine, Pala, Calif., have been analyzed and found to be albite, the former containing 1.71% MnO and 0.98% Fe_2O_3 . These substances are probably present as inclusions of manganite and goethite.

A. W.

Tourmaline in serpentine. A. LACROIX. *Bull. soc. franc. min.* 37, 75-6(1914).—L. shows that the discovery of tourmaline in serpentine by Duparc and Sigg (*C. A.* 8, 1734) bears out what he had noted in his *Mineralogie de France*, that mineralizers, especially B, are not confined to acid magmas, but occur in basic ones as well. Tourmaline, usually Mg-bearing, occurs in limestones, and even in gypsum or anhydrite beds, where metamorphosed by basic igneous rocks at several localities. Axinite, on the other hand, usually occurs in or near granite. (The article on a similar subject by Mügge (*C. A.* 5, 1383) is not mentioned.—ABSTR.)

E. T. W.

The crystal forms of mesolite. FERDINAND GONNARD. *Bull. soc. franc. min.* 37, 180-93(1914).—The crystal forms and angles which have been given by various authors for this mineral are summed up and discussed. Certain contradictory statements are probably to be explained by the occurrence of vicinal faces in place of the normal ones. It is in general not advisable to state crystal angles to fractions of minutes or seconds, since they may differ by many minutes from one specimen to another because of vicinal forms, variations in compn., and especially with the instrument employed for measurement, or, indeed, the "personal equation."

E. T. W.

Intumescent kaolinite. W. T. SCHALLER AND R. K. BAILEY. U. S. Geol. Survey. *J. Wash. Acad. Sci.* 6, 67-8(1916).—A white minutely cryst. mineral from Back Bone Mountain, LeFlore Co., Okla., has proved on examn. to be kaolinite, although it differs from previously described occurrences of this mineral in intumescent strongly before the blowpipe. The n 's are $\alpha = 1.561$, $\beta = 1.563$ and $\gamma = 1.567$ and agree with the values given by certain authors for this species; the mean value $n = 1.54$ given in some books is regarded as too low [for cryst. material, though not amorphous—ABSTR.]. Analysis by B. gave SiO_2 46.55, Al_2O_3 38.90, H_2O 14.04, sum 99.49%, agreeing closely with the theory for the mineral. The H_2O was found to behave normally, only traces escaping below 330° .

E. T. W.

Analysis of keffekilite from the Crimea. H. KASPEROVICH. *Mater. Kennn. geol. Bau. Russian Reich.; Festschr. V. Vernadskii* 1914, 121-2; *Neues Jahrb. Min. Geol.* 1915, I, Ref. 27.—Analysis of keffekilite, from Bakchisarai, nearly homogeneous in compn., gave SiO_2 51.00, Al_2O_3 16.28, Fe_2O_3 0.92, FeO 1.13, CaO 4.09, MgO 5.41, H_2O 19.79, CO_2 1.09, sum 99.71. After deducting 2.4% CaCO_3 which was

admixed with the material, these results correspond with the formula 5.09 SiO_2 , $1 \text{ R}_2\text{O}_3$, 1.19 RO , $6.63 \text{ H}_2\text{O}$.
E. A. TSCHUDV.

Deformations of crystals of betafite and beryl. A. LACROIX. *Bull. soc. franc. min.* 37, 101-7 (1914).—Crystals of betafite, normally isometric, with octahedron and dodecahedron, are occasionally found so deformed that they appear to be orthorhombic or tetragonal. In most cases this is due to unequal development of individual faces of one form, but in one locality the octahedron faces along one axis seem to oscillate with those of a trisoctahedron, (332), the dodecahedron at the same time oscillating with the tetrahexahedron (320); this phenomenon corresponds to that observed in pyrite crystals from Falls of French Creek, Pa. Crystals of monazite and strüverite are also occasionally deformed. In certain specimens of beryl the prism is replaced by a very long pyramid, and in others etch-figures yield dihexagonal pyramids. The etching in the latter was probably non-atmospheric.
E. T. W.

Microscopical and chemical study of phosphorite from the Ural Mts. V. CHIRVINSKII. *Bull. soc. oural amis. sci. nat.* 32, 105-20; *Neues Jahrb. Min. Geol.* 1915, I, Ref. 28.—A phosphorite vein occurs at the contact of granite and chlorite schists near the village of Pachkun, 15 versts (10 miles) from the Reshevsk smelter. The material is earthy at the surface, but becomes compact and sometimes brecciated at a greater depth. Analysis gave CaO 50.59, Fe_2O_3 1.84, Al_2O_3 1.86, P_2O_5 37.79, CO_2 2.13, F 2.32, Cl trace, H_2O 2.27 (hygroscopic 0.87, and crystn. 1.40), insol. 2.05, sum 99.85%. Loss on ignition 4.84%. This analysis corresponds with $\text{Ca}_3(\text{PO}_4)_2$ 82.50, CaF_2 4.76, CaCO_3 4.84%. The vein is probably of hydrothermal origin. It is the first phosphorite deposit of this type found in Russia.
E. A. T.

Theoretical considerations governing persistence of ore. T. A. RICKARD. *Min. ing Sci. Press* 112, 83-8 (1915).—R. further develops the idea (cf. C. A. 9, 1020) of persistence of ore, from modern theories governing the origin of ore-bodies: mineralization, secondary enrichment, structural relationship, the continual changes in the ores proper, and the probably young geological age of most deposits. The point is brought out that the above agencies of ore formation will be greatly modified with depth as pressure and temp. increase, and the ground becomes impervious to circulating waters.
C. BRAMSON.

Pneumatogenous ore deposits. A. SACHS. Breslau. *Centr. Min. Geol.* 1915, 501-4.—In S.'s previous paper (C. A. 9, 2046) pneumatogenous ore deposits were referred to, but only pneumato-epigenetic or contact deposits were described. In the present article several types regarded as pneumato-syngenetic are discussed, comprising: Primary Sn-ore deposits, where SnF_4 and H_2O , introduced by granitic magmas, reacted to form SnO_2 and HF , the ores depositing from the vapor condition; ore deposits in propylitized rocks, where it is suggested that FeCl_3 and AuCl_3 vapors reacted with H_2S to form Au-bearing pyrite; and Hg-ore veins, which are thought to have been formed by reactions of vaporized Hg compds. with H_2S . In the two latter cases subsequent action by H_2O , which S. regards as a condensation product of steam originally dissolved in the magma, but given off on its solidification, has produced many secondary minerals and obscured the primary nature of the deposit.
A. W.

The chemical and geological distinction of coal from lignite. A. SACHS. Breslau. *Centr. Min. Geol.* 1915, 475-8.—S. accepts the chem. distinctions worked out by Donath and Rzehak (C. A. 8, 2139) but believes that they have not recognized the geological relationship between coal and lignite. He suggests that the coals of the lower Cretaceous (and earlier periods) have formed (sich gebildet) as coal, those of the Upper Cretaceous (and later periods) as lignite.
A. W.

A new petrographic type, manjakite. A. LACROIX. *Bull. soc. franc. min.* 37, 68-75 (1914).—A rock of granoblastic texture, containing garnet, biotite, hypersthene; a little labradorite, and accessories, is described. The hypersthene was sepd. by a heavy soln. and analyzed by Boiteau and gave the results under (I) below. The garnet was analyzed by Pisani (II). The rock as a whole was also analyzed by B. (III):

	D.	SiO ₂	TiO ₂	Al ₂ O ₃	Fe ₂ O ₃	FeO	MnO	MgO	CaO	Na ₂ O	K ₂ O	P ₂ O ₅	H ₂ O ⁻	H ₂ O ⁺
I.	3.52	48.17	0.28	8.17	3.95	17.21	...	22.09	0.28	...	...	...	...	...
II.	3.80	41.10	...	22.40	...	23.40	0.44	11.12	1.92	...	...	...	...	...
III.	...	43.06	1.76	16.04	4.48	11.30	0.18	16.51	2.00	1.08	3.14	0.12	0.09	0.45

The hypersthene is unusual in the high Al₂O₃ and Fe₂O₃ content, the garnet is intermediate between almandite and pyrope, and the rock is remarkable in being high in Fe and Mg and in alkalis, especially K, at the same time. The rock belongs in absarakose (III. 5.3'.2'), but is different from any heretofore known, and is really related to the Al-bearing pyroxenites. Comparison with previous analyses shows nothing of closely related compn. The rock is, however, probably of igneous origin, and a new name, *manjakite*, from the locality (Ambohimanjaka) is proposed for it. E. T. W.

The quartz porphyries in the vicinity of Oberschöna, Thuringia. EMIL ULLRICH. Marburg. *Centr. Min. Geol.* 1915, 577-89, 606-16.—A detailed petrographic description. A. W.

The petrography of the basalt tuffs of the Habicht forest, near Cassel. ARTHUR BERNS. Marburg. *Centr. Min. Geol.* 1915, 483-500, 517-24.—The rocks are described petrographically in great detail, some of the fragments in the tuff showing rather unusual mineralogical associations. A. W.

Theory of the origin of clays. WILBUR STOUT. *Trans. Am. Ceram. Soc.* 17, 557-91 (1915).—Coal measure clays are believed to have originated from the residual products of Carboniferous plant life. Evidence favors the assumption that the plant residue was a clay-like compd. high in Al₂O₃. Under oxidizing conditions these residual products would build up a clay deposit. The theory accounts for the remarkable physical properties such as colloidal character, homogeneity, freedom from impurities and the const. relation between SiO₂, Al₂O₃ and H₂O. This theory requires no break in the growth of plants during deposition of clay and coal, only a change from oxidizing to preserving conditions, and it explains the origin of clay partings found in coal strata. C. H. KERR.

An organic oölite from the Ordovician. FRANCIS M. VAN TUYL. *Univ. Ill. Science* 43, 171 (1916).—An occurrence of siliceous oölite, the grains of which show org. structures of algal type, is reported. The matrix is dolomitic, and many of the grains have been wholly or partly changed to dolomite with obliteration of structure prior to silicification. E. T. W.

Space models for introduction into the study of eruptive rocks (NIGGLI) 1. Structure models according to W. H. and W. L. Bragg (MÜGGER) 1. A new polarization instrument (BAUER) 1.

9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Mineral and metal production in 1915. ANON. *Mining Eng. World* 44, 229-60, 266-83 (1916).—A long discussion with many statistics of the production in 1915 throughout the world and more particularly in the United States of the following sub-

stances: Au, Ag, Cu, Pb, Zn, Fe, steel, Al, Hg, Pt, Sn, Ti, W, Sb ores, Mn ore, Ra, V, U, potash, H_2SO_4 , portland cement, coal and petroleum. E. J. C.

Colloids and colloidal slimes. E. E. FREE. *Eng. Mining J.* 101, 249-54(1916).
—A general review and discussion. A bibliography is given. F. W. S.

The mechanical principles of the blast furnace. J. E. JOHNSON, JR. *Met. Chem. Eng.* 14, 38-45, 77-87(1916).—Of the total blast pressure of a furnace that is required to drive the air through the tuyères is in ordinary practice only 10%, while practically all the rest, except 1-3% needed to send the gases through the downcomer flues and burners, is spent in forcing the blast through the charge column. To calc. engine-house pressure add the combined resistances of the hot and cold blast mains and of the stoves which should not exceed 0.5 lb. The pressure drop in tuyères of circular cross section is expressed by the formula, $P_1 - P_2 = 2.4 (Tv^2/P_1 d^4)$, where P_1 and P_2 are abs. pressures without and within, T abs. blast temp. ($F^\circ + 460$), v the vol. of air passing each tuyère per min. measured in thousands of cu. ft., and d the diam. of the tuyère in inches. In furnace design careful account must be taken of the number and diameters of tuyères since the air-jet must be strong enough to reach the center of the hearth to prevent the formation of a cold cone but not so strong as to carry an excess to the center allowing pilasters of dead material to form on the walls between the tuyères. As a formula for detg. the blast pressure required to overcome the resistance of the charge column, J. proposes: $P_1^2 - P_2^2 = HK w^3/D^4$, where P_1 and P_2 are abs. pressures at tuyères zone and stock line, w wt. of air blown per min., H height of furnace, and D furnace diam. The value of K has been detd. from experience to be approx. 0.0008 and it remains fairly const. either for the fine Mesabá or the lumpy Southern ores. He discusses at length the 4 elements contributing to the support of the charge column, viz., (1) the upward pressure of the gas, (2) the friction on the sides of the shaft, a resistance difficult to measure but one which sometimes exceeds 100% of charge weight, (3) the vertical upward thrust against the downward converging slope of the bosh walls and (4) flotation pressure in the molten mass in the hearth which is itself more than sufficient to support the column. The height of furnaces that may be blown to full capacity is approx. 90 ft.; larger furnaces must be run with less than a proportionate amt. of air to allow for a regular descent of the charge. In the discussion of the principles which govern the shape of the furnace, numerous figures showing the changes evolved in the last 75 years are given. H. L. OLIN.

The Gellens process of treating refractory ores. G. A. GELIENS. *Mining Eng. World* 43, 473-4(1915).—The process effects the extn. of Au, Ag and Cu from coned. sulfides and sulfide ores containing antimonides, arsenopyrites, blende, chalcopyrite, pyrites, etc., and the sulfides and tellurides of Au and Ag, by treatment with NaOH and $KClO_3$, with aeration during amalgamation. H. L. OLIN.

Device for reversing open-hearth steel furnaces. ANON. *Met. Chem. Eng.* 14, 111(1916).—A description of the Schumann device for the above purpose. A clock makes elec. contacts at fixed time intervals, and the closing of the elec. circuit operates a 4-way valve which admits pressure to one end or the other of a hydraulic cylinder. All valves involved in the reversal of the furnace, as well as the oil burners if the furnace is oil-fired, are hung on cords with counterweights so that the movement of the piston in this cylinder makes all the necessary changes. The reversal may also be made at any time other than that for which the clock is set by operating a hand contact. An outline of the system is given in a sketch. W. L. BADGER.

Clarifying wash water from purifying blast furnace gas. ANON. *Stahl u. Eisen* 35, 829-33(1915).—An illustrated article showing various settling devices. CARLE R. HAYWARD.

Coal and coke efficiency in blast furnace operation. B. F. BURMAN. *Met. Chem. Eng.* 14, 137-40(1916).—**Coal efficiency:** In the interests of keeping the ash and S content of coal shipments below certain prescribed limits, and as an indicator of the improvement of methods at the mine for this purpose, the adoption of an "efficiency percentage" system is advocated. Standard values are obtained by computing the av. minimum values (dry basis) for the ash and sulfur for a year's coal output, and adopting them as standards for the next year's work. By assuming these values to represent 100% efficiency, the "efficiency" of any other percentage composition may be computed. **Coke efficiency:** The object of the efficiency system is not only to improve the quality, but to keep the coke at the same uniform value and physical structure. The value of the coke is improved by decreased ash, S and volatile matter, and an increased fixed-C content. Standard values for comparison may be obtained by computing the av. analysis (dry basis) of the coke for one year with fair max. and minimum limits defined. This analysis may be used for the coming year, and by assuming the av. max. value for fixed C, and the av. minimum values for moisture, volatile matter, ash and sulfur to represent 100% efficiency, the "efficiency percentages" of any other analysis may be detd. The total "analysis efficiency" of the coke is equal to the av. of the sum of the fixed C, volatile matter, ash, and S "efficiencies," the moisture "efficiency" being treated separately. The losses due to improper quality of the coke may be detd. fairly well by figuring the relative value of the coke used.

E. A. TSCHUDY.

A new process for making converter bottoms for the basic Bessemer process. E. BRÜHL. *Stahl u. Eisen* 35, 941-7(1915).—The dolomite bottom is packed in with tar and carefully dried attaining a max. heat of 500°. The bottom is not baked in the usual way as most of the tar would be burned out leaving the bottom porous. The hot metal of the first charge is allowed to bake the bottom, thus leaving much of the C of the tar as coke. Figures are given showing the superiority of the method.

CARLE R. HAYWARD.

Chrome-iron ore as lining for reverberatory furnaces. E. HALL. *Eng. Mining J.* 101, 267-8(1916).—An account of trials with chromite lining for the reverberatory-matting furnace at Silverspur, Queensland, Australia. Success was achieved with chromite, dry-masonry lining; large bottom blocks of chromite were bedded on a mixt. of clean blende and crushed chromite. Compn. of slag averaged: SiO_2 32, ZnO 25, PbO 5, FeO 20%, while the mat fall was under 3%. MgO bricks lasted a much shorter time than bricks of chromite or bauxite; the latter were therefore used in critical places (on the firebox side of the bridge, in the vulcatory arch, in the front above the skimming door, for jambs and arches of the side doors). The main drawback is the accumulation of chromite sand as a layer between the mat and the slag. This sand is too rich in Ag to be thrown away, and should be regularly skimmed out. It was found impossible to resmelt the residues (mixt. of chromite sand, slag, mat, and "bottoms") in a reverberatory matting furnace, but it can be done in a Pb blast furnace, with high column and large capacity. Possibly, when smelting straight Cu ore carrying but little Ag or Au, this material would be poor enough to reject.

F. W. SMITHER.

Pig-iron mixers with special reference to the most practicable size. FR. SPRINGORUM. *Stahl u. Eisen* 35, 825-9, 852-8(1915).—The value of the mixer in steel plants is discussed as well as its development from small mixers holding 775 tons to the modern mixers holding 2000 tons. Mixers are heated with blast-furnace gas, producer gas or oil. The three methods are discussed and costs compared.

CARLE R. HAYWARD.

Blast furnace smelting of cyanide precipitate. REGIS CHAUVENET. *Met. Chem. Eng.* 14, 96-9(1916).—The process consists in smelting the ppt. on a Pb basis, in a

small furnace constructed in miniature like a Pb-smelting furnace. Briquets are made consisting of dry ppt., 100 parts; PbO, 100-125 parts; blanket concentrate containing 35% SiO₂ and 30% S, 60-75 parts. With high Cu in the ppt. raw concentrate is used to form a mat; with low Cu it is added in the roasted state. The furnaces in use at Goldfield are of the cylindrical type, 20 in. at the tuyère line with steel jackets. The charge is 500 lbs. of Pb followed by briquets 100, old slag 40, borax 10, cupel bottoms 51, Fe₂O₃ 5 and coke 25. The Pb bullion obtained by this method contains 20% Au and 1% Cu while the mat averages 20% Pb and 50 oz. Au and 200 oz. Ag per ton. The latter is allowed to accumulate until a sufficient amt. is at hand for a separate run.

H. L. OLIN.

Experimental cyanide plant of the Michigan College of Mines. CHAS. F. SPAULDING. *Mining Eng. World* 43, 809-10(1915).—A description, with drawing, of a working model.

H. L. OLIN.

The Nevada Packard mill. ROBERT B. TODD. *Eng. Mining J.* 101, 247-8 (1916).—An illustrated description. The mill is a 100-ton, all-sliming cyanide plant.

E. J. C.

Cyanide process applied to antimonial ores. MACARTHUR, FORREST & Co. *Eng. Mining J.* 101, 224(1916).—A cheap process devised for treating the Sb-Au ores of the Murchison Range, Transvaal. The process is carried out at the United Jack Mine as follows: The ore is crushed in 2 No. 7 ball mills to 30-mesh, discharged to bins, and conveyed as required to 6 circular dissolving tanks (23 ft. 9 in. diam. and 8 ft. deep). Hot NaOH soln. is pumped upon the sands and drawn through them in much the same way that cyanide solns. are applied upon the Rand. The soln. is drained off to 3 carbonators, where it is treated with CO₂ from a CaO kiln. The Sb is pptd. as an amorphous sulfide, and the sludge is pumped to the ordinary type of filter press and pressed into cakes, which are finally dried and made ready for the market. The soln. from the filter press goes back to stock tanks for use over again. The sand residue is treated in the usual way by cyanide soln. to recover the Au.

F. W. SMITHER.

Copper refining in the United States: O. NIELSEN. *Metall u. Erz* 12, 439-45, 464-8(1915).

CARLE R. HAYWARD.

Pulverized coal for copper smelting. N. L. WARFORD. *Mining Eng. World* 43, 724-3(1915).—The use of pulverized coal as fuel has been extended to include all the reverberatory furnaces of the Anaconda Copper Mining Co. The coal is broken to 2 in. size with 2 Jeffrey 30 × 30 in. roll crushers of 125 ton hourly capacity and its moisture content reduced from 6-10% to 1% in 3 Ruggles-Coles class A-12 dryers. It is further reduced to 100 mesh by means of 3 Jeffrey 34 × 20 in. disintegrators and 10 Raymond 5 roller pulverizers. A specially designed feeder and burner is used.

H. L. OLIN.

Copper Queen reduction works, Arizona. C. A. TUPPER. *Mining Eng. World* 43, 725-8(1915); cf. Rutherford, C. A. 9, 2867.

H. L. OLIN.

Hydrometallurgy of lead. H. R. ELLIS. *Met. Chem. Eng.* 14, 122(1916).—Oxidized ores from Washoe County, Nevada, containing 10% of lead, nearly all present as sulfate, the rest being galena, and 10.0 oz. of Ag per ton, were leached with hot 20% brine soln. containing 0.5% of CuSO₄. The ore was crushed to 40 mesh. After diln. of the soln. and pulp with more hot brine soln. containing no CuSO₄, the clear liquid was drawn off and the operation repeated with fresh brine, finally giving the settled pulp a displacement wash with hot water. The soln. from the vats was passed through cement copper to recover the silver and then through scrap iron to recover the lead. An extn. of 85% of both the Pb and Ag values was obtained. Old concn-

trates containing quite a percentage of arsenic and sulfides, after receiving an oxidizing roast, were treated by the above method with an extn. of only 45-50% of the contained Pb and Ag. The largest amount of ore treated at one time was one ton.

E. A. TSCHUDY.

A simple calculation of a lead blast furnace charge. F. VON SCHLIPPENBACH. *Metall u. Erz* 12, 399-402(1915).

CARLE R. HAYWARD.

The Lungwitz zinc-smelting process. WOOLSEY MCA. JOHNSON. *Met. Chem. Eng.* 14, 105-6(1916).—An account of an unsuccessful attempt to produce Zn spelter in the blast furnace under pressures that should prevent the formation of Zn vapor at furnace temps. A pressure of 80 lbs., calcd. to be sufficient to liquefy the Zn at 1350°, was found to be only 10% of that required since the theory neglected to take into account the partial pressures of other gases present, *e. g.*, CO and N₂, whose total vol. was 9 times that of the Zn vapor.

H. L. OLIN.

The technical importance of the dust question for zinc smelters. VON OSCAR GEROLD. *Metall u. Erz* 12, 403-10, 419-26(1915).—The large amt. of dust in Zn smelters is bad for the health of workmen and causes loss in values. The paper describes and illustrates apparatus for properly ventilating the building and recovering the dust.

CARLE R. HAYWARD.

The Washoe reduction works, Anaconda. L. S. AUSTIN. *Mining Sci. Press* 112, 195-203(1916).—A detailed description with illustrations, plans, etc.

F. W. S.

Thermoelectricity of special steels. E. L. DUPUY AND A. M. PORTEVIN. *Rev. metal.* 12, 657-79(1915).—The thermoelec. properties of a number of special steels were measured between -78.6° and 0° and between 0° and 100°. The results of this investigation show that the curve representing the thermoelec. power of a steel as a function of its compn. (1) takes the form of an hyperbola where the metal added exists in solid soln. and that (2) where there is a mixt. of 2 phases the curve is nearly a straight line. Special steels may thus be classed into 2 groups in regard to their thermoelec. properties. Special steels of Ni, Mn, Si and Al give a curve in the form of a U, from which it is inferred that the metal added exists in the steel in the form of a solid soln. Special steels of Cr, W, and Mo show curves in which there is at first a sharp fall indicating, as in the preceding, a partial solid soln., followed by a rise and continuing more or less parallel to the x-axis. This gives some idea as to the limit of soly. in the solid state of the metal added. This is particularly of interest in the case of the duplex alloy present in carbon steel. Here the C seps., when satn. is reached, either as a constituent of pearlite or an extra-eutectic. The thermoelec. properties of special steels permit the classification of the latter in a manner sufficiently sharp to furnish valuable information complementary to their other physical and mechanical properties.

L. T. FAIRHALL.

Failure of materials under repeated stress. H. F. MOORE AND F. B. SEELY. *Proc. Am. Soc. Testing Materials* 15, II, 437-66(1915).—An investigation into the relation between stress at failure to the number of repetitions of stress.

D. B.

The latest improvements in Brinell hardness-testing machines. ANON. *Met. Chem. Eng.* 14, 59-60(1916).—A description of the Scimatco-Brinell hardness-testing machine.

W. T. H.

The relation between maximum strength, Brinell hardness and scleroscope hardness in treated and untreated alloy and plain steels. R. R. ABBOTT. *Proc. Am. Soc. Testing Materials* 15, II, 42-61(1915).—When steels have been heat-treated to a strength of over 200,000 lb. per sq. in. it becomes difficult and expensive to cut a test bar for physical tests. It is becoming customary to test the hardness of the finished steels and from that infer the other physical properties. In order to test the relation-

ship between the various physical properties some 300 different types of steel were selected, and 25 test bars cut from each. Each test bar was heat-treated in a different way. The following results were obtained: C steels, Brinell hardness is proportional to max. strength; scleroscope hardness is proportional to max. strength; Brinell hardness is proportional to scleroscope hardness. The same relations hold for Ni, Cr-V, and Cr-Ni steels of various compns. The equations of the various linear functions were detd. D. B.

Internal stresses developed by different quenching mediums and their effects. H. V. WILKE. *Proc. Am. Soc. Testing Materials* 15, II, 27-41(1915).—The internal stresses resulting from the quenching of a 9 $\frac{1}{2}$ in. cylinder in various media, and under various conditions were detd. Slow and mild water quenching results in a fiber stress of 45,000 lb. per sq. in.; light tempering oil about 35,000; heavy tempering oil about 24,000, fish oil about 30,000. It is shown that the tensile properties of rapidly cooled steel are superior to those of one slowly cooled. However, high rate of cooling may easily develop internal fracture. Metallurgists are confronted with the alternative of conservative physical properties, or of high elastic limit, elongation and reduction of area with attendant possibility of internal fracture. It was also found that the effect of the initial temp. of the quenching medium on tensile properties is not serious, but it affects the internal stresses. D. B.

The fatigue of nickel and iron wires when subjected to the influence of alternating magnetic fields of frequency 50 per second. W. BROWN. *Sci. Proc. Roy. Dublin Soc.* 14, 336-44(1915).—With Ni wire the harder the wire or the greater its rigidity, the greater is the fatigue. The fatigue rises rapidly with the time and reaches a max. With Fe wire the time to reach max. fatigue is much greater than in the case of Ni. Fe in a comparatively soft state could not be fatigued at all. D. B.

The subsidence of torsional oscillations of iron wires and alloys when subjected to the influence of alternating magnetic fields of frequency 50 per second. W. BROWN. *Sci. Proc. Roy. Dublin Soc.* 14, 393-404(1915). D. B.

The subsidence of torsional oscillations and the fatigue of nickel wires when subjected to the influence of alternating magnetic fields of frequencies up to 250 per second. W. BROWN. *Sci. Proc. Roy. Dublin Soc.* 14, 521-8(1915).—The time taken to effect the max. fatigue appears to vary inversely as the frequency of the applied alternating magnetic field. D. B.

Elastic limit. T. D. LYNCH. *Proc. Am. Soc. Testing Materials* 15, II, 415-36(1915). D. B.

The magnetic transformation of cementite. K. HONDA AND H. TAKAGI. *Sci. Rep. Tohoku Imp. Univ.* 4, 161-8(1915); *Engineering* 100, 665-7(1915).—By cooling, the magnetic transformation of cementite begins at 215° and by heating it ends at the same temp. This is the critical temp. of the cementite. In former expts. steels with a C content from 0.14 to 1.5% showed almost the same critical temp. as the latter steels. Since the ferro-magnetic compounds of Fe have critical temps. peculiar to them it may be concluded that the carbides may possess different critical temps. But since the various steels, with from 0.14 to 4.2% C., show a single transformation between room temp. and 700°, it is probable that the only carbide existing at ordinary temp. is cementite. D. B.

Apparatus for determining the critical point in iron and steel. ANON. *Iron Age* 96, 928(1915). D. B.

The nature of the A₂ transformation in iron. K. HONDA. *Sci. Rep. Tohoku Imp. Univ.* 4, 169-214(1915).—A critical study of recent investigations. The heat effect corresponding to the A₂ transformation takes place over a wide range of temp.

The A_2 transformation is, therefore, probably not an allotropic change. Benedick's view that the A_2 is a change associated with the A_1 transformation is not plausible because it rests on the belief that the heat effect at A_2 is due to the residual effect of the A_1 transformation brought down by the impurities in the Fe; but *pure* Fe shows a heat effect. In a definite magnetizing field, the magnetic transformation takes place in a certain definite interval independent of the rate of cooling or heating. This result weakens the allotropic theory. Heat evolution in Fe or Ni during cooling does not appreciably change for different magnetizing fields. Since the heat evolved or absorbed at A_2 is known to be about $1/2$ that at A_1 , the discontinuity in the curve of expansion should be of the same order of magnitude as that at A_1 , if A_2 is allotropic like A_1 . This is not the case. The A_2 transformation is not allotropic but is some intermolecular change which takes place gradually in the α phase and in a large interval of temp. From the standpoint of the phase doctrine, β -iron is to be rejected, although the name may be retained for convenience. Also in *J. Iron Steel Inst.* 91, 199-254(1915).

D. B.

The magnetic study of the A_2 transformation in pure iron. K. HONDA AND H. TAKAGI. *Sci. Rep. Imp. Tohoku Univ.* 4, 261-5(1915).—A magnetic analysis of the A_2 transformation was made on 4 specimens of pure Fe. The results agreed well with a thermal analysis made by another investigator. The results on the whole are not favorable to the theory of magnetons, as given by Weiss.

D. B.

The partial protection of pieces of steel subjected to cementation. F. GIOLITTI. *Atti accad. sci. Torino* 50, 414-9(1915).—L. Guillet and V. Bernard (*C. A.* 8, 3000) obtained negative results in studying the protective effect of metallic layers of various thickness and qualities against carburizing action of cementation agents. G. has obtained results somewhat different and believes that the protective action of metallic deposits depends to a large extent on the special conditions under which the deposit is formed and on the surface of the steel, so that the protective action may be varied within very wide limits. Cementation expts. are described with a very mild steel heated with wood charcoal in an atm. of CO. An electrolytic deposit of Ni (0.05 mm. thick) was made on $1/2$ of 1 cylinder and it was cemented 40 mins. at 900°. A photo micrograph shows that the Ni effectively protected the surface of the steel from cementation. Similar expts. with specimens cemented at 1000° for 1 hr. show that the Ni layer at this temp. does not protect as well as at 900°, but it does have the effect of diminishing somewhat the rapidity and intensity of the carburization. A specimen protected with an electrolytic Cu deposit 0.05 mm. thick cemented at 1000° for 1 hr. showed a cemented layer a little thinner than on an unprotected specimen and a little thicker than on the preceding. A specimen $1/2$ protected by electrolytic Cu cemented at 900° for 40 mins. showed uniform cementation.

E. J. WITZEMANN.

Controlling the sulfur in melting pig iron. W. M. CARR. *Foundry* 43, 189(1915).—S cannot be kept very low, nor reduced, in the cupola; it can be in the open hearth. As the cupola requires less fuel, it is suggested that where low-S cast Fe is to be produced, the metal should be melted in a cupola and run into an open hearth for the elimination of S by adding Fe-Mn. The metal may be held in the open hearth almost indefinitely, and the C and Si may be regulated by suitable additions.

H. W. GILLET.

The production and properties of electrolytic copper. B. WILBOURN. *Electrician* 76, 235-7(1916).—The manufacture of Cu wire, including rolling, annealing, jointing and testing is described. The modulus of elasticity should be taken as 18,000,000 instead of 16,000,000, the figures usually used. Tensile strength and the effect of temp. are also reviewed.

W. E. RUDER.

Recent processes for improving the physical properties of zinc. E. H. SCHULZ. *Chem. Ztg.* 39, 547(1915).—A lecture before the Ges. deut. Metallhütten-u. Bergleute. The addition of about 6% Cu and 3% Al increases markedly the hardness and toughness of cast Zn. It also produces a more homogeneous metal which contracts but slightly on cooling. Pressing or rolling improves the qualities of Zn. E. H.

Corrosion of iron. K. P. GRIGOROWITCH. *Rev. soc. russe de metal.* 1, 70-88, 115-47(1914); *Rev. metal.* 12, *Extraits* 242-7; *J. Soc. Chem. Ind.* 34, 1253.—The electrolytic corrosion of Fe in contact with different metals and other substances was studied. Contact with FeS was found to promote corrosion; the sulfide was not dissolved during the process, its electrolytic potential being lower than that of metallic Fe; the greater ease of oxidation of Fe contg. S (as MnS) may thus be due to local currents produced between the ferrite and MnS. The divergence of opinion as to the relative corrodibilities of cast and wrought Fe and steel is regarded as proceeding from inherent differences in the methods of investigation employed. The influence of thermal treatment on the soly. (corrosion) and electrolytic potential of various steels was detd.; the soly. of ordinary cast steel was greater after quenching, or reheating to 400°, and generally least after annealing but varied only slightly with the C content; the electrolytic potential of the steels varied with the temp. and time of reheating, but more with regard to the intermediate than to the initial and final values. E. J. C.

Experiments on the corrosion of molybdenum steel. LESLIE ARCHISON. *J. Chem. Soc.* 107, 1531-8(1915).—A sample of pure C-steel was compared with a series of similar steels containing up to 20% Mo as regards the tendency to corrode in 3% brine, 1% H₂SO₄, 10% H₂SO₄ and in tap water. The results on the whole indicate that the addition of small quantities of Mo to pure steel increases at first the tendency to corrode, but when 15% or more of Mo is present the corrosion becomes less. W. T. HALL.

Recent progress in corrosion resistance. D. M. BUCK. *Iron Age* 95, 1231-9 (1915).—The statement at the end of the abstract of this paper in *C. A.* 9, 3212, that G. H. Charls in discussion confirmed B.'s conclusions is incorrect. E. J. C.

The temperature-concentration diagrams of carbon with manganese, nickel and iron. W. BORMAN. Danzig. *Dissertation Kgl. Techn. Hochschule, Danzig* 54 pp. (1915).—The b. p. of pure Mn at 30 mm. was found to be 1510°; the b. p. of molten Mn satd. with C, 1526° at 30 mm. The soly. of C in molten Mn between 1200° and 1300° was studied. Pure Ni b₃₀ 2341°; Ni satd. with C b₃₀ 2490°. On the Ni-C diagram the line showing where the mixed crystals begin to sep., the eutectic line, and the eutectic point were detd. For the 3 diagrams the compn. of the vapor phase was detd. The app. is described in detail with the calibrations of the thermal couples, etc. D. B.

The system cobalt-carbon at temperatures above 1500°. F. KEILIG. *Dissertation Kgl. Techn. Hochschule, Danzig* 28 pp.(1915).—C shows with increasing temp. an increasing soly. in Co. At the highest temp. measured, the soly. was 9.24% C at 1 atm. From 2100° to 2200° the presence of Co₂C was detected in the melt. The soln. satd. with C b₃₀ 2415° ± 10°. The vapor from this soln. contained 2.0 ± 0.6% C. Pure Co b₃₀ 2375° ± 10°. D. B.

The binary aluminium alloys. HERMANN SCHIRMEISTER. *Stahl u. Eisen* 35, 649-52, 873-7, 996-1000(1915).—The effects of the following elements on Al were discussed with many tables and curves: Zn, Mg, Cu, Ni, Co, Fe, Sb, Si, Cd, Sn, Pb, Bi, Cr, Mn, Wo, Mo, V, Ti, Zn, Ta. CARLE R. HAYWARD.

Metallographic investigation of the system tellurium and selenium. Y. KIMATA. *Mem. Coll. Sci. Imp. Univ. Kyoto* 1, 119-21(1915); *J. Soc. Chem. Ind.* 34, 1211.—Te

and Se form two series of solid solns. The liquidus passes from the m. p. of Te 441° , on the one hand, and that of Se 197° , on the other, to a minimum at Se 95% and 130° ; at this point the crystals have the same compn. as the melt. Se and the Se-rich reguli have a strong tendency to solidify to glassy masses. E. J. C.

The alloys of tellurium and lead. M. KIMURA. *Mem. Coll. Sci. Imp. Univ. Kyoto* 1, 149-52(1915); *J. Soc. Chem. Ind.* 34, 1211.—The system Te-Pb yields only one compd., PbTe, m. 904° . There are no solid solns. The liquidus runs down from 441° , the m. p. of Te, to an eutectic point at 24% Pb and 412° , up to a max. at 61.89% Pb (PbTe) and 904° , and then down to the m. p. of Pb, 326° . E. J. C.

Metallographic investigation of the system antimony and tellurium. Y. KIMATA. *Mem. Coll. Sci. Imp. Univ. Kyoto* 1, 115-8(1915); *J. Soc. Chem. Ind.* 34, 1211.—The m. p. of Sb is 627° , that of Te is 442° . Only one compd. exists, Sb₂Te₃, m. 620° . This compd. forms with Sb an eutectic melting at 540° and contg. 27-28% Te; and with Te an eutectic melting at 420° and contg. a little under 90% Te. No solid solns. are formed. E. J. C.

Manganese-nickel alloys. A. D. DOURDINE. *Rev. soc. russe de metall.* 1, 11-23, 341-95(1912); *Rev. metal.* 12, 125-33(1915); *J. Soc. Chem. Ind.* 34, 1058.—The liquidus curve drops sharply from the m. ps. of the pure metals (Mn 1235° , Ni 1451°) to a flat minimum between Mn 56 and 63% at a little above 1000° . The alloys contg. Mn 0-38% and 71-100% consist of solid solns., but the thermal curves for the alloys with Mn 38-56% and 63-71% show certain peculiarities which appear to indicate the existence of 2 modifications, stable and unstable, of the compd. MnNi (Mn 48.37%). The microscopic structure of the alloys is described and discussed with reference to the thermal effects observed. E. J. C.

The manufacture and uses of alloy steels. H. D. HIBBARD. U. S. Dept. Interior, Bur. Mines, *Bull.* 100, 72 pp.(1915).—The manuf., methods of working, heat treatment, compn., properties and uses of alloy steels are described. W, Cr, Mn, Ni, Ni-Cr, Si, high-speed tool, and Cr-V steels are considered. A comprehensive bibliography is appended for each steel. E. A. TSCHUDY.

Choice of alloys for water works design. H. CARPENTER. *J. Am. Water Works Assoc.* 2, 351-8(1915).—Among the bronzes the so-called naval bronze is usually satisfactory. Resistance to corrosion is aided by replacing about 3% of the Cu with Pb. Monel metal is the most perfect alloy but is quite expensive since it is difficult to obtain sound castings. It is believed that Ni steel has not been given sufficient considerations by the engineer. W. F. LANGELIER.

The properties of cold-worked metals. II. Methods of measuring small changes in density produced by annealing. R. G. PARKER AND T. M. LOWRY. *J. Chem. Soc.* 107, 1160-8(1915); cf. *C. A.* 9, 2756.—The small changes in d. produced by annealing may be detd. by means of the pycnometer, by suspension in water or by recording the change in vol. with the aid of the dilatometer. The precautions necessary for accurate work with the pycnometer and with the dilatometer are described in detail. The use of the former instrument is illustrated by a series of measurements on a dental alloy and on Cu and the use of the dilatometer is illustrated with measurements on Sb. W. T. HALL.

Manganese-bronze. J. B. RHODES. *Metal Ind.* 13, 462(1915).—A description of its manufacture from various scrap materials. D. B.

Phosphorus limit in malleable castings. E. TOUCHEDA. *Iron Age* 96, 92-46, (1915).—Dynamic tests were made on specimens of different P content by detg. the number of blows required to break the specimen. When the amt. of combined C is

very low the evil effects of P are slow to make themselves felt. Unsoundness is often caused by shrinkage. D. B.

Materials employed in case hardening. R. A. MILLHOLLAND. *Iron Age* 96, 1041-2(1915).—M. compares the advantages of natural and manufactured materials for case hardening. D. B.

Case hardening retorts and furnaces. R. A. MILLHOLLAND. *Iron Age* 96, 1111-4 (1915).—Notes on materials employed, methods of packing, and furnaces. D. B.

The process of case hardening. R. A. MILLHOLLAND. *Iron Age* 96, 1166-7 (1915).—The effect of high temp., influence of time and temp., case and core treatment are described. D. B.

High temperature flames in metal working. H. R. SWARTLEY, JR. *Iron Age* 96, 1122(1915).—A review of the present practice in the use of oxy-acetylene and oxy-hydrogen flames. D. B.

The application of electricity to the heating of metals. F. L. BISHOP. *Electrician* 76, 158-9, 189-90(1916).—A discussion of the recent developments, present status and limitations in the application of electricity to the heating of metals for the purpose of annealing, hardening or other heat treatments. B. discusses briefly, with cuts, the different types of furnaces employed in lab. work, and points out the application of these furnaces to commercial service, where such application has been made

F. W. SMITHER.

General electric practice in sherardizing. ANON. *Iron Age* 96, 1108-10(1915).—The apparatus used and practical details are given. W. E. RUDER.

Electric welding as developed to date. C. B. AUHL. *Iron Age* 96, 1356-9, 1414-6 (1915).—The LaGrange-Hoho and Thomson processes are described, of which only the latter is used in America. W. H. BOYNTON.

Oxy-acetylene welding practice. S. W. MILLER. *Machinery* 22, 404-6, 461-7 (1916); cf. *C. A.* 10, 37.—Pure rolled sheet Al or Al sheet with but little alloy can be "oxy-acetylene welded" with excellent results providing a good flux is used. The resulting weld will be as malleable as the original sheet. Directions are also given for welding Fe and other metal sheets. C. G. F.

Tailings sampling device (SHAW) 1. Thermal insulation of high-temperature equipment (BOECK) 4.

Blast furnace. W. P. THORNTON. U. S., 1,167,729, Jan. 11. Metal shell and H₂O-trough structure.

Furnace brick. W. J. HILLIS. U. S., 1,168,211, Jan. 11. Ground flint 20, is mixed with plastic clay 10, carborundum 30 and "binding" or "hard flint" clay 40% to form a brick which is adapted to stand extreme heat, *e. g.*, as a lining of open-hearth steel furnaces.

Desulfurizing and smelting ores. A. S. DWIGHT. U. S., 1,169,069, Jan. 18. Fine ores are sintered into thin layers or blocks without addition of any binder and the sintered material is fed gradually edgewise into a smelting flame.

Ore-concentrating and amalgamating apparatus. W. L. MCLEAN. U. S., 1,169,083, Jan. 18.

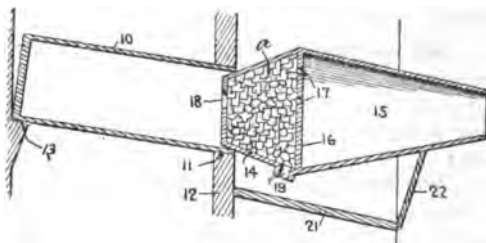
Obtaining lead or zinc in an electric furnace. A. HELFENSTEIN. U. S., 1,167,998, Jan. 11. Pb or Zn ores are distd. in an elec. furnace and the metal vapors and gases are exhausted from the distg. zone and the CO and CO₂ are used for heating the incoming charge in a preheating zone. The gases generated in the latter are drawn off

to avoid contamination of the metal vapors with oxide-forming gases and to minimize or prevent formation of metallic dust.

Extracting zinc from ores. F. LAIST and F. F. FRICK. U. S., 1,167,700, Jan. 11. ZnS ore containing Fe is roasted with MnS or MnCO_3 , leached with dil. H_2SO_4 , oxidized with MnO_2 to convert ferrous into ferric Fe and the latter is pptd. by $\text{Ca}(\text{OH})_2$. The purified soln. is electrolyzed to deposit the Zn, using insol. anodes, and the acid soln. remaining which contains highly oxidized Mn compds. is used for extg. Zn from other portions of roasted ore.

Extracting zinc from ores. F. LAIST and F. F. FRICK. U. S., 1,167,701, Jan. 11. Zn is recovered from oxidized ores containing Fe by leaching with hot dil. H_2SO_4 , oxidizing the ferrous compds. in soln. by treatment with MnO_2 , purifying the soln. by addition of an excess of calcined ore and action of MnO_2 , and electrolytically depositing the Zn with simultaneous regeneration of MnO_2 .

Zinc-extraction apparatus. M. M. PEARLMAN. U. S., 1,167,925, Jan. 11. A retort 10 for generating Zn vapors communicates through the opening 18 with a filtering chamber 14 filled with refractory material *a* which is sepd. from the condensing chamber 15 by a perforated wall 16. 21, 22 are supports for holding the filter and condenser in position at the mouth of the retort.



Briquetting zinc ores. O. KIPPE. U. S., 1,168,401, Jan. 18. A soln. of Mg, Zn, Ca or Fe sulfate or chloride is used to moisten Zn ore mixed with "blue powder" or "Zn ashes or trimmings" and the solvent is evapd. after pressing the material into briquets.

Heating metal billets with powdered coal as fuel. W. P. BARBA. U. S., 1,167,472, Jan. 11. Powdered coal used for heating billets or other metal articles is mixed before use with about 2-5% of CaCO_3 to raise the m. p. of the ash produced so that it may adhere to the articles and form a protective coating on them and avoid production of scale.

Heating metals with powdered coal. W. P. BARBA. U. S., 1,167,471, Jan. 11. About 2-4% of powdered refractory clay is added to powdered coal before burning in furnaces containing billets or metal to be forged in order to raise the m. p. of the ash formed and avoid production of scale on the metal.

Heating metals with powdered coal. W. P. BARBA. U. S., 1,167,470, Jan. 11. About 2% of SiO_2 is added to powdered coal to be burned in furnaces, for heating metal billets, to combine with alkalis in the coal and minimize the formation of scale on the billets.

Apparatus for recovering metals and ammonia from solutions. F. L. WILSON. U. S., 1,167,460, Jan. 11. Ammoniacal liquors obtained in the treatment of ores of Zn, Cu or Ni with NH_3 and CO_2 are passed through the app. continuously and heated to effect distn. and recovery of NH_3 and pptn. of the metals as carbonates and hydroxides.

Protecting iron or steel against rust. W. H. ALLEN. U. S., 1,167,966, Jan. 11. Fe or steel articles to be rust-proofed are immersed in a soln. containing about 3% of $\text{Ca}(\text{H}_2\text{PO}_4)_2$ and carrying also about 0.4% of $\text{Mn}_2\text{O}_3 \cdot \text{H}_2\text{O}$, while passing air through the soln., until a layer of ferrosferric phosphate is formed.

Alloy-coated iron or steel. CLAYTON MARK, JR. and CLARENCE MARK. U. S., 1,168,663, Jan. 13. Fe or steel articles are coated with an alloy of Pb 92, Sb 4.5 and Zn 3.5% to protect them from corrosion. A bright hard coating of good resistance to acids is produced, which does not easily flake or peel off.

Coating iron or steel with lead alloy. CLAYTON MARK, JR. and CLARENCE MARK. U. S., 1,168,664, Jan. 18. Fe or steel articles are dipped into a molten alloy of Pb 86-98, Sn 1-8 and Zn 1-6% which is protected by a layer of NH_4Cl flux containing Zn and Fe. The bath is maintained at a temp. of 400-500°.

Copper alloy for edge tools. W. C. PEASE. U. S., 1,168,962, Jan. 18. Cu is alloyed with Al 6.6, Fe 1.96, Sb 1.26 and Si 1.6%, to harden it. The Sb may be omitted, using the Si 0.74; Al 3.08 and Fe 1.80%.

Electric resistance alloy. M. A. HUNTER. U. S., 1,168,074, Jan. 11. An alloy is formed of Cu 5-25, Ni 75-95 and Cr 10-25 parts, the preferred proportions being 15:85:20, resp.

Alumino-thermic mixture. J. H. DEFFELER. U. S., 1,168,061, Jan. 11. In welding by alumino-thermic mixts., a body of added metals is placed in a container sheet of Fe or other fusible material which is preheated with the mold used in welding and is then allowed to unite with the molten metal produced by the alumino-thermic mixt.

Welding different metals. H. SEIDLER. U. S., 1,168,752, Jan. 18. A casing of molten Cu is poured around a core of steel or other metal of higher m. p. than the casing metal, the 2 metals are heated to the welding temp. and are allowed to cool so that the contraction of the casing metal on the core effects a firm weld.

Welded gold-silver plate. C. J. THORP. U. S., 1,168,441, Jan. 18. Sheets of Au and Ag are fused together, one upon the other, to form a composite plate with Au on one face and Ag on the other, for use in density for making crowns, etc.

10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

Hugo Schiff. ANON. *Chem. Ztg.* 40, 37-8(1916).—Died Sept. 8, 1915. An obituary. J. H. MOORE.

Precipitation of quinine salts in saline solutions. FRANCESCO LENCI. *Giorn. farm. chim.* 64, 154-60(1915).—L.'s results confirm those obtained by Tarugi (d. C. A. 8, 2687). E. J. C.

Condensation of chloromethyl ether with α -alkylacetoacetic esters. ARTHUR LAPWORTH AND BENJAMIN S. MELLOR. Manchester. *J. Chem. Soc.* 107, 1273-80 (1915).— CH_2ClOMe in dry Et_2O reacted with $\text{AcNaMeCO}_2\text{Me}$ to form *methoxy-methoxy- β -methoxy- α -methylcrotonate*, $\text{MeOCH}_2\text{OCMe:CMcCO}_2\text{Me}$, b. 113°, rather stable towards concd. KOH and NaHSO_4 , and without action upon PhNHNH_2 , from which the corresponding *free acid* (A), feathery crystals or flat needles from petroleum, m. 72°, was obtained by very gradual hydrolysis with KOH in MeOH. When heated (A) loses CO_2 with the formation of small amts. of HCO_2H and of *γ -methoxymethoxy- Δ^2 -butylene*, $\text{MeOCH}_2\text{OCMe:CHMe}$, b. 183-5°, readily adding 1 mol. Br, and yielding HCHO when heated with mineral acids. When heated with H_2O at 150° in sealed tubes for 5 hrs., (A) lost CO_2 and formed HCHO and EtCOMe . Very similarly $\text{AcNa}(\text{CH}_2\text{Ph})\text{CO}_2\text{Me}$ reacted with CH_2ClCOMe to form *ethyl methoxy- β -methoxy- α -benzylcrotonate*, $\text{MeOCH}_2\text{OCMe:C}(\text{CH}_2\text{Ph})\text{CO}_2\text{Et}$, viscid oil with pungent odor, b. 174-5°, devoid of all ketonic properties, absorbing Br, and decolorizing KMnO_4 . The corresponding *free acid* (B), needles, m. 108°, which when heated gives rise to

CO_2 , γ -methoxymethoxy- δ -phenyl- Δ^8 -butylene, b. $238-40^\circ$, and small amts. of HCO_2H . H_2O acting upon (B) at 150° causes the loss of CO_2 and the formation of $\text{PhCH}_2\text{CH}_2\text{COMe}$. The Me ester of (A) readily condensed with $\text{AcCH}_2\text{CO}_2\text{Me}$ or $\text{AcCH}_2\text{CO}_2\text{Et}$ in the presence of ZnCl_2 and Ac_2O to form cryst. products. $\text{AcCH}_2\text{CO}_2\text{Et}$ led to the formation of a substance ($\text{C}_{12}\text{H}_{16}\text{O}_8$?), which could not be readily purified, but $\text{AcCH}_2\text{CO}_2\text{Et}$ yielded the compound $\text{C}_{11}\text{H}_{16}\text{O}_8$, m. $88-8.5^\circ$, readily changing to a gummy mass on exposure to air and having either 1 OCH_2OMe or 2 MeO groups (as shown by the Zeisel no.). All attempts to obtain definite hydrolysis products of this compd. were unsuccessful.

LOUIS E. WISE.

Rotatory power and refractivity. II. Rotatory powers, refractivities, and molecular solution volumes of camphor, bromocamphor, and ethyl tartrate in certain solvents. DAVID H. PRACOCK. Nobel's Explosive Factory, Ardeer, Ayrshire. *J. Chem. Soc.* 107, 1547-67 (1915); cf. *C. A.* 9, 749.—Using Livens' equation for $[\alpha]$ per unit length of solns. (cf. *C. A.* 7, 2896), P. deduces the following equation connecting rotatory power and refractivity: $r'p^2a(n^2-1)(n^2-1+1/a)/2 = [\alpha]$, where r' = const. arising from a term in Livens' equation, p is the frequency of the light employed, and a is a const. which can be calcd. from the equation $[\alpha_1]/[\alpha_2] = (n_1^2-1)(n_1^2-1+1/a)/(n_2^2-1)(n_2^2-1+1/a)$. The above equation does not take absorption into account. In order to test the truth of the theoretical relationship by means of expt., P. has detd. the $[\alpha]_D^{25}$ and n_D^{25} (as well as the d_4^{25} and V_m) for varying concns. in the case of camphor in EtOH, acetone, AcOEt, PhH, PhCl and iso-BuOH; of solns. of bromocamphor in EtOH, acetone, AcOEt, PhH; and of Et tartrate in iso-BuOH and BuOH. The values for the expressions, $(n^2-1)(n^2-1+1/a)$ (expression (A)) and $(n^2-1)(n^2-1+1/a)/[\alpha]_D$ (expression (B)) were found for all the concns. studied. According to the above equations, as long as the $[\alpha]_D$ of a substance remains of the same sign, in various solvents, the sign of expression (A) should remain unchanged. The value for expression (B) for a given series of solns. should remain const. provided the variation of $[\alpha]_D$ with concn. is due to variations in the velocity of light within the medium. P. finds, however, that in certain cases there are inconsistencies between the theory and the exptl. facts, possibly due to such factors, as absorption, which have not been considered. In very many other cases there is a close agreement between $[\alpha]$ and the "refractive expression." In general, camphor solns. showed a rather close agreement for the relation between rotatory power and refractivity. Camphor, in PhH, however, gave somewhat excessive variations in the value of expression (B), suggesting the possibility of the effect of PhH absorption bands. The curves for $[\alpha]_D$ of camphor in acetone and AcOEt resemble each other very closely, and the refractive expressions are also in very good agreement. The relation between $[\alpha]_D$ and refractivity are somewhat closer in the bromocamphor series than in the camphor series. Here the values for expression (B) of the EtOH and acetone solns. are practically identical, although $[\alpha]_D$ of the 2 series show marked variation, a fact which points to the change in the optical properties of the medium, and not to the deformation of the bromocamphor mol. In the case of Et tartrate in iso-BuOH and in BuOH, the general connection between $[\alpha]_D$ and n fails to hold. A minimum of $[\alpha]_D$ was noted in both cases (cf. Patterson, *J. Chem. Soc.* 79, 47 (1901)). Camphor in iso-BuOH also fails to show the usual connection between $[\alpha]_D$ and n . This indicates that the above effects are in part characteristic of iso-BuOH. The limitations of the methods used, the errors in calcg. the values of consts. and the discrepancies between theory and exptl. data are discussed. All data are tabulated, curves have been drawn whenever possible, and the derivations of equations are indicated.

LOUIS E. WISE.

Thermal decomposition of hydrogenated hydrocarbons. DAVID T. JONES. Eskmeals, Cumberland. *J. Chem. Soc.* 107, 1582-8 (1915).—Cyclohexane (A), methyl-

cyclohexane (B) and 1,4-di- and 1,2,3,4-tetrahydronaphthalene, (C) and (D), resp., were thermally decompd. in contact with porous porcelain. The decompns. were carried out in a hard glass bulb, constructed to allow complete air exhaustion prior to the introduction of the hydrocarbon, and to permit heating in an electric furnace. A manometer attachment registered the first signs of expansion, and the heating was continued at a temp. slightly above that at which the decompn. began, until expansion had practically ceased. After cooling, the gaseous products were quant. removed by means of a Sprengel pump and analyzed in a Bone and Wheeler gas analysis app., the absorbants being H_2SO_4 to remove PhH and the olefins with more than 3 C atoms; $\text{Ag}(\text{NH}_3)_2\text{Cl}$ to remove C_2H_2 and $\text{MeCH}:\text{CH}_2$. H was detd. by treatment with oxidized Pd; CH_4 and C_2H_4 were detd. by explosion methods. Decompn. of (A) was effected at 500° , the compn. of the resulting mixt. being approx. as follows: 26.1% PhH and higher olefins, 0.2% C_2H_2 , 8.5% C_2H_4 , 40.3% H, 3% CH_4 , and 21.9% C_2H_6 , the latter value being too high owing to undecompd. (A). (B) decompd. at 530° , yielding 12.8% C_6H_6 and C_8H_{10} , traces of C_2H_2 , 10.6% C_2H_4 , 42.1% H, 22.5% C_2H_6 , and 12% C_3H_8 . (C) decompd. at 420° , yielding a large amt. of C_{10}H_8 and a mixt. of 85.4% H and 14.6% CH_4 , with traces of C_8H_{10} . (D) heated at 530° yielded 3.3% PhH and C_8H_{10} , 3.5% C_2H_4 , 80.2% H, 9% CH_4 , and 4% C_2H_6 . The app. used in the decompn. is described in detail. The results are contrasted with those of other investigators in the field of thermal decompn. (cf. Haber, *Ber.* 29, 2691(1896), and Thorpe and Young, *Proc. Roy. Soc.* 21, 184(1873)), and the mechanism of the decompn. of H is briefly discussed.

LOUIS E. WISE.

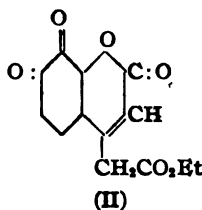
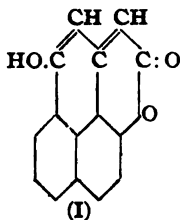
Coumarin condensation. BIMAN B. DRY. *Imp. Coll. Sci., South Kensington. J. Chem. Soc.* 107, 1606-51(1915).—D. has studied the reactions of a number of phenols with $\text{OC}(\text{CH}_3\text{CO}_2\text{H})_2$ (A) and with various β -ketonic esters. An investigation of the action of $\text{CH}_3(\text{CO}_2\text{Et})_2$ upon phenols in the presence of EtONa showed that coumarin-acetic acids were the condensation products. The literature relating to similar coumarin condensations is reviewed in detail (cf. especially, Pechmann, *Ber.* 17, 929, 1646, 2187(1884); 32, 3681, *et al.*). In the presence of concd. H_2SO_4 , α -naphthol and (A) condense to form 1,2, α -naphthapyrone-4-acetic acid, $\text{C}_{10}\text{H}_6\text{O}.\text{CO}.\text{CH}:\text{CCH}_2\text{CO}_2\text{H}$ (B), appearing

in 2 modifications: a yellow cryst. powder (deposited by the original condensation mixt.), m. $212-3^\circ$, and slender, yellow plates, m. 181° . Both forms when heated above their m. ps. evolve CO_2 and yield 4-methyl-1,2, α -naphthapyrone. (B) gives a pale yellow *monosilver salt*, but after heating with alkali, neutralizing and adding AgNO_3 , the Ag salt of the corresponding naphthylglutaconic acid was formed. The following derivs. of (B) were prepd.: *ethyl ester*, long, prismatic needles, m. 139° ; *anilide*, short needles with a greenish tint, m. 264° (with charring); *amide*, prisms, m. 262° . The nitration of (B) in glacial AcOH with the subsequent addition of H_2SO_4 gave rise to 6-nitro-1,2, α -naphthapyrone-4-acetic acid, yellow nodules from glacial AcOH , m. 212° , with the evolution of CO_2 , and the formation of 6-nitro-4-methyl-1,2, α -naphthapyrone (C), nodular masses from $\text{C}_6\text{H}_5\text{N}$, m. 236° (also formed by the nitration of 4-methyl-1,2, α -naphthapyrone). When boiled with aq. NaOH , (C) was converted into *sodium β -4-nitro-1-hydroxy-2-naphthylcrotonate*, red, prismatic needles, which, when decompd. with cold HCl , yielded the *free acid*, 2,4-($\text{HO}_2\text{CCH}:\text{CMe}$)(O_2N) $\text{C}_{10}\text{H}_7\text{OH}$, m. $128-30^\circ$ (decompn.). On oxidation with KMnO_4 , (C) gave rise to 1,4,2- $\text{C}_{10}\text{H}_6(\text{OH})(\text{NO}_2)\text{CO}_2\text{H}$, m. 214° (cf. König, *Ber.* 23, 807(1890)). On reduction with SnCl_2 , (C) was converted into the corresponding *amino derivative*, lustrous, yellow needles from PhNO_2 , m. 243° , whose *hydrochloride*, prisms, decomp. $276-8^\circ$; *acetyl derivative*, needles, m. $277-8^\circ$; *benzoyl derivative*, long needles, m. $261-2^\circ$. P_2S_5 acting upon 4-methyl-1,2, α -naphthapyrone in xylene, gave rise to 2-thio-4-methyl-1,2, α -naphthapyrone

(D), yellow microprisms, with metallic green reflex, from glacial AcOH, m. 187°, which when heated in PhH with HgO was converted into the original pyrone. (D) in alc. reacted with HONH₂ to form *4-methyl-1,2,α-naphthapyrone oxime*, C₁₀H₈O.C(:NOH).CH:CMc, soft, yellow needles, m. 235°. The Et ester of (B)

gave rise to *ethyl 2-thio-1,2-α-naphthapyrone-4-acetate*, golden yellow needles from glacial AcOH, m. 146°. (A) and β-naphthol reacted to form *4,3-β-naphthapyrone-1-acetic acid* (E), C₁₀H₆C(CH₂CO₂H):CH.CO.O, freshly pptd., m. 202-3°; if recrystd. from

alc., yellow needles, m. 191°, and changing into 4,3-β-naphthapyrone. The colorless silver salt of (E) is formed in cold neutral soln. If (E) is boiled in aq. NaOH for several hrs., the soln. neutralized with HNO₃ and AgNO₃ added, pale yellow *disilver β-2-hydroxy-1-naphthylglutaconate* is formed. The *ethyl ester of (E)*, plates, m. 164°; *methyl ester*, pale yellow plates, m. 187°. (E), after boiling with 16% aq. NaOH, formed *β-2-hydroxy-1-naphthylglutaconic acid*, yellow powder, m. 174° (with the formation of CO₂ and 1-methyl-4,3-β-naphthapyrone) and reconverted into (E) on attempted recrystn. from alc. or other solvents. *2-Thio-1-methyl-4,3-β-naphthapyrone*, yellow needles, with green reflex, m. 199°, and *1-methyl-4,3-β-naphthapyrone oxime*, lemon-yellow needles, m. 197°, were both prepd. by methods analogous to those previously outlined. By treating 1-methyl-4,3-β-naphthapyrone in boiling AcOH with Cl, or by condensing β-naphthol with AcCH₂CO₂Et, D. obtained *2-chloro-1-methyl-4,3-β-naphthapyrone* (F), prismatic needles, m. 135°. When (F) in alc. was heated with concd. aq. KOH, and the soln. acidified D. obtained *α-chloro-β-2-hydroxy-1-naphthylcrotonic acid*, HOC₁₀H₆CMc:CCICO₂H, plates, m. 148° and reverting into (F), possessing an aromatic odor. With similar treatment, 4,3-β-naphthapyrone yielded *β-2-hydroxy-1-naphthylcrotonic acid*, HOC₁₀H₆CMc:CHCO₂H, mica-shaped plates, m. 146°, possessing an aromatic odor. Et 4,3-β-naphthapyrone-1-acetate, when heated in concd. H₂SO₄ for 1 hr. at 120-30° and the product poured into cold H₂O, deposited 5-hydroxy-2-keto-*peri-peri-naphthindenofurane* (I), soft, yellow needles with greenish reflex, m. 280-2°



(charring). Its *sodium salt*, orange-red prisms, becoming purple on exposure to light. *Acetate*, short, yellow needles, m. 211-2°, fluorescing in alc. *Benzoate*, soft needles, from alc., m. 207°; *methyl ether*, m. indefinitely, 224-9°. 7-Hydroxycoumarin-4-acetic acid (G) (cf. Burton and Pechmann, *Ann.* 261, 167 (1891)) formed by the method outlined above yields the *disilver β-2,4-dihydroxyphenylglutaconate*, yellow ppt. Et ester (H) of (G), needles, m. 157°, not 134° (as given by P.), was prepd. by condensing *m*-(HO)₂C₆H₃ with NaHC(CO₂Et)₂ in abs. alc. The *acetate* of (H), needles, m. 124°; *benzoate*, needles, m. 126°; *methyl ester* of (G), silky needles, m. 122°; *methyl ether* of (G), prisms, m. 187°, with evolution of CO₂ and formation of 7-methoxy-4-methylcoumarin, m. 159° (cf. P. and Duisberg, *Ber.* 16, 2125 (1883)). The *ethyl ester* of the Me ether of (G), aggregates of radiating needles, m. 105°. On chlorination in AcOH, (G) formed the 3,6,8-trichloro derivative, m. 246° with evolution of CO₂ and formation of 3,6,8-trichloro-7-hydroxy-4-methylcoumarin (cf. Fries and Lindemann, *C. A.* 8, 1744). The tri-Cl acid, when boiled under reflux for 4 hrs. with 20% alc. KOH and

the soln. acidified, yielded 4,6-dichloro-5-hydroxy-1-carboxycoumarone-2-acetic acid, $\text{Cl}_2(\text{HO})\text{C}_6\text{H}_2\text{O}(\text{CO}_2\text{H})\text{:CCH}_2\text{CO}_2\text{H}$, m. 256-7°, yielding a cryst. silver salt. Quinol

reacted very feebly with (A), but condensed with the Et ester of (A) to form ethyl 6-hydroxycoumarin-4-acetate, fern-like needles, m. 174-6°. Catechol and (A) reacted to form a very small quantity of 8-hydroxycoumarin-4-acetic acid, needles, m. 228-30°. 7-Methylcoumarin-4-acetic acid (cf. Fries and Volk, C. A. 5, 1411) forms an anilide, blunt needles, m. 250°; a 3,6-dichloro derivative, plates, m. 231-2°, with the formation of 3,6-dichloro-4,7-dimethylcoumarin. A poor yield of 6-methylcoumarin-4-acetic acid, needles, m. 181°, was obtained, by the usual procedure, from 4-MeC₆H₄OH. The ethyl ester, silky needles, m. 131°; anilide, powder, m. 242-3°; 3-chloro derivative, fine, silvery needles, m. 163-4°, which, on boiling with alc. KOH, formed 1-carboxy-4-methylcoumarone-2-acetic acid, needles, m. 244°; silver salt (not characterized). Ethyl 8-methylcoumarin-4-acetate, microneedles, m. 114°, formed by treating o-cresol and (A) with abs. alc. and H₂SO₄, gave rise to the free acid, needles, m. 184°, with evolution of CO₂ and formation of 4,8-dimethylcoumarin, soft needles, m. 118°. Orcinol was the mother substance of 5-hydroxy-7-methylcoumarin-4-acetic acid (J), needles, m. 260-5°, passing into the anhydride (not characterized), on drying at 150-60°. (J) yields silver β-2,6-dihydroxy-p-tolylglutaconate, when treated by the usual method. Ethyl ester of (J), pale yellow, silky needles, m. 219°, forming a cryst. sodium derivative, an acetyl derivative, needles, m. 139°, and a benzoyl derivative, plates, m. 165°. The methyl ether of the methyl ester of (J), slender prisms, m. 133°, the mother liquor from which, upon acidification, yielded the methyl ether of (J), needles, m. 205°. Alk. KMnO₄ oxidized (J) to p-orsellinic acid, m. 166-8° (decompn.) (p-orsellinic acid prepd. from orcinol m. 162-4°, and the mixt. of acids m. 162-4°). o-4-Xylenol readily condensed with (A), forming 6,7-dimethylcoumarin-4-acetic acid (K), powder, m. 213-4° (when freshly pptd.), but m. 198° (decompn.) when crystd. from alc., passing, when heated, into 4,6,7-trimethylcoumarin, m. 169°. Ethyl ester of (K), needles, m. 145°; anilide, needles, m. (charring), 259-60°; 8-nitro derivative of (K), yellow needles, m. 189-90°; 3-chloro derivative, oblong plates, m. 194-6°. 2-Thio derivative of the Et ester of (K), prepd. by the usual method, reddish yellow needles, m. 156°. The following pyrogallol derivs. were synthesized: 7,8-Hydroxycoumarin-4-acetic acid, hard needles, m. 214-5°, showing daphnetin color reactions, and decompg. into β-methyl daphnetin (cf. P. and Cohen, Ber. 17, 2188(1884)); ethyl ester (L), prismatic needles, m. 191°; anilide, microcrystals, m. 270-2° (decompn.). (L) in dry acetone, when oxidized with an excess of PbO₂, formed ethyl 7,8-diketocoumarin-4-acetate (II), scales, from petroleum-PhH mixts., m. 170-5°, reducing NH₂-AgNO₃, converted by alkalis and H₂SO₄ into the original coumarinacetic acid. Methyl 7,8-dimethoxycoumarin-4-acetate, woolly needles, m. 139°, is readily hydrolyzed by alkalis into the corresponding free acid, sandy, cryst. powder, m. 179°. 6,7-Dihydroxycoumarin-4-acetic acid (from hydroxyquinol), short prisms, m. 214° with evolution of CO₂ and the formation of 4-methylesculetin (P. and Krafft, Ber. 34, 423(1901)). Its ethyl ester, needles from acetone, m. 214°. 5,7-Dihydroxycoumarin-4-acetic acid (1 mol. H₂O) (prepd. from phloroglucinol), m. 204-5°, forming an internal anhydride, C₁₁H₆O₆ (m. p. not given), when heated at 140-50°. From 4-ClC₆H₄OH, D. obtained 6-chlorocoumarin-4-acetic acid, slender needles, m. 182° with conversion into 6-chloro-4-methylcoumarin. Ethyl ester, silky needles, m. 167°. 6-Chloro-m-cresol was the mother substance of 6-chloro-7-methylcoumarin-4-acetic acid, flakes, m. 206° with the formation of 6-chloro-4,7-dimethylcoumarin, m. 213° (also formed from ClMeC₆H₄OH and AcCH₂CO₂Et). 3-Me₂NC₆H₄OH and the Et ester of (A) gave rise to ethyl 7-dimethylaminocoumarin-4-acetate, slender, colorless prisms, m. 133°, giving an intensely bluish violet fluorescence in alc., which disappears on addition of acid. On careful hydrolysis the ester yields

the *free acid*, yellow needles, m. 168°, giving rise to the corresponding coumarin, m. 145°. More vigorous hydrolysis of the ester with hot alkali causes scission of the coumarin ring. The following were products obtained by condensing $\text{EtO}_2\text{C.COCH}_2\text{CO}_2\text{Et}$ with phenols: (from *p*-cresol) *ethyl 6-methylcoumarin-4-carboxylate*, needles, m. 155–7°; *free acid*, m. 208–10°; (from *p*- $\text{ClC}_6\text{H}_4\text{OH}$) *ethyl 6-chlorocoumarin-4-carboxylate*, bright yellow needles, m. 96–7°; *free acid*, pale yellow needles, m. 224°; (from 6-chloro-*m*-cresol) *ethyl 6-chloro-7-methylcoumarin-4-carboxylate*, golden yellow needles, m. 117°; *free acid*, powder, m. 246°; (from *m*-cresol) *ethyl 7-methylcoumarin-4-carboxylate*, pale yellow needles, m. 94–6°; *free acid*, m. 200°; (from β -naphthol) *ethyl 4,3- β -naphthapyrone-4-carboxylate*, prisms, m. 138° (cf. Bartsch, *Ber.* 36, 1968(1903), who failed to obtain this product); *free acid*, m. 256°. Condensation between phenols and $\text{AcCHClCO}_2\text{Et}$ (prepd. by a slight modification of Allihn's method, *Ber.* 11, 569(1878)) gave rise to the following compds.: (from *p*-cresol) *3-chloro-4,6-dimethylcoumarin*, long needles, m. 160°, quant. converted by alc. KOH into 2,4-dimethylcoumarilic acid, m. 224°; (from *m*-cresol) *3-chloro-4,7-dimethylcoumarin*, prismatic needles, m. 135°, converted into the corresponding coumarilic acid by alc. alkali; (from *o*-4-xenol) *3-chloro-4,6,7-trimethylcoumarin*, needles, m. 170°, converted by alc. alkali into 2,4,5-trimethylcoumarilic acid, needles, m. 249–50° (decompn.), which was changed into the corresponding coumarone, m. 41° (cf. Störmer, *Ann.* 312, 300(1900)) when distd. with lime; (from phloroglucinol) *3-chloro-5,7-dihydroxy-4-methylcoumarin*, yellow needles, m. 306–8° (decompn.); *dimethyl ether*, needles, m. 170°; *diacetate*, silvery needles, m. 154°; *dibenzoate*, rhombic plates, m. 187°; (from hydroxyquinol) *3-chloro-6,7-dihydroxy-4-methylcoumarin*, needles, m. 259°; *diacetate*, needles, m. 172°; *dibenzoate*, flat, slender needles, m. 193°; (from α -naphthol) *3-chloro-4-methyl-1,2- α -naphthapyrone*, long, stout needles, m. 225–7°, quant. converted into α -naphthafurane-1-carboxylic acid when heated with alc. KOH. The following are derivs. of $\text{EtO}_2\text{C.COCHClCO}_2\text{Et}$: (from *m*-cresol) *ethyl 3-chloro-7-methylcoumarin-4-carboxylate*, sharp needles, m. 154°, yielding, with alc. KOH, *5-methylcoumarone-1,2-dicarboxylic acid*, powder, m. 218–21°; (from *o*-4-xenol) *ethyl 3-chloro-6,7-dimethylcoumarin-4-carboxylate*, needles, m. 177°, giving rise to *4,5-dimethylcoumarone-1,2-dicarboxylic acid*, needles, m. 321–24°. The foregoing di- CO_2H acid on heating with lime probably formed 4,5-dimethylcoumarone, oil. The above hydroxycoumarins dissolve in cold alkali with a yellow color of varying intensity. On methylating the OH group or otherwise destroying the active H the coumarins produced dissolve in hot alkali without coloration. LOUIS E. WISE.

Displacement of the halogen in optically active phenylhalogenacetic acids by the anilino group. ALEXANDER MCKENZIE AND STANLEY C. BATE. Univ. St. Andrews, Dundee. *J. Chem. Soc.* 107, 1681–5(1915).—*dl*-(PhNH)PhCHCO₂H (A) (cf. Knoevenagel, *Ber.* 37, 4084(1904), *et al*) was prepd. both from *dl*-PhCHClCO₂H (B) and *dl*-PhCHBrCO₂H by reaction with PhNH₂ under varying conditions. The following is a convenient method for the prepn. of (A): 1 mol. of (B) was heated for 6.5 hrs. on the H₂O bath with 4.4 mols. of PhNH₂. An excess of 2 *N* NaOH was added, the unchanged PhNH₂ removed with steam and (A) pptd. by means of aq. HCl. (A) crystd. from C₆H₆ in leaflets, m. 174–5° after drying *in vacuo*. (The data quoted in the literature regarding the m. p. are discordant.) Re-resolution of (A) was effected by means of the cinchonine salt. An equimol. mixt. of (A) and cinchonine in EtOH deposited *cinchonine l-phenylanilinoacetate*, glassy needles, not obtained c. p., which, after treatment with NH₄OH, followed by acidification with dil. H₂SO₄, yielded the *free l-acid* (C), m. 188°, [α]_D (acetone) –117.9°, (EtOH) –111.7°, (AcOEt) –106.8°. *l*-PhCHClCO₂H (D), when heated with 9.5 mols. of PhNH₂ in aq. NaOH, yielded a partially racemized *d*-(PhNH)PhCHCO₂H, [α]_D 25°. When the *d*-isomer of (D) was similarly treated, a partly racemized (C) was obtained. Less racemization was

noted when the reaction between (*D*) and PhNH_2 was carried out in dry PhH . Direct heating of (*D*) with PhNH_2 , with or without the subsequent addition of NaOH , yielded a very feebly *d*-rotatory anilido acid. A much less racemized acid was obtained ($[\alpha]_D^{25}$ 92.5° and 99°) by condensing *l*- $\text{PhCHBrCO}_2\text{H}$ with PhNH_2 in aq. alkali or in dry PhH . (*C*) undergoes partial racemization when treated with aq. alkali, the racemization increasing with the concn. of the base. Parallel control expts. showed that alkali had a much greater racemizing effect on (*C*) than had aq. alkali.

LOUIS E. WISS.

Experiments on the Walden inversion. X. Displacement reactions with *l*-phenylbromoacetic acid. ALEXANDER MCKENZIE AND NELLIE WALKER. Univ. St. Andrews, Dundee. *J. Chem. Soc.* 107, 1685-1701(1915); cf. *C. A.* 7, 2548.—A study of the Walden inversion with *l*- $\text{PhCHBrCO}_2\text{H}$ (*A*) was undertaken in order that 2 acids of the types *CabcCl* and *CabcBr* might be contrasted. (For data relating to the *Cl* acid, cf. *C. A.* 2, 2236; 3, 2963; and Senter, *C. A.* 9, 2520.) The resoln. of *dl*- $\text{PhCHBrCO}_2\text{H}$ was effected as follows: To 63 g. morphine in 900 cc. MeOH were added 90 g. of the *dl*-acid. Crystn. was then allowed to proceed during 6 hrs. (longer time periods possibly favoring partial elimination of the *Br*). The resulting morphine salt was decompd. with cold aq. H_2SO_4 , the product extd. with Et_2O , the exts. dried over Na_2SO_4 , allowed to evap. spontaneously, and the residue recrystd. 4 times from light petroleum. (*A*) thus obtained in 15 g. yield sepd. in large glistening leaflets, m. 87-8°, $[\alpha]_D^{15.6}$ -147°, $[\alpha]_{441}$ -178.2°. Modifications of the resoln. method resulted in the formation of $\text{PhCHBrCO}_2\text{H}$ mixts. of varying $[\alpha]_D$. The action of H_2O upon (*A*) at room temp. led to the formation of $\text{PhCH(OH)CO}_2\text{H}$, $[\alpha]_D$ 4.7°. The rates of racemization of a 1% aq. soln. of (*A*) were detd. at 25° and at 36.8°, and compared with the rates of *Br* displacement ("hydroxylation") at the same temps. The former were followed polarimetrically, while the hydrolysis consts. were detd. by withdrawing aliquots of the soln. at intervals, titrating with 0.025 *N* alkali, and deducing *k* from the usual equation for a unimol. reaction. The comparative data, tabulated and graphically represented, shows that racemization progresses more rapidly than does *Br* displacement. During the course of the above expts. the gradual development of a very slight but distinct *d*-rotation was at times noted, after the racemization reaction had apparently proceeded to completion. McK. and W. suggest the following explanation of the action of H_2O upon (*A*): An initial formation of *dl*- and *l*- $\text{PhCH(OH)CO}_2\text{H}$ (*B*) is followed by a slight reaction in the opposite direction, between HBr and (*B*), resulting in the formation of *d*- $\text{PhCHBrCO}_2\text{H}$ which is rapidly transformed into a mixt. of *dl* and *d*- $\text{PhCH(OH)CO}_2\text{H}$. A quant. study of the action of a mixt. of equal vols. of acetone and H_2O upon (*A*) also showed that the velocity of racemization was appreciably greater than the rate of hydroxylation. *Morphine l*-phenylbromoacetate, prisms(?) very sparingly sol. in the common solvents, was formed by the addition of 1 mol. of (*A*) to 0.5 mol. of morphine in MeOH . After boiling this salt for 2 hrs. with 113 parts H_2O , an optically inactive $\text{PhCH(OH)CO}_2\text{H}$ was isolated. Data and curves comparing the action of aq. NaOH and of H_2O upon the *Na* salts of (*A*) indicate that the rate of racemization is more rapid when alkali is present. The increased rate of racemization is probably due to the action of NaOH upon the $\text{PhCH(OH)CO}_2\text{H}$ formed by hydrolysis. NH_4OH acting upon (*A*) gave a mixt. of *dl* and *d*- $\text{PhCH(NH}_2\text{)CO}_2\text{H}$ (crystd. from H_2O), $[\alpha]_D$ 97.4°. The mother liquor further yielded a $\text{PhCH(NH}_2\text{)CO}_2\text{H}$, $[\alpha]_D$ 149.3° (cf. Fischer and Weichhold, *Ber.* 41, 1286(1908)). The filtrate from this crop when acidified and extd. with Et_2O yielded a *l*-mandelic acid, $[\alpha]_D$ -55.8°. When NH_3 is passed into (*A*) in dry PhH and the mixt. acidified, a mixt. of $\text{PhCHBrCO}_2\text{H}$, m. 73-87°, $[\alpha]_D$ -28.6°, was obtained. The action of a number of compds. upon (*A*) resulted in the formation of varying $[\alpha]$. The following is a list of

the reacting compds., the $[\alpha]_D$ of the resulting mandelic acid obtained in each case being given in the parentheses: Ag_2CO_3 (95.3°); AgNO_3 (62°); Ag_2O (84.8°); HgNO_3 (37.4°); $\text{Hg}(\text{NO}_3)_2$ (21°); HgO (19.1°); PbO (13.7°); $\text{Pb}(\text{OH})_2$ (5.8°); $\text{Pb}(\text{NO}_3)_2$ (5.3°); CuSO_4 ($\approx 0^\circ$). MeONa and the Na salt of (A) gave a mixt. of *dl* and *l*- $\text{PhCH}(\text{OMe})\text{CO}_2\text{H}$, $[\alpha]_D -61^\circ$, but when the Ag salt was substituted for the Na salt a *d*- $\text{PhCH}(\text{OMe})\text{CO}_2\text{H}$, $[\alpha]_D 54^\circ$, was obtained. Similarly MeONa and $\text{PhCHClCO}_2\text{H}$ gave a mixt. of *dl* and *l*- $\text{PhCH}(\text{OMe})\text{CO}_2\text{H}$, $[\alpha]_D -40.3^\circ$, whereas $\text{PhCHClCO}_2\text{Ag}$ yielded a *d*-acid, $[\alpha]_D 40^\circ$.

LOUIS E. WISZ.

Semicarbazones. V. Semicarbazones of benzaldehyde and some of its substitution products. JAMES A. R. HENDERSON AND ISIDOR M. HILBRON. Royal Tech. Coll., Glasgow. *J. Chem. Soc.* 107, 1740-52(1915).—Continuation of previous work on the semicarbazones (*C. A.* 9, 604). A number of semicarbazones have been spectrographically examd., and the formation of their unstable hydrochlorides has been investigated. *p*- $\text{MeC}_6\text{H}_4\text{CH}:\text{NNHCONH}_2$ absorbs dry HCl , forming an unstable, yellow salt containing approx. 1.5 mols. HCl . *Salicylaldehyde semicarbazone dihydrochloride*, yellow, unstable in air; *monosulfate*, straw-yellow, decomp. 150° , fairly stable in air. *o*-*Methoxybenzaldehyde semicarbazone*, needles, m. 215° (decompn.); *dihydrochloride*, dark orange, fairly stable in air. *p*- $\text{HOC}_6\text{H}_4\text{CH}:\text{NNHCONH}_2$ (A) (cf. Borsche and Bolser, *Ber.* 34, 2098(1901), who obtained a yellow compd., m. $223-5^\circ$; and Knöpfer, *Monatsh.* 31, 72(1910), who prepd. a white substance, m. 218°) was obtained as colorless needles, m. 222° (decompn.); *dihydrochloride*, yellow, unstable; *monosulfate*, yellow. A small amt. of (A) was obtained in the form of a yellow isomer, but was apparently converted into the stable, colorless compd. on crystn. from hot alc. *p*-*Methoxybenzaldehyde semicarbazone* was obtained in 2 modifications: yellow prisms, m. 168° (sol. in acetone), and colorless needles, m. 209° (decompn.), insol. in acetone (previously prepd. by Knöpfer, *et al.*, m. $203-4^\circ$). The *dihydrochloride* is a very unstable, orange-yellow salt. The *monosulfate*, mustard-yellow, decompd. 152° , and was stable in air. Orange-yellow *vanillin semicarbazone dihydrochloride*, decomp. 78° , was very unstable in air, melted to a dark red liquid, which dried to form a pale yellow solid. *Veratraldehyde semicarbazone dihydrochloride*, dark orange-yellow, unstable in air, began to m. 90° , decompd. 130° . *Piperonal semicarbazone dihydrochloride*, orange-red salt, unstable in air, decompd. 110° . *2-Hydroxy-m-methoxybenzaldehydesemicarbazone*, needles, m. 225° (decompn.); *dihydrochloride*, yellow, unstable, m. 158° (decompn.); *2,3-dimethoxybenzaldehyde semicarbazone*, needles, m. 231° (decompn.); *dihydrochloride*, dirty yellow salt, unstable. *o*-, *m*- and *p*- $\text{ClC}_6\text{H}_4\text{CH}:\text{NNHCONH}_2$, colorless, m. $229-30^\circ$, 230° , and $232-3^\circ$, resp. (previously prepd. by Law and Perkin, *C. A.* 2, 3336, who give $225-6^\circ$, 228° and 230° , resp.). A small quantity of a yellow form of *o*- $\text{ClC}_6\text{H}_4\text{CH}:\text{NNHCONH}_2$, prisms, m. 146° , was also isolated. The *hydrochloride* of the *o*-compd., cream-colored, unstable, decompd. 203° ; the *m*-*hydrochloride*, colorless, unstable, decompd. 198° ; the *p*-*hydrochloride*, unstable, pale yellow, decompd. 182° . *o*-, *m*- and *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{CH}:\text{NNHCONH}_2$ (cf. Thiele and Stange, *Ann.* 283, 25 (1894), who give the m. p. of the *p*-compd. as 221° , whereas H. and H. find 211°) yielded, resp.: a *hydrochloride*, cream-colored, unstable, decomp. 212° ; *hydrochloride*, cream-colored, unstable, decomp. 222° ; *hydrochloride*, pink, fairly stable, not decomp. 275° . *o*-*Acetoxybenzaldehyde semicarbazone*, granular powder, m. 167° ; *dihydrochloride*, dark yellow salt, unstable in air. *o*-*Benzoyloxybenzaldehyde semicarbazone*, needles, m. $195-6^\circ$; *dihydrochloride*, cream-colored, unstable. *2-p-Nitrobenzoyloxybenzaldehyde*, pale yellow leaflets, m. 128° ; *semicarbazone*, pale yellow needles, m. 218° (decompn.); *monohydrochloride*, unstable in air. *p*- $\text{Me}_2\text{NC}_6\text{H}_4\text{CH}:\text{NNHCONH}_2$ (B) yielded a hydrochloride of indefinite constitution, containing more than 3 mols. HCl , very unstable. Spectrographic investigation showed that with 2 exceptions the above semi-

carbazonones in 0.0001 *N* alc. soln. showed a band at about $1/\lambda$ 3500, (*B*) and $p\text{-O}_2\text{NC}_6\text{H}_4\text{CH:NNHCONH}_2$ being the exceptions. When the semicarbazone contains a OH group, the addition of EtONa causes a shift in the position of the absorption band towards the red. When the H of the OH group is displaced by Me, the addition of EtONa causes no change in the position of the band. (*B*) in alc. showed the same absorption curve as $p\text{-HOC}_6\text{H}_4\text{CH:NNHCONH}_2$ in EtONa. The curves obtained for $o\text{-HOC}_6\text{H}_4\text{CH:NNHCONH}_2$ and its Me ether, and for 2-hydroxy-*m*-methoxybenzaldehyde semicarbazone and its Me ether show a band at about $1/\lambda$ 2600, in concd. H_2SO_4 , which is not present in the other curves.

LOUIS E. WISE.

Isomerism of the oximes. VII. 5-Bromovanillin oxime, 5-nitrovanillin oxime and 6-nitropiperonal oxime. OSCAR L. BRADY AND FREDERICK P. DUNN. *Imp. Coll. Sci. Tech.*, S. Kensington. *J. Chem. Soc.* 107, 1858-62 (1915); cf. *C. A.* 9, 603.—Realizing that certain negative groups in the PhH ring appear to favor the existence of isomeric oximes, B. and D. studied the effect of the introduction of negative substituents into vanillin oxime. 5-Bromovanillin (*A*) prepd. by direct bromination of vanillin in glacial AcOH, in the presence of AcONa, was converted into the oxime (*B*), needles, m. 179°. (*A*) could not be oxidized to the acid by CrO_3 in glacial AcOH nor by alk. KMnO_4 . (*B*) when boiled with Ac_2O for an hr. yielded 5-bromo-4-acetoxy-3-methoxybenzonitrile, m. 110-1°, which when heated for a few min. with dil. aq. NaOH formed the sodium derivative of 5-bromo-4-hydroxy-3-methoxybenzonitrile, plates. The latter yielded the corresponding nitrile, needles, m. 144°, which when hydrolyzed with 20% aq. NaOH formed 3,4,5-MeO(HO)BrC₆H₃CO₂H, m. 221° (cf. Robertson, *Ibid* 93, 792 (1908)). The diacetyl derivative of (*B*), cryst. powder from aq. alc., m. 122°, was formed by dissolving (*B*) in warm Ac_2O and decomp. with Na_2CO_3 , or by concn. of a mixt. of (*B*) and Ac_2O in vacuo over H_2SO_4 and Ca(OH)_2 . Hydrochloride of (*B*), m. 175° (decompn.). 5-Nitrovanillin oxime (*C*), orange-yellow needles, m. 216°; sodium salt, red needles, non-explosive but deflagrating slightly on rapid heating. With Ac_2O , (*C*) yielded a monoacetyl derivative (1 H_2O), orange needles, m. 147°; diacetyl derivative, cryst. yellow powder, m. 112°. The latter was more readily formed by treating (*C*) in $\text{C}_6\text{H}_5\text{N}$ with AcCl . The hydrochloride of (*C*), m. 204° (decompn.). 6-Nitropiperonal oxime (const. not given) yielded an acetyl derivative, yellow needles, m. 142°, but failed to form a hydrochloride.

LOUIS E. WISE.

Transition points of polymorphic phthalylhydrazides. FREDERICK D. CHATTAWAY AND WILLIAM J. LAMBERT. Oxford. *J. Chem. Soc.* 107, 1773-81 (1915).—Phthalylphenylhydrazide (*A*) exists in 2 enantiomeric forms, pale yellow orthorhombic plates and short, bright yellow, monoclinic crystals (cf. C. and Wünsch, *C. A.* 6, 1152). C. and L. have carefully detd. the soly. of the enantiomerides in EtOH and CHCl_3 , drawn 2 pairs of soly. curves, and noted the point of intersection (transition point) in each set of curves. The transition point (most accurately detd. in CHCl_3) lies at about 9.4°. The av. result of similar detns. in acetone and AcOEt was 9.5°. Phthalylphenylmethylhydrazide (*B*) exists as bright orange triclinic prisms, stable at higher temps., and compact, pale yellow, monoclinic crystals, stable at lower temps. Here the transition point was not readily detd. by the soly. method, but was shown to lie in the neighborhood of 55°. The point was very accurately detd. by the use of a dilatometer, which was packed with a mixt. of coarse crystals of the 2 forms, filled to a suitable height with a satd. soln. of (*B*) in acetone and placed in a const. temp. bath adjusted to about 55°. The dilatometer capillary was then sealed, and the temp. noted at which no increase or decrease in vol. occurred. The transition point was shown to be 55.1°. The transition point of (*B*), detd. by observing the growth of one form at the expense of the other, in a mixt. of enantiomerides covered with acetone, and noting the temp. at which no growth of either form could be detected, was shown to

be approx. 55.25°. Detailed tabulated data are given. C. and L. have also presented exptl. data in confirmation of van't Hoff's deduction (made in 1897-8) that the *ratio of solubilities of enantiomerides at a given temp. is independent of the solvent.* L. E. W.

3-gem-Dimethylpiperidine. JOHN J. G. M. DUNLOP. Cambridge. *J. Chem. Soc.* 107, 1712-3(1915).—This compd. was needed in an attempt to prep. a dicyclic quaternary NH_4 salt which should have no lateral sym. with reference to the N atom (cf. C. A. 7, 591). Of the various methods tried for the reduction of α,α -dimethylglutarimide, only that with Na in boiling AmOH gave 3-gem-dimethylpiperidine, b. 137°, smells like $\text{C}_6\text{H}_{10}\text{NH}$, best purified through the *chloroaurate*, needles, m. 182°; *hydrochloride*, very deliquescent; *hydriodide*, m. 200°, somewhat deliquescent; *benzoyl derivative*, needles, m. 68-9°. M. HEIDELBERGER.

A decomposition of certain *o*-nitromandelic acids. GERTRUDE M. ROBINSON AND ROBERT ROBINSON. Sydney. *J. Chem. Soc.* 107, 1753-62(1915); cf. C. A. 8, 3417.—3,4,6-(MeO)₃(O₂N)₂C₆H₃CHO and KCN in HOAc at room temp. for 3 days, followed by addition of H₂O, collection of the ppt. and hydrolysis with concd. HCl on the H₂O bath, gave 6-nitro-3,4-dimethoxymandelic acid, pale yellow needles, m. 169-72° (decompn.); 10 g. heated in 50 cc. PhNO₂ until the vigorous reaction commenced yielded 4,5,4',5'-tetramethoxyazobenzene-2,2'-dicarboxylic acid (A), glistening leaflets resembling hematite, m. 274° (decompn.), gives a blue color with H₂SO₄. Azoveratrole (B), when purified by recrystn. from EtOAc, m. 182°, not 163° (Kauffmann and Kugel, C. A. 5, 3813); in HOAc it gives with HNO₃ (d. 1.42) 2,2'-dinitro-4,5,4',5'-tetramethoxyazobenzene, orange needles, m. 315° (decompn.); this is also obtained by triturating (A) with HNO₃ and letting stand overnight, but differs in having a red color, due, presumably, to some isomorphous impurity, as no chem. or other phys. differences could be detected; reduced by shaking for a few days with Sn, SnCl₂, and concd. HCl, it forms 4,5-(H₂N)₂C₆H₃(OMe)₂ (C), isolated as the phenanthraphenazine, m. 259-61°, not 255° (Moureu, *Compt. rend.* 123, 33(1896)), and sol. in H₂SO₄ with a magenta, not violet color; it fluoresces violet in alc. or HPh. In HOAc with HNO₃ (d. 1.52) (B) gives a greenish yellow ppt. which redissolves to a red soln., which then yields *N*, 2,2'-trinitro-4,5,4',5'-tetramethoxyhydrazobenzene, probably RNHN(NO₂)R, yellow needles, m. 228°, gives an olive green soln., changing to blue, in warm H₂SO₄; forms (C) on reduction. 6,3,4-(O₂N)₃(CH₂O)₃C₆H₃CH(OH)CO₂H (which may be resolved through the brucine salt), when heated in PhNO₂, evolves some N, possibly due to the formation of Ph₂ compds. from the azo compd., giving a chocolate-colored mixt. from which, through the Na salt, was isolated 4,5,4',5'-dimethylenetetraoxyazobenzene-4,4'-dicarboxylic acid (D), brick-red needles, m. 270° (decompn.), sol. in H₂SO₄ with a blue color; when ground up with an excess of HNO₃ (d. 1.45) the purple liquid loses its color and yields a red ppt., which, after addition of H₂O, yields 2,2'-dinitro-4,5,4',5'-dimethylenetetraoxyazobenzene, crimson needles from PhNO₂, darkens 295°, decomps. 305°, gives a blue color in H₂SO₄; treated as in the case of the veratrole deriv. it yields 2,3-methylenedioxyphenanthraphenazine, also prepd. from 4,5-(O₂N)₂C₆H₃O₂CH₃, pale yellow needles, m. 305°, fluoresces blue-violet in HPh, sol. in H₂SO₄ with a magenta color. 20 g. 3,4-CH₂O₂C₆H₃CH₂OH, satd. at 0° in 100 cc. HOAc with HCl and then gradually treated with 30 cc. HNO₃ (d. 1.42), with cooling, gave, after standing 15 min. and pouring into H₂O, 6-nitrohomopiperonyl chloride, pale salmon-colored leaflets, m. 86°, powerfully irritating to the skin, but contains the Cl more firmly bound than in the untrated compd.; when boiled in PhNO₂ it gives (D) in poor yield; with cold MeOH-KOH it yields 2,2'-dinitro-4,5,4',5'-dimethylenetetraoxystilbene, brown-red needles, darkens 280°, but does not m. below 350°. M. HEIDELBERGER.

Monotropic polymorphic anilides. FREDERICK D. CHATTAWAY AND WILLIAM J. LAMBERT. Oxford. *J. Chem. Soc.* 107, 1766-73(1915).—Anilides cryst. in general

in 3 forms, which may be designated as the woolly, the needle, and the compact forms. It is now found that a large number of anilides may be made to cryst. in 2 of these forms, and some even in all 3. Both 2,4-Br₂C₆H₃NHAc (A) and 4-BrC₆H₄NHAc (B) have been observed by others to cryst. in 2 forms, but transformations of these forms have not been recorded. If these 2 anilides are crystd. from alc. needles first appear. These slowly redissolve, giving way to the compact form, it being necessary occasionally to seed the (A) solns. to cause the change. The rapidity of the change varies greatly with the solvent and with the compd. used, (A) requiring 6 months, 10 days, 5 days, and (B) 8 weeks, 24 hrs., 6 hrs., in 50% alc., abs. alc., and HOAc, resp., when chilled magmas of the needle form in test tubes were seeded with the stable form and allowed to stand. In CHCl₃ and HPh the change was so rapid on cooling that only the stable form could be detected. The rate of transformation increases rapidly with the temp., and is almost instantaneous just below the m. p. In both cases the compact form is the stable form between 0° and the m. p. The solys. of the 2 modifications of the 2 compds. were plotted graphically for the ranges of temp. in which the change was sufficiently slow, giving pairs of parallel curves, indicating that the compds. are monotropic. The solubilities of (A), (B), *p*-ClC₆H₄NHAc, 2,4-Cl₂C₆H₃NHAc, 4,2-ClBrC₆H₃NHAc, and 2,4-ClBrC₆H₃NHAc were detd. in EtOH between the temps. of 5° and 45°, and the results plotted in a series of curves. No general conclusions could be drawn from the curves. The solns. were weighed out in a pipet of special design, a plug of cotton wool below a constriction in the detachable stem serving to filter the soln. M. H.

Colorations produced by some organic nitro compounds with special reference to tetranitromethane. II. ALEXANDER K. MACBETH. Belfast. *J. Chem. Soc.* 107, 1824-7(1915); cf. *C. A.* 9, 1037.—A qual. examn. of the colors produced on adding C(NO₂)₄ to solns. of various unsatd. substances suggested that this might be used to indicate the amt. of residual affinity in the mol. of the substance tested, or to give a comparison of the reactivities of substances of the same or similar type. The following series of substances shows a progressively deepening set of colors from negligible to reddish brown: (CH₃)₂O, 1,4-dioxane, 1,4-thioxane (A), (CH₃)₂S (B), 1,4-dithiane (C), and MeN(CH₃)₄NMe. A study was made of the influence of the S atoms in (A), (B), and (C), by following the change in the absorption spectrum of the NO₂ compd., as given in paper I. In the case of (B) and (C) the penetrations of the band developed are nearly identical, and both are much greater than in the case of (A). These results agree with Clarke's (*C. A.* 7, 593) on the initial velocities of the S atoms in these substances with BrCH₂Bz. Another point of interest developed is that the presence in the unsatd. mol. of electronegative atoms or conjugated linkages exerts an inhibitive action on the production of color with C(NO₂)₄. This is illustrated by a number of examples. In aromatic substances, however, the conjugated linkages do not inhibit the coloration. Solvents exert a pronounced effect; petr. ether and, to a lesser degree, CHCl₃ hinder the "nitrite isomerization" to which the development of color is attributed, and H₂O accelerates it. Diagrams of the absorption spectra obtained are given. M. HEIDELBERGER.

Methoxyl determination in compounds containing sulfur. ALFRED KIRPAL AND THEODOR BÜHN. *Monatsh.* 36, 853-63(1915).—In the pyridine method the H stream earlier recommended (*C. A.* 8, 2163) can be replaced by a CO₂ stream. The method gives good results with methylimide detns. but cannot be used for EtO detns. The ordinary Zeisel method may be used as follows: CdSO₄ soln., heated to 60°, is placed before the AgNO₃ soln. This absorbs the H₂S and pptts. it as CdS. With this method EtO groups can also be detd. C. J. WEST.

Hydrolysis product of dimolecular isovaleryl cyanide and a new preparation of isobutyltartronic acid. JOSEF PLATTNER. Univ. Innsbruck. *Monatsh.* 36, 899-910

(1915).—20 cc. $(\text{Me}_2\text{CHCH}_2\text{CO})_2\text{O}$ and 9 g. KCN were allowed to stand 24 hrs., the K salt pptd. with a large vol. of Et_2O and the soln. concd., giving an oil which would not cryst. Upon hydrolysis with a mixt. of 70 g. concd. H_2SO_4 and 10 g. H_2O , this yields *dimolecular isovalerylformamide*, $\text{Me}_2\text{CHCH}_2\text{C}(\text{CONH}_2)_2\text{OCOCH}_2\text{CHMe}_2$, leaflets, m. 167° . With dil. HCl (d. 1.1) the diamide gives isobutyltartronic acid, m. 107° . *Lead, silver, barium salts*. *Phenylhydrazine salt*, cryst. powder, m. 136° . If the dicyanide is hydrolyzed with a mixt. of 70 g. concd. H_2SO_4 and 5 cc. H_2O , *isovalerylformamide*, $\text{Me}_2\text{CCH}_2\text{COCONH}_2$, is the principal product, tables, m. 60° . Upon hydrolysis with HCl this yields α -ketocaproic acid, isolated as the *silver salt*, cryst., and the *phenylhydrazone*, long needles.

C. J. WEST.

Dibutyramide and dipropyltriazole and its salts. W. MILLER. Univ. Innsbruck. *Monatsh.* 36, 929–39 (1915).—Dibutyramide is best prepd. by treating $(\text{C}_4\text{H}_7\text{O})_2\text{O}$ with small amts. of KCNO at 120° (oil bath temp.), waiting until the CO_2 evolution ceases before another lot is added. When CO_2 is no longer evolved the diamide is filtered off and the filtrate again treated with KCNO. 1 mol. diamide and 2 mols. $\text{H}_2\text{NCONHNH}_2\cdot\text{HCl}$ react to give 1 mol. *hydrazodicarbonamide*, separated by its insoly. in water, m. 246° , and 1 mol. *dipropyltriazole*. Better yields are obtained by using $\text{Ca}(\text{C}_4\text{H}_7\text{O})_2$ to neutralize the HCl formed. *Silver salt*, $\text{C}_8\text{H}_{14}\text{N}_2\text{Ag}$. *Mercury salt*, $2(\text{C}_8\text{H}_{14}\text{N}_2\text{HgCl})\cdot 2(\text{C}_8\text{H}_{14}\text{H}_2\text{HgCl}\cdot\text{HCl})\cdot\text{HgCl}_2$. *Hydrochloride*, octahedrons, m. 133° .

C. J. WEST.

p-Chloro- and *p*-bromo-*m*-cresols. II. R. F. VON WALTHER AND K. DEMMELMEYER. *J. prakt. Chem.* 92, 107–32 (1915); cf. C. A. 9, 2641.—The sulfonation of *p*-chloro-*m*-cresol (a) has been previously conducted simply as a means of sepg. (a) from its isomers; the acid itself was not identified (cf. Liebrecht, Ger. pat. 233,118). *6*-Chloro-3-hydroxy-1-methylbenzene-4-sulfonic acid (b) is formed when (a) is slowly added to an equal wt. of H_2SO_4 (d. 1.84) at 70° and then sufficiently heated to keep in a molten condition (there is no tendency to form a di- SO_3H acid either with H_2SO_4 or ClSO_3OH). (b) seps. from H_2O or concd. HCl in leaves with 2 mols. H_2O . On rapid heating it m. 93° , but when heated slowly it m. as low as 75° (decompn.). Though readily decompd. at 100° into (a) and H_2SO_4 , it is stable toward boiling dil. NaOH or boiling 10% HCl. Cl is not removed on reduction with Na and alc.; PCl_5 fails to give an acid chloride. Its Na salt was not esterified when treated with MeI or Me_2SO_4 . On nitration the SO_3H group is split off with the formation of the dinitro-*p*-chloro-*m*-cresol which m. 68° . The *sodium salt* of (b) is pptd. by Na_2CO_3 ; it is difficultly sol. in cold H_2O and seps. from hot H_2O in leaves (100 cc. H_2O at 14° dissolves 1.82 g. salt). (b) is not liberated by dil. acids from solns. of its Na salt. *Disodium salt*, from (b) and concd. NaOH, small needles; *potassium salt*, 4 H_2O , leaves from H_2O ; *neutral barium salt*, leaves; *calcium salt*, 2 H_2O , clusters of microscopic needles; *silver salt*, prisms from H_2O ; *ammonium salt*, elongated prisms, difficultly sol. in cold H_2O ; *aniline salt*, from (b) and $\text{PhNH}_2\cdot\text{AcOH}$, prisms from H_2O . *Di-p-chloro-m-cresyl carbonate* (c), pptd. on passing COCl_2 into the alk. soln. of (a), seps. in long silk-like threads from ligroin, m. 141° ; heated at 215° with dry NaOEt in a H atm. (c) is converted into *p*-chloro-*m*-cresyl Et ether and Et *p*-chloro-*m*-cresotinate. The yield of the latter is small. *Methyl p-chloro-m-cresyl carbonate*, from (a) and ClCO_2Me with the calcd. quantity of NaOH, oil, b. 135° . *Ethyl p-chloro-m-cresyl carbonate*, b. 148° . *p*-Chloro-*m*-cresoxyacetic acid (d), obtained in good yield from (a) and $\text{ClCH}_2\text{CO}_2\text{H}$ according to the method of Giacosa (*J. prakt. Chem.* 19, 396), prisms from H_2O , m. 176° ; *sodium salt*, needles from H_2O ; *potassium salt*, silk-like threads from H_2O ; *ammonium salt*, leaves from H_2O ; *calcium salt*, long prisms from H_2O ; *barium salt*, small leaves from H_2O ; *silver salt*, clusters of needles from H_2O ; *copper salt*, blue needles in clusters from 75% alc.; *lead salt*, needles from dild. alc.; *methyl ester*, by action of dry HCl on the

MeOH soln., leaves from petr. ether, m. 37°; *ethyl ester*, leaves from petr. ether, m. 32°. *6-Chloro-4-nitro-3-cresoxyacetic acid* (e), from (d) heated at 100° with concd. HNO₃ for several hrs., clusters of light yellow, slender needles or threads from H₂O, m. 155°; concd. HNO₃ has only a slight action on (d) in the cold. A di-NO₂ compd. was not obtained on treating (d) with concd. HNO₃ + Ac₂O. When treated with Na₂S₂O₄, (e) is not reduced to the corresponding NH₂ compd., but is converted into

3-keto-6-chloro-7-methyl-1,4-benzoxazine, $\text{MeClC}_6\text{H}_3\text{O.CH}_2\text{CO.NH}$, long needles from 70% alc. or 70% AcOH, m. 187°. By application of the Reimer and Tiemann reaction (a) is converted into *6-chloro-3-hydroxy-4-toluic aldehyde*, long, light yellow needles from petr. ether, 50% alc. or 50% AcOH, m. 68°. The yield is relatively large for this reaction. The *sodium salt*, deep yellow leaves, is very unstable. *6-Bromo-4-nitro-3-cresol* (f), from *p*-bromo-*m*-cresol (g) in AcOH with the calcd. amt. of dil. HNO₃ in the cold, deep yellow needles from 96% alc., m. 124°, volatile with steam. The *ammonium salt* seps. in bright orange-colored needles; *sodium salt*, red needles; *potassium salt*, dark red prismatic needles; *calcium salt*, bright orange leaves; *barium salt*, dark orange leaves from alc.; *silver salt*, dark red needles. *6-Bromo-2,4-dinitro-3-cresol* (h), from (g) nitrated with 2 mols. dil. HNO₃ without cooling, bright yellow leaves from 50% AcOH, m. 111°, non-volatile with steam; *ammonium salt*, small orange needles; *sodium salt*, bright orange needles; *potassium salt*, orange needles; *calcium salt*, long, orange prisms from alc.; *barium salt*, bright yellow needles; *silver salt*, orange needles. *6-Bromo-4-amino-3-cresol*, formed in good yield by reduction of (f) with Na₂S₂O₄, leaves from H₂O, unstable when moist, m. 116°. *6-Bromo-3-hydroxy-1-methylbenzene-4-sulfonic acid* (i), produced under the same conditions as (b), seps. from hot concd. HCl soln. in small iridescent leaves containing 2 mols. H₂O and m. (not sharply) 103–125°; *ammonium salt*, long prisms from H₂O; *sodium salt*, leaves from hot H₂O; *potassium salt*, stout prisms; *calcium salt*, leaves from H₂O; *barium salt*, long prisms; *silver salt*, leaves from H₂O; *aniline salt*, hexagonal prisms from H₂O. On nitration (i) is converted into (h) with replacement of —SO₃H. The following derivs. of (g) were also prepd.: *Di-p-bromo-m-cresyl carbonate*, prismatic leaves from alc., m. 130°. *Methyl p-bromo-m-cresyl carbonate*, b₁₈ 158°. *Ethyl p-bromo-m-cresyl carbonate*, b₁₇ 167°. *p-Bromo-m-cresoxyacetic acid* (j), prismatic leaves from 50% AcOH, m. 178°; *sodium salt*, prismatic needles from H₂O; *potassium salt*, prismatic leaves from H₂O; *ammonium salt*, needles from H₂O; *calcium salt*, prisms; *barium salt*, leaves from H₂O; *silver salt*, needles; *lead salt*, needles; *copper salt*, blue cubes; *methyl ester*, leaves from petr. ether, m. 36°; *ethyl ester*, leaves from petr. ether, m. 46°. *6-Bromo-4-nitro-3-cresoxyacetic acid*, obtained by heating (j) with concd. HNO₃ and Ac₂O, long, light yellow needles from H₂O, or bright yellow prisms from dil. AcOH, m. 177°; a di-NO₂ deriv. could not be isolated. Reduction produced a benzoxazine but the yield was too small to permit of identification. *6-Bromo-3-hydroxy-4-toluic aldehyde*, light yellow needles from 50% AcOH, m. 96°; the *sodium salt*, yellow leaves, is unstable.

NORMAN A. SHEPARD.

β-Hydroxy-β-phenylethylamine and related compounds. C. MANNICH AND E. THIELE. Univ. Goettingen. *Arch. Pharm.* 253, 181–95(1915).—The difficulties heretofore encountered in the reduction of aminoalkyl aryl ketones to the corresponding alcs. have been eliminated by the use of palladinized charcoal and H₂, thus rendering compds. of the type PhCH(OH)CH₂NH₂ available for synthetic investigation. Palladinized charcoal was prepd. by passing H through a suspension of powdered animal charcoal (previously freed from Fe by extn. with HCl) in a soln. of PdCl₂, the dried product containing about 2% Pd. The method of starting point in the present investigation was the mixt. of BzC BzCH₂NH₂.HBr resulting

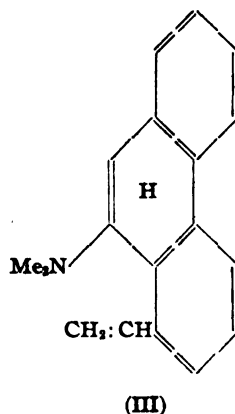
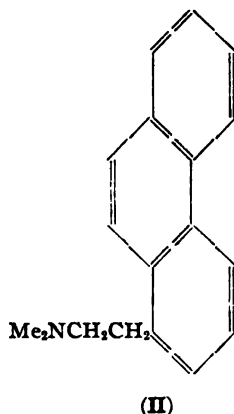
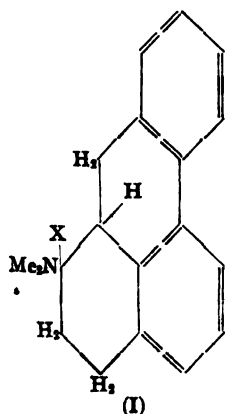
from the action of hexamethylenetetramine on BzCH_2Br (cf. *C. A.* 5, 3237). On satn. with H in the presence of the above catalyst, the new base sepd. from the concd. filtrate as the carbonate which was then changed into the *hydrochloride*, m. 211° . β -Hydroxy- β -phenylethylamine, $\text{PhCH}(\text{OH})\text{CH}_2\text{NH}_2$, glistening needles, m. about 40° , was obtained by treating the hydrochloride with NaOEt , and found to be more stable toward alkali and acid than adrenaline. The Bz deriv., $\text{PhCH}(\text{OH})\text{CH}_2\text{NHBz}$, m. 146° (cf. Rosenmund, *Ber.* 37, 2483(1904); also *C. A.* 7, 2553), yields with Ac_2O and NaOAc the compound, $\text{PhCH}(\text{OAc})\text{CH}_2\text{NHBz}$, glistening needles, m. $112-3^\circ$. Other condensations effected were: with ClCO_2Et the derivative, $\text{PhCH}(\text{OH})\text{CH}_2\text{NHCO}_2\text{Et}$, scales, m. $87-8^\circ$ (cf. M. and Hahn, *C. A.* 5, 3237); with carbamide, β -hydroxy- β -phenylethylcarbamide, $\text{PhCH}(\text{OH})\text{CH}_2\text{NHCONH}_2$, crystals, m. 95° ; with $\text{Cl}_2\text{CHCO}_2\text{Et}$, phenyldichloroacetylaminomethylcarbinol, $\text{PhCH}(\text{OH})\text{CH}_2\text{NHCOCHCl}_2$, glistening leaves, m. 91° ; with $\text{CNCH}_2\text{CO}_2\text{Et}$, phenylcyanacetylaminomethylcarbinol, $\text{PhCH}(\text{OH})\text{CH}_2\text{NHCOCH}_2\text{CN}$, glistening needles, m. 111° ; with $\text{ClCH}_2\text{CO}_2\text{Et}$, the piperazine com-

pound, $\text{PhCH}(\text{OH})\text{CH}_2\text{N} \begin{array}{c} \text{CH}_2\text{CO} \\ \text{COCH}_2 \end{array} \text{NCH}_2\text{CHPhOH}$, cryst., m. 121° . Reduction

of $\text{MeOC}_6\text{H}_4\text{COCH}_2\text{NH}_2$ in concd. soln. yielded $p\text{-MeOC}_6\text{H}_4\text{CH}(\text{OH})\text{CH}_2\text{NH}_2$ (cf. Rosemund, *l. c.*), which gave the *benzoyl* compound, $\text{MeOC}_6\text{H}_4\text{CH}(\text{OH})\text{CH}_2\text{NHBz}$, feely needles, m. $151-2^\circ$, the latter forming the *acetate*, fine needles, m. 139° . Similarly were obtained the derivatives, $\text{MeOC}_6\text{H}_4\text{CH}(\text{OH})\text{CH}_2\text{NHCO}_2\text{Et}$, leaflets, m. 95° , and $\text{MeOC}_6\text{H}_4\text{CH}(\text{OH})\text{CH}_2\text{NHCONH}_2$, crystals, m. $122-3^\circ$. The hydrochloride (cf. M. and Hahn, *l. c.*), $\text{HOC}_6\text{H}_4\text{COCH}_2\text{NH}_2\cdot\text{HCl}$, prepd. by the action of HI on the MeO compd., gave on reduction β -hydroxy- β - p -hydroxyphenylethylamine hydrochloride, cryst. powder, m. 172° (decompn.); the free base, needles, m. $157-8^\circ$; the *dibenzoyl* derivative, leaflets, m. 215° ; the *O*-acetate, crystals, m. 170° .

W. O. E.

The Hofmann degradation of alkaloids of the phenanthrene (apomorphine) group. J. GADAMER. Univ. Breslau. *Arch. Pharm.* 253, 266-73(1915).—The scission of quaternary *N*-Me derivs. of methylated apomorphine, bulbocapnine and corytuberine to corresponding methine bases by means of hot concd. NaOH takes place in accordance with Formulas I and II. The theoretically possible formula (III) could not be con-



sidered in this connection from the fact that the isolated methine bases were optically inactive. It had already been shown by Klee (cf. *C. A.* 9, 298) in the case of isothebaine, which is quite similarly constituted, that both methine bases are simultaneously formed in about equal quantity and that the one constituted like Formula III possesses a

reverse optical activity to that of the mother substance. Scholtz (cf. *C. A.* 9, 2079) has likewise observed in the case of bebeerine the scission of methylisobebeerine methylhydroxide into an inactive α - and an active β -methine base. Degradation expts. carried out with Kondo on bulbocapnine Me ether in accordance with Kuntze's procedure reveal the fact that the methine base arising from boiling the *N*-Me ammonium base was optically active; that while bulbocapnine Me ether is *d*-rotatory, the methine base is strongly *l*-rotatory. G. and Kondo were able to prep. from the methine base, which heretofore had only been obtained in amorphous form, by soln. in MeOH a portion in cryst. optically active condition. In order to obtain the optically inactive methine base corresponding to Formula II in a pure state, the crude product was subjected to fractional satn. and Et_2O extn. After repeated attempts the inactive methine base (II), as well as the methine base (III), were isolated, the latter finally showing $[\alpha]_D = -270^\circ$. As subsequently shown by Kuntze, his former adverse findings resulted from the fact that he examd., not the crude product, but the pure methine bases prep'd. therefrom. Of the 2 methine bases obtained by such degradation, derivs. of the optically inactive form are the more difficultly sol. and more readily crystd. In former expts., the optically active constituent of the crude product always remained in the mother liquors. Kuntze was further able to show that the relative proportions in which the 2 bases are formed depends on the concn. of the soln., higher concns. favoring the formation of the optically active methine base. The methine base formed on heating dimethylapomorphine methiodide, which Pschorr failed to observe, is a mixt. of active and inactive compds. Likewise in the case of apomorphine, the resulting active methine base, which is obtainable in cryst. form, shows an opposite rotatory power (138.6°) to that of the mother substance. Similar conditions were found to obtain in the degradation of corytuberine, both dimethylcorytuberinemethines being formed. The hydrochloride showed $[\alpha]_D = -265^\circ$, the dimethylsulfate -220° to -225° . Tribenzoylcorytuberine was absolutely inactive. W. O. E.

Amber. A. TSCHIRCH AND CORNELIS DE JONG. Univ. Bern. *Arch. Pharm.* 253, 290-305 (1915).—A quantity of crude succinoabietic acid in 2 lots (designated A and B), isolated some 21 yrs. ago by Aweng, was treated according to T.'s extn. process and found to consist of a mixt. of substances. The available samples were dissolved in Et_2O (A yielding about 15%, B 10% insol. residue) and extd. with 1% $(\text{NH}_4)_2\text{CO}_3$.

The *succoxyabietic acid*, $\text{O.O.C}_{10}\text{H}_{19}\text{CO}_2\text{H}$, thus isolated and purified by means of the Pb salt, forms an amorphous powder, m. 120° , very sol. in alc., CHCl_3 , AcOH, acetone, $\text{C}_6\text{H}_5\text{N}$, $\text{C}_6\text{H}_{11}\text{OH}$ and MeOH, slightly sol. in cold, easily in hot C_6H_6 ; acid no. direct 147.21, indirect 151.80, sapon. no. cold 153.15, hot 174.18; I no. 18.60. The Et_2O soln. yielded to 1% Na_2CO_3 more than 50% *succinoabietinolic acid*, $\text{C}_{20}\text{H}_{30}\text{CO}_2\text{H}$ (purified via its Pb salt), amorphous powder, m. 112° (sample A) and 110° (sample B), very easily sol. in CHCl_3 , AcOH, acetone, $\text{C}_6\text{H}_5\text{N}$ and $\text{C}_6\text{H}_{11}\text{OH}$, easily sol. in cold alc., hot MeOH and C_6H_6 , acid no. direct 89.63, indirect 92.61, sapon. no. cold 97.03, hot 141.93, I no. 47.71. Treatment of the Et_2O soln. with 1% KOH developed the odor of borneol. HCl ppts. from the alk. liquid succinoabietinolic acid in the form of its borneol ester. Hydrolysis of the residue from the Et_2O soln. with 0.1 *N* KOH effects degradation in the succinoabietinolic acid as follows: $2\text{C}_{20}\text{H}_{30}\text{O}_2 + 2\text{H}_2\text{O} = 2\text{C}_{24}\text{H}_{38}\text{O}_2 + \text{C}_{20}\text{H}_{30}\text{O} + \text{C}_{10}\text{H}_{18}\text{O} + 2\text{H}_2\text{CO}_3$, the products thus being borneol, succinosilvic acid, succinoabietol and H_2CO_3 . *Succinoabietol*, $\text{C}_{20}\text{H}_{30}\text{O}$, amorphous powder, m. $90-1^\circ$, easily sol. in alc., Et_2O , acetone, CHCl_3 , insol. in petr. ether, identical with the product $\text{C}_{20}\text{H}_{30}\text{O}_2$ of Aweng. The Ac deriv. is sol. in petr. ether. *Succinosilvic acid*, $\text{C}_{24}\text{H}_{38}\text{O}_2$, amorphous powder, m. 104° , identical with Aweng's product. Quite similar results were obtained on a reexamn. of the alc.-sol. portion (about 30%) of amber. The alc.-insol. portion (about 70%), succinin, consisted principally of a resene, *succinoresene*, yellow amorphous

powder insol. in org. solvents, acids and alkalies. In addition to succinoresene, the alc.-insol. portion contains succinoresinol succinate which is hydrolyzed on treatment with 0.5 *N* KOH. *Succinoresinol*, $C_{12}H_{20}O$, m. 228° , is identical with Aweng's product.

W. O. E.

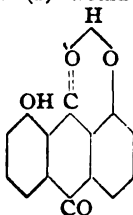
Salt-forming power of natural chrysazin derivatives. O. A. OESTERLE AND E. R. HAUGSETH. Univ. Strassburg. *Arch. Pharm.* 253, 327-9(1915).—In cryst. rhein from C_2H_5N , Tisza observed (*C. A.* 3, 639) a retention of the solvent, which persisted even after washing with aq., alc. and ethereal acid solns. The present work follows closely along the lines of Pfeiffer's expts. (cf. *C. A.* 7, 3474) who found that certain hydroxyanthraquinones enter into combination with C_2H_5N to form salts. In the case of rhein, the salt, $C_{14}H_8O_2(OH)_2CO_2H.C_2H_5N$, was obtained, while frangula-emodin yields the compound, $C_{14}H_8O_2Me(OH)_2.C_2H_5N$, both of which lose their C_2H_5N on heating at $100-10^{\circ}$. No salts were obtained with chrysazin, chrysophanic acid and aloë-emodin, a behavior in perfect accord with the findings of Pfeiffer, who reported that only those hydroxyanthraquinones having OH groups in the β -position yield salts, α -hydroxyanthraquinones showing no such tendency.

W. O. E.

Certain derivatives of rhein. O. A. OESTERLE AND E. R. HAUGSETH. Univ. Strassburg. *Arch. Pharm.* 253, 330-4(1915); cf. *C. A.* 4, 1601.—On refluxing crude rhein chloride (cf. *Schweiz. Wochenschr.* 1911, No. 46) with C_2H_5OH , rhein propyl ester, $C_{14}H_8O_2(OH)_2CO_2C_3H_7$, was formed, yellowish brown needles, m. 145° , sol. in alc., Et_2O , $CHCl_3$, petr. ether, C_6H_6 , xylene and AcOH. The acetate, $C_{14}H_8O_2(OAc)_2CO_2C_3H_7$, resulted on treating the ester with Ac_2O and $AcONa$, yellow needles, m. 178° , insol. in cold dil. NaOH. Similarly, the following were prepd.: rhein isopropyl ester, yellowish brown crystals, m. 181° (acetate, light yellow needles, m. 190°); rhein isobutyl ester, yellow needles, m. 153° (acetate, yellow needles, m. 169°); rhein phenyl ester, yellow needles, m. 215° (acetate, yellow needles, m. 176°); rhein benzyl ester, could not be obtained in pure form (acetate, lemon-yellow, felty needles, m. 203°).

W. O. E.

The reactivity of α -hydroxyl groups in anthraquinones. O. A. OESTERLE AND E. R. HAUGSETH. Univ. Strassburg. *Arch. Pharm.* 253, 335-41(1915).—In the investigation of naturally occurring chrysazin (*a*) derivs., it has been repeatedly observed that the hydroxyls occupying α -positions show great differences in point of reactivity. In the methylation of chrysophanic acid (cf. *ibid* 243, 441(1905)), the introduction of the first Me group was effected without difficulty, while the di-Me ether was less easily prepd. and then only with indifferent yield. The behavior of (*a*) derivs. toward $ClCH_2CO_2Et$ is even more remarkable. Rhein (1,8-dihydroxyanthraquinone-3-carboxylic acid) reacts with 2 mols. $ClCH_2CO_2Et$, yielding the compd. $C_{14}H_8O_2(OH)(OCH_2CO_2Et)(CO_2CH_2CO_2Et)$ (cf. *C. A.* 4, 1601). Similarly, $ClCO_2Et$ reacts with salicylic acid to form the compd. $C_6H_4OCO_2Et(CO_2CO_2Et)$ (cf. Friedlaender, *Fortschr. Teerfarbenfabr.* 6, 146). An explanation for such variation in the behavior of apparently similarly situated hydroxyls is possibly found in a recent paper by Pfeiffer (cf. *C. A.* 7, 3474) in a study of color lakes. In the case of anthraquinones possessing α -(α)-hydroxyls, the assumption is made that the H of α -hydroxyls is in coördinate union with the carbonyl O ("innere Komplexsalzbildung") and is thus weakened in reactivity. According to this view (*a*) would present the following appearance:



from which it is seen that in chrysazin and its derivs. having hydroxyls in the α -position, one group first enters into reaction, the second group reacting only under exceptional conditions. Attempts made to prep. a di-K salt of (a) were unsuccessful, the only salt obtained being identical with the mono-K compd. reported by Woelbling (cf. *Ber.* 36, 2941 (1903)). $\text{ClCH}_2\text{CO}_2\text{Et}$ converts the K salt of (a) into the ester, $\text{C}_{14}\text{H}_9\text{O}_7(\text{OH})\text{OCH}_2\text{CO}_2\text{Et}$, yellow needles, m. 198° , sol. in Et_2O , CHCl_3 , AcOH and C_6H_6 (acetate, $\text{C}_{14}\text{H}_9\text{O}_7(\text{OAc})\text{OCH}_2\text{CO}_2\text{Et}$, canary-yellow needles, m. 144°). *Chrysazinmonoglycolic acid*, $\text{C}_{14}\text{H}_9\text{O}_7(\text{OH})\text{OCH}_2\text{CO}_2\text{Et}$, yellow, hexagonal leaves, m. 236° . With Me_2SO_4 (a) yields the monomethyl ether, $\text{C}_{14}\text{H}_9\text{O}_7(\text{OH})\text{OMe}$, orange-yellow needles, m. 198° (acetate, $\text{C}_{14}\text{H}_9\text{O}_7(\text{OAc})\text{OMe}$, yellow needles, m. 208°). In addition to the mono-Me ether, which is also formed on treating the acetate with dil. NaOH the dimethyl ether, $\text{C}_{14}\text{H}_9\text{O}_7(\text{OMe})_2$, golden-yellow needles, m. 221° is obtained. W. O. E.

The reaction of levulose with diphenylamine. L. RADLBERGER. *Oesterr.-ung. Z. Zuckerind.* 44, 261-4 (1915).—Continuing the work of Kehrman and Micewiz (*C. A.* 7, 348) and Wieland and Müller (*C. A.* 8, 346), R. finds that the reaction between levulose and Ph_2NH occurs in 2 stages. The Ph_2NH is first converted to diphenylbenzidine by the H_2SO_4 , and then this is converted by the reduction of the levulose to *p*-diphenylquinonephenyldiimide, and indamine. Since on warming acid solns. of carbohydrates to 68° levulose or glucose is formed, the blue color reaction announced by Ihl (*Chem. Ztg.* 9, 451) as characteristic of all carbohydrates is, therefore, caused by either levulose or glucose, which, acting as oxidizers in the reaction in a similar manner, cannot easily be distinguished. E. A. TSCHUDY.

Structure of the dihydro- β -naphthoic acids. C. G. DERRICK AND OLIVER KAMM. *J. Am. Chem. Soc.* 38, 400-19 (1916).—The 3rd of the 3 possible dihydro- β -naphthoic acids with the unsatd. linkage in the same ring as the CO_2H group has been prepd. and it is shown that this new acid (a), m. 118° , is the Δ^1 , the "stable" acid (b), m. 161° , the Δ^2 , and the "labile" acid (c), m. 101.2° , the Δ^3 -compd. Incidentally, it was noticed that the amines of (a) and (b) and $\text{PhCH}:\text{CHCONH}_2$, m. 148° , all of which

contain the grouping $>\text{C}:\text{C}:\text{C}(\text{O})-$, have a marked cinnamon-like odor. The β - $\text{C}_{10}\text{H}_7\text{CO}_2\text{H}$ was obtained through the nitrile which, in turn, was prepd. by distg. the Na sulfonate with $\text{K}_4\text{Fe}(\text{CN})_6$ (yield, 120 g. from 62.5 g. salt) or the Ca salt with KCN (yield, 18 g. from 40 g. salt). Reduction with 3% Na-Hg in the cold in a stream of CO_2 to neutralize the alkali gives a mixt. of 75% (c) and 25% (b); in hot solns. the relative yields are 40 and 60%, resp. Sepn. is best effected by Baeyer's fractional pptn. method. Heated with excess of $\text{Ba}(\text{OH})_2$ or KOH at 160° in sealed tubes, both (b) and (c) yield the new acid (a), sometimes contaminated with some (b). Boiling of (c) 1 hr. with 10% KOH produces a partial rearrangement into (b) but no (a) is formed, but long boiling with more concd. (1:2) KOH can effect an almost complete rearrangement into (a). (a) seps. from dil. AcOH or alc. in needles whose solubility in various solvents is intermediate between that of (b) and (c); its ionization const. in H_2O at 25° is about 3.0×10^{-5} ; the solubility in H_2O ranges from 0.39 g. at 0° to 20.1 g. at $96-7^\circ$ in 10 cc. satd. soln., the corresponding values for (b) being 0.19 and 10.5 g. Its dibromide, from (a) and Br in cold CHCl_3 , m. 190° , that of (b) m. 210° and that of (c) (which does not decomp. spontaneously, as stated by Baeyer), m. 172° (all with decompn.). The dibromide of (c) dissolves in 5% soda but soon deposits in 80%

yield the lactone $\text{C}_9\text{H}_6\text{CH}_2\text{CH}(\text{CHBr})\text{CH}(\text{O})\text{CO}$, which, when boiled with 20% KOH , slowly dissolves with formation of $\text{C}_9\text{H}_6\text{CH}_2\text{CH}(\text{CO}_2\text{K})\text{CH}:\text{C}(\text{OH})$ (not isolated).

yielding on acidification the *keto acid*, $\text{C}_6\text{H}_4\text{CH}_2\text{CH}(\text{CO}_2\text{H})\text{CH}_2\text{CO}$, m. $143-5^\circ$, 1.5

g. of which dissolves in 1 l. of H_2O ; its *semicarbazone* m. 266° (decompn.). The dibromide of (b) decomps. smoothly, even at 0° , in 5% aq. soda or KOH into $\beta\text{-C}_{10}\text{H}_7\text{CO}_2\text{H}$ and HBr (90% yield). The dibromide of (a) in cold 5% KOH very quickly decomps. into the *acid* $\text{C}_6\text{H}_4\text{CH}(\text{OH})\text{C}(\text{OH})(\text{CO}_2\text{H})\text{CH}_2\text{CH}_3$, plates from Et_2O , m. 182° (yield,

65%), which is oxidized by KMnO_4 to $o\text{-HO}_2\text{CC}_6\text{H}_4\text{CH}_2\text{CH}_2\text{CO}_2\text{H}$ (d). From 5 g. (a) in 75 cc. cold H_2O and 3 g. KOH treated in the course of 1 hr. with 6 g. KMnO_4 in 300 cc. H_2O is obtained an *acid* $\text{C}_6\text{H}_4\text{CO}\text{C}(\text{OH})(\text{CO}_2\text{H})\text{CH}_2\text{CH}_3$ or its hydrate

(found, neutral equiv. 210, C 60.5%, H 5.98%), m. $119-20^\circ$; 5 g. with 5 g. KMnO_4 gives 40% of (d).

CHAS. A. ROUILLER.

Structure of the dihydro- α -naphthoic acids. OLIVER KAMM AND HARRY B. MCCLUGAGE. *J. Am. Chem. Soc.* 38, 419-30(1916).—By reactions analogous to those used with the β -acids (preceding abstr.) it has been shown that the "stable" α -acid (a) is the Δ^1 - and the "labile" acid (b) the Δ^2 -compd. The 3rd possible Δ^2 -compd. has not been isolated thus far. (b), prepd. by Baeyer and Schoder's method (*Ann.* 266, 169(1891)), m. 86.5° after very careful purification (B. and S., 91°), ionization const. in 0.001 N soln. at 25° 11.52×10^{-5} ; 30 min. boiling with aq. 5% KOH suffices to rearrange it completely into (a), m. 121.5° (B. and S., 125°), ionization const. 7.96×10^{-5} . The ionization consts. agree well with those detd. for B. and S.'s products by Bethmann (*Z. physik. Chem.* 5, 399(1890)). Dibromide of (b), in 6.5 g. yield from 5 g. (b) and 5 g. Br in 15 cc. cold CHCl_3 (as the bromide is sol. in CHCl_3 it must be pptd. with several vols. of petr. ether), m. 125° . Dibromide of (a), in 7.6 g. yield from 5 g. (a), m. 151° (decompn.). The dibromide of (b) dissolves clear in 5% aq. KOH but in about 1 min. the soln. becomes slightly turbid, due to the sepn. of a small amt. of C_{10}H_8 ; the filtrate from this gives 85% of $\alpha\text{-C}_{10}\text{H}_7\text{CO}_2\text{H}$. The dibromide of (a), on the other hand, yields the *dihydroxy acid*, $\text{C}_{11}\text{H}_{12}\text{O}_4$, plates from Et_2O , m. 175° . In the hope of being able to synthesize the Δ^2 -acid, $1,4\text{-C}_{10}\text{H}_8(\text{OEt})\text{CO}_2\text{H}$ was reduced in hot alk. soln. with Na-Hg, but the EtO group was also reduced, the product being tetrahydro- α -naphthoic acid.

CHAS. A. ROUILLER.

Zingiberol—a new sesquiterpene alcohol occurring in the essential oil of ginger. BENJAMIN T. BROOKS. *J. Am. Chem. Soc.* 38, 430-2(1916).—B. has isolated from ginger oil (freed from terpenes and sesquiterpenes) citral, methylheptenone, nonylaldehyde, linalool, *d*-borneol, acetic and caprylic acids (as esters), a trace of a phenol (probably chavicol), cineol and a sesquiterpene alc., *zingiberol* (a), $\text{C}_{15}\text{H}_{26}\text{O}$, $b_{14.5}$ $154-7^\circ$ (24 g. from 150 g. oil), which imparts to the oil its peculiar persistent, though mild, ginger odor. Garnett and Greier's "gingerol" (*C. A.* 2, 447; 3, 2719) is a mixt. of (a) with a trace of a phenol. (a), heated with Ac_2O , gives only 17% ester, as calcd. from the sapon. no., and gives no phenylurethan with PhNCO after 4 days. With Na in dry Et_2O it readily forms a Na compd. and when gently heated with KHSO_4 it loses H_2O , forming zingiberene or isozingiberene, b. $255-7^\circ$, which with HCl in glacial AcOH yields the dihydrochloride, m. 169° ; the same salt is obtained from (a) and HCl in AcOH, while HBr gives the dihydrobromide, m. 176° (Semmler, *C. A.* 7, 2938).

CHAS. A. ROUILLER.

Some constituents of sumbul root. FREDERICK W. HEYL AND MERRILL C. HART. *J. Am. Chem. Soc.* 38, 432-46(1916).—An unsliced root from Moscow was used. Air-dried, it contained 10.2% moisture and 6.5% ash, Ligroin extd. 11.8%, Et_2O 14.6%, alc. 27.4%. The residue insol. in alc. contained 17.5% crude fiber, 10.6% pentosans, 3.4% protein, 7.7% starch, 1.4% dextrin; the alc. ext. showed 1.7% sucrose, approx.

1.0% levulose and 18.7% resin (after extg. hot); extn. with boiling 95% alc. removes 27.4% of the root while exhaustive percolation in the cold exts. only about 20%, 17.3% being pptd. by H₂O. The products sol. in cold alc. and in H₂O are, besides the above sugars, AcOH, an umbelliferone glucoside and betaine. The resin insol. in H₂O was extd. successively with ligroin, Et₂O, CHCl₃, AcOEt and alc. The ligroin ext. consisted of about 17% resinous material (other than fat), sol. in 1% KOH and yielding on hydrolysis vanillic acid and an oil resembling the volatile oil. The fat yielded a large amt. of indefinite unsaponifiable material, from which were isolated a fraction having approx. the compn. C₂₇H₄₈O and b₁₂ 168–73°, and a *phytosterol*, C₂₇H₄₈O, m. 134–5°; *acetate*, m. 121–2°. The fatty acids identified were acetic, butyric, valeric, tiglic, angelic, oleic, linoleic, cerotic, palmitic and stearic. The Et₂O ext. yielded a *phytosterolin*, C₂₈H₄₈O₆, m. 290° (*acetate*, m. 159–60°), and a trace of vanillin; it consists of 42% neutral and 52% acid resinous constituents; the former is an ester yielding umbelliferone (b), while the latter consists of a mixt. of resin acids yielding vanillic acid and (b) on hydrolysis. The CHCl₃ ext. consists largely of a resinous glucoside yielding (b) and glucose on hydrolysis. The AcOEt ext. was not a glucoside but gave (b) on hydrolysis, while the alc. ext. likewise yielded (b) and a reducing sugar on hydrolysis. Exptl. data are given in detail.

CHAS. A. ROUILLER.

Some derivatives of coumarin. FRANCIS D. DODGE. *J. Am. Chem. Soc.* 38, 446–57 (1916).—Coumarin (a) and limettin (b) with NaHSO₃ yield well-defined cryst. sulfonic compds. analogous to that obtained from esculetin by Rochleder (*J. prakt. Chem.* 101, 415 (1863); cf. also Liebermann, *Ber.* 35, 2919 (1902), and earlier papers). Thus, from (a) warmed 15–30 min. on the H₂O bath with 6 parts of 20% NaHSO₃ is obtained *sodium hydrocoumarinsulfonate* (c), crystals with 1 H₂O, sol. in about 5 parts of H₂O at 15°; the aq. soln. is neutral but at once reacts with alkali, neutralizing 1 mol., so that the compd. can be sharply titrated; if the soln. is concd. addition of a little 0.5 N alkali produces a transient ppt. of (a), which soon redissolves and the soln. becomes neutral again; further addition of alkali causes a repetition of the phenomenon until (a) ceases to sep. and the soln. remains permanently neutral; the soln. now does not contain the original (c), nor has the SO₃H group been split off, for the I absorption is negligible, but if the (a) pptd. by quickly adding alkali is filtered off before it redissolves, the filtrate is found to contain much sulfite. These facts are plausibly explained thus: (a) + NaHSO₃ = C₈H₆O.CO.CH(SO₃Na).CH₃ (c); (c) + NaOH =



(a) should therefore be sol. in Na₂SO₃ and as a matter of fact 10 g. (a) will dissolve in 100 cc. of 25% Na₂SO₃ after 3 days at room temp. and in 0.5 hr. at 100°, the soln. behaving in all respects like that obtained by titrating (c). *Potassium hydrocoumarinsulfonate*, from (a) and KHSO₃, needles with 1 H₂O; soly. in H₂O at 15°, 7.6%. *Barium salt*, from (c) and Ba(OAc)₂, cryst. ppt., sol. in about 44 parts H₂O at 20°. *Copper salt*, from (c) and CuSO₄, pale blue prisms. The soln. of *sodium hydrocoumarinsulfonate* (d) when highly concd. forms a viscous liquid solidifying in a desiccator to an indistinctly cryst. mass; the *barium salt*, prepd. by double decompn., seps. in not very sol. needles. With a large excess of alkali, (c) smoothly yields coumaric acid (e), about 10 g. being obtained by heating 10 g. (a) with 100 cc. of NaHSO₃ until dissolved, evapg. to about 50 cc., adding 40 g. of 50% KOH, evapg. to dryness on the H₂O bath, dissolving in H₂O and treating cold with concd. HCl. On the other hand, a soln. of (d) from 2 g. (a), when evapd. to dryness, powdered and allowed to stand 2 days with 5 cc. Ac₂O, yields (c), from which, working quickly and with ice-cold solns., 30 and 40% (a) can be recovered with NaOH and Ba(OH)₂, resp. This therefore gives the following cycle of reactions: (a) $\rightleftharpoons$ (c) $\rightleftharpoons$ (d) $\rightleftharpoons$ (e). (c) is also decompd. by alkali car-

bonates at room temp.; on adding concd. soda to a 20% soln. of (c), the liquid after a time becomes filled with fine crystals of (a) which, however, completely redissolve in a few hrs. (a) is apparently quant. regenerated from (c) at 130–60° according to the equation $2(c) = 2(a) + \text{Na}_2\text{SO}_3 + \text{SO}_2 + \text{H}_2\text{O}$. (b), a dimethoxycoumarin, also known as citraptene, yellow needles from Me_2CO , m. 148°, in the same way gives a sodium hydrolimettinsulfonate, plates with 4 H_2O (7.5 g. from 10 g. (b) gently boiled 0.5 hr. with 80 g. of 20% NaHSO_3 sol. in 6 parts H_2O at 20°; attempts to prep. a limetic acid analogous to (e) gave a non-crystallizable substance. (b) slowly dissolves in 25% Na_2SO_3 at 100° but no crystals can be obtained by salting out or evapg. the soln. The results of a few titrations of (a) and (b) immediately after heating with alc. KOH and at different time intervals thereafter, showing the progressive regeneration of the lactone, are reported. Although this lactone formation in alk. soln. is not strictly characteristic of coumarins, it is allowable to assume that in many cases where the phenomenon is observed some member of the coumarin series is probably present, as in the case of oil of bergamot and possibly of Gordin's "xanthoxylin" (*J. Am. Chem. Soc.* 28, 1649(1906)).

CHAS. A. ROULLIER.

Spectrophotometric study of copper complexes and the biuret reaction. PHILIP A. KOBER AND ARTHUR B. HAW. *J. Am. Chem. Soc.* 38, 457–72(1916); cf. *C. A.* 7, 3976; 9, 3252.—It has been found by K. and his colleagues that the Cu complexes of NH_2 derivs. and other similar substances can be divided into 3 classes: (1) blue, (2) purple or "semi-biuret," and (3) red or "biuret;" in (1) 2 N groups (amino, imino, imide or amide) are so placed that by forming "stable" rings they can combine with the Cu; in (2) there are 3 and in (3) 4 such groups. As the coordination no. of Cu is 4, in (2) an aquo or HO group is probably attached to the Cu besides the 3 N groups, and in (1) probably 2 HO groups are attached to the Cu. To establish the theory, it must be shown that the absorption spectra agree with the macroscopical observations and that it is really the N groups which produce the characteristic colors. The present paper deals largely with the 1st line of proof. In the ultraviolet the absorption is general and variations in the constitution of the complexes cannot be followed by quant. spectroscopy. In the visible spectrum the absorption curves were quant. detd. by means of a sector photometer and a high dispersion spectroscope on the basis of Talbot's law of rotating sectors. The results are probably accurate only to within 2%. The Cu complexes of 5 NH_2 acids and 4 dipeptides in neutral soln., of 5 tripeptides and 2 tetrapeptides in neutral, faintly alk. and strongly alk. soln., and of egg albumen, edestin, casein and biuret in strongly alk. soln. were studied and the results are reported in curves. The amt. and nature of the absorption of a given complex depends somewhat on the concn. of HO ions; in the tetrapeptides the red color is only faintly developed in the weaker alkali and more strongly in the more concd. alkali while the reverse is true for the tripeptides. There are 3 types of absorption curves: beginning at about 480, 459 and 443 $\mu\mu$, resp., with max. at 630, 540 and 505 $\mu\mu$. Diglycylglycine in faintly alk. soln. gives the semi-biuret color as strongly as the other tripeptides, Fischer's statement that it is an exception probably being due to the fact that he used strong alkali in making the biuret test. The protein complexes in strongly alkaline soln. give practically the same curves as tripeptides in faintly alk. soln. K. and H. conclude that the "biuret reaction" is no other than a complex formation with Cu and, as far as color formation is concerned, no decompn. of the protein is involved, and that the protein configurations are such that they permit only 3 N groups to form rings with Cu; therefore the protein mol. must be aggregated and is not in the form of long free chains or branches of peptides or conjugated NH_2 acids. Oxy or HO complexes of Cu, no matter what their configuration, are all blue or green, never red, and are characterized by their relative instability in alk. solns., and, on the other hand,

that red colors are due to N groups is indicated by the fact that substances possessing only N and no O give a red biuret reaction (diguandine copper); complexes containing a deficiency of O groups but sufficient N groups give a red biuret reaction; there is a great parallelism between the number of N groups available for combination with the Cu and the amt. of the red color.

CHAS. A. ROULLER.

The phosphoric acid in starch. JOHN H. NORTHPROP AND J. M. NELSON. *J. Am. Chem. Soc.* 38, 472-9(1916).—The P is chem. combined in the starch grains and cannot be extd. with dil. acid, either as free H_3PO_4 or in combination. The sample of potato flour used contained 0.06% P; no N could be found by the Kjeldahl or Dumas methods. Heated 14 hrs. on the H_2O bath with 10 parts of 10% HCl, all of the P is set free as H_3PO_4 , but when a paste of 10 kg. starch in 40 l. H_2O is treated with steam under 50 lbs. until completely liquefied, heated at 65° until it no longer gives a ppt. with alc., neutralized with solid $Ba(OH)_2$, filtered and pptd. with 2 vols. of 85% alc., there is obtained 60 g. of a white hygroscopic substance; 300 g. of this, treated with H_2SO_4 , $PbCO_3$ and H_2S , evapd. to a syrup under 25 mm. and pptd. with 8 l. of glacial AcOH yields 110 g. of a granular ppt. (the filtrate on concn. *in vacuo* and pptn. with alc. gives 75 g. of a yellowish powder with 3.4% P); the AcOH ppt. is a very hygroscopic powder, sol. in H_2O , pptd. by alc., contains 4.9% P (none as inorg. phosphates), no N, small amts. of MgO, sulfates, chlorides and SiO_2 , does not reduce Fehling soln.; benzoylation by the Schotten-Baumann method yields colloidal products from which, by pptn. from $CHCl_3$ or Me_2CO with ligroin, Et_2O , H_2O , etc., were obtained 2 amorphous substances containing 0.99-1.08 and 1.40-1.48% P, resp. $Pb(OAc)_2$, however, ppts. from the alc. soln. of the AcOH ppt. a *lead salt* const. in compn. under different conditions of prepn. (30.30-30.53% Pb, 3.78-3.99% P), which with H_2S yields the free acid as an extremely hygroscopic powder (5.24-5.56% P, 35.20-35.45% C, 5.84-5.93% H), reduces Fehling soln., $[\alpha]_D^{22}$ $108^\circ 30'$, gives on acid hydrolysis a reducing sugar equiv. to 65% glucose and yielding a heavy ppt. of glucosazone. The simplest formula conforming to the above analyses is $C_{17}H_{41}O_{16}(H_3PO_4)$. The % of Pb in the salt is greater than what it should be if the metal were combined only with the phosphoric acid (26.73%), but as the salt is formed in strong alc. soln., some of the Pb may be combined with the carbohydrate. The amt. of reducing sugar corresponds to 1 mol. maltose to 1 of phosphoric acid. The remainder of the mol. corresponds to $C_5H_8O_5$. No evidence of the presence of a pentose could be obtained but since difficulty was encountered in completely burning the substance in the analyses, owing to the presence of the H_3PO_4 , it is possible that the remainder of the mol. is a hexose. Since it does not reduce Fehling soln., it might be inositol or, if a hexose, so combined with H_3PO_4 as to destroy its reducing power. No inositol could be found in 8 g. of the crude material.

CHAS. A. ROULLER.

Stability of silver fulminate under water. ALFRED M. PETER. *J. Am. Chem. Soc.* 38, 486(1916).—A sample of the salt which had remained under H_2O in a bottle with a well greased stopper for some 40 years was found to be distinctly cryst. but of a mouse-gray color, owing to long exposure to light. Otherwise it showed no signs of change in physical or chem. properties.

CHAS. A. ROULLER.

Stereochemistry of the quinone oximes. VII. The mono-oximes of the 3-halogen-toluquinones. F. KEHRMANN, with F. MUSSMANN AND C. FACCHINETTI. Univ. Geneva. *Ber.* 48, 2021-6(1915); cf. *Ann.* 310, 89(1900).—As with the I compd. (*J. prakt. Chem.* 39, 397(1889)), so also 3-chloro- (a) and 3-bromotoluquinone (b) yield only mono-oximes, $OCMe:CH.C(:NOH).CH:CX$, and no dioximes. *Oxime of (a),*

from 10 g. (a) in 50 cc. alc. and a concd. aq. soln. of 1.5-2.0 mols. of $NH_2OH.HCl$ heated 15 min. on the H_2O bath, light yellow leaves, sol. in dil. alkalies with greenish yellow

color; heated a short time with Ac_2O and NaOAc , it yields an *acetate* sepg. from ligroin in 2 (probably stereoisomeric) forms: light yellow needles, m. 72° , and short thick, amber-yellow prisms, m. 62° ; only the former can be obtained pure, repeated crystn. of the latter always giving a mixt. of the 2 forms. With SnCl_2 and HCl , the oxime yields *aminochlorocresol*, 6,2,4- $\text{ClMe}(\text{H}_2\text{N})\text{C}_6\text{H}_3\text{OH}$, needles from C_6H_6 , m. 137° , turns brown in the air, while with HNO_3 (d. 1.1) at room temp. is obtained *nitrochlorocresol*, 6,2,4- $\text{ClMe}(\text{O}_2\text{N})\text{C}_6\text{H}_3\text{OH}$, light yellow prisms from ligroin, m. 122° . (b), from dibromo-*o*-cresol and $\text{Na}_2\text{Cr}_2\text{O}_7\text{-AcOH}$, orange-yellow needles from alc., m. 93.5° . *Oxime*, lemon-yellow leaves from C_6H_6 ; *acetate*, obtained in 2 forms, m. 74° and (impure) 71° , resp. *Aminobromocresol*, needles from C_6H_6 , m. 142° ; *hydrochloride*, needles yielding with Ac_2O an *acetate*, needles from C_6H_6 , m. 165° . *Nitrobromocresol*, lemon-yellow prisms from ligroin, m. 120.5° , identical with the product obtained from 2,4- $\text{Me}(\text{O}_2\text{N})\text{-C}_6\text{H}_3\text{OH}$ and 1 mol. Br_2 in a little AcOH at room temp. Heated on the H_2O bath with HNO_3 (d. 1.2) the oxime yields *dinitro-o-cresol*, 2,4,6- $\text{Me}(\text{O}_2\text{N})_2\text{C}_6\text{H}_3\text{OH}$, yellow needles from alc., m. 85.5° . VIII. The dioxime of 4-chlorotoluquinone and the mono-oximes of 4,6-dichlorotoluquinone and of 3,6-dichlorotoluquinone. With GIUSEPPE SILVA and CORNELIUS KÉLETI. *Ibid* 2027-35; cf. *Ann.* 303, 1 (1898).—Both forms of 4-chlorotoluquinone mono-oxime, when boiled 24 hrs. in concd. alc. soln. with twice the calcd. amt. of $\text{NH}_2\text{OH.HCl}$, the HCl set free being neutralized from time to time with NaHCO_3 , yield the same *dioxime*, ill-defined light yellow cryst. kernels from alc. and AcOH , turns brown and decomp. about 240° ; addition of solid NaOH to the concd. reddish yellow alk. soln. ppts. a golden yellow *sodium salt* in thick prisms; boiling with excess of Ac_2O and NaOAc yields a *diacetate*, homogeneous, thick prisms from AcOH , decomp. about 185° . With $\text{SnCl}_2\text{-HCl}$ the dioxime gives 2,5-diamino-4-chlorotoluene *dihydrochloride*, converted by $\text{Ac}_2\text{O-NaOAc}$ into a *diacetyl derivative*, silky needles from alc. *Dinitrosochlorotoluene*, from the dioxime in dil. alk. soln. with $\text{K}_3\text{Fe}(\text{CN})_6$, lemon-yellow powder, decomp. about $163\text{--}5^\circ$, cannot be recrystd. without decompn., converted by reducing agents into the dioxime and then the diamine, while with concd. HNO_3 it gives the *dinitro compound*, thick, amber-yellow prisms from ligroin, m. 107° . When 4-chlorotoluquinone rubbed up with dil. HCl is treated with small portions of fuming HCl until the mass darkens and thickens and is then warmed on the H_2O bath until the cryst. magma is almost white, dild. with H_2O , filtered, dissolved in just enough boiling 50% AcOH and allowed to partially cryst., most of the trichlorotoluquinone formed can be removed; the filtrate on oxidation with cold Na_2CrO_4 yields 4,6-dichlorotoluquinone, golden yellow leaves from alc., m. $85\text{--}6^\circ$. *Oxime*, $\text{OC.CCl:CH.C(:NOH).CMe:CCl}$,

light yellow needles (no dioxime could be obtained); *benzoate*, m. 154° . With HNO_3 (d. 1.1) on the H_2O bath the oxime gives *dichloronitro-m-cresol*, light yellow needles from ligroin, m. 128° , decomp. a little higher. $\text{SnCl}_2\text{-HCl}$ reduces the oxime to the quinol. 3-Chlorotoluquinone and HCl yield, besides about 5% of tri- Cl compd., 3,6-dichlorotoluquinone, sepg. from alc. on standing after addition of H_2O in golden yellow prisms with alc. of crystn., m. 67° ; a hot satd. alc. soln. of the prisms deposits alc.-free leaves, stable in the air, m. 76° ; on long standing in the mother liquors they go over into the alcoholated prisms. With SO_2 in alc. is obtained the *quinol*, needles, m. 85° ; *diacetate*, prisms or fine needles from alc., m. 110.5° . 3,6-Dichlorotoluquinone *oxime*, light yellow needles, m. 135° , then immediately decomp., sol. in dil. alkalies with greenish yellow color; *acetate*, rhombic prisms from C_6H_6 , m. 85° , $a:b:c = 0.86265:1:1.1592$, showing light yellow-brown pleochroism. *Dichloroaminocresol*, from the oxime and $\text{SnCl}_2\text{-HCl}$, thick needles from C_6H_6 , m. 128° ; *diacetyl derivative*, needles, m. 129° . *Dichloronitrocresol*, from the oxime and HNO_3 (d. 1.1) at room temp., light yellow crystals from ligroin, m. 135° ; *acetate*, yellowish white needles from ligroin and C_6H_6 , m. 98° .

CHAS. A. ROULLIER.

Esters of tertiary trichlorobutyl alcohol and their pharmacology. R. WOLFFENSTEIN, A. LOEWY AND M. BACHSTEZ. Charlottenburg and Berlin. *Ber.* 48, 2035-43 (1915).—In order to test the pharmacological influence of esterification on alcs., various esters of the pharmacologically active $\text{CCl}_3\text{CMe}_2\text{OH}$ (a) were prepd. Indications were obtained that by treating (a) with finely divided Na in PhMe its Na alcoholate is formed but a repetition of the expt. led to a violent explosion. No reaction between (a) and PCl_5 could be observed (cf. Willgerodt and Dürr, *Ber.* 20, 539(1887)). (a) forms a well-defined hydrate. Anhydrous (a) in Et_2O stratified with decolorized fuchsin- SO_2 soln. gives a violet color. The esters were prepd. from the corresponding acid chlorides with or without the aid of tertiary bases, or from the acids in the presence of a condensing agent. *Propionate* (b), yellowish oil, b_{14} 88-90°. *Isovalerate* (c), b_{20} 108-10°. *Bromoisovalerate* (d), b_{17} 152°. *Chloroacetate* (e), crystals from dil. alc., m. 48°. *Trichloroacetate* (f), needles from dil. alc., m. 40°. *Diethylglycinate* (g), from (e) and NHEt_3 , b_{20} 142-5°; *hydrochloride*; solns. of salts with org. acids (AcOH) dissociate on warming, the free (g) sepg. but redissolving on cooling; *chloroplatinate*, platelets, m. 212°. *Dimethylglycinate* (h), from 20 g. (e) shaken 5 hrs. at 100-10° with 30 cc. of 27% aq. NHMe_3 , oil; *hydrochloride*, rhombic platelets, m. 220°. *Piperidylacetate* (i), oil slowly crystg. on standing, has an AcNH_2 -like odor and an intensely bitter taste. *Allophanate* (j), from NH_2COCl and (a) at room temp., crystals from dil. alc., m. 114°. *Acid malonate* (k), from 35 g. (a) and 22 g. $\text{CH}_3(\text{CO}_2\text{H})_2$ heated several hrs. with 3 g. ZnCl_2 , 6-sided platelets from 50% alc., m. 116°. *Neutral malonate* (l), m. 102-3°, insol. in alkalis. *Dibromocinnamate* (m), m. 99-100°. These esters are not hydrolyzed in the organism, each exerting an action peculiar to itself, often entirely different from that of its components and of an unexpected nature. The toxicity of homologous esters increases with the mol. wt. As compared with (a) its acetate shows decreased narcotic and increased toxic action; this is true to an increasing degree of (b) and (c); (c) is no longer narcotic but is a convulsant poison (to rabbits); this also holds for (d) and the diethylaminovalerate. (e) and (f) are less powerful, both as narcotics and poisons, than the acetate. The pyruvate and (j) are strongly toxic but not at all narcotic. (g) and (h) have pronounced narcotic action while (i) is a convulsant but not a narcotic. (k), (l) and substituted malonates are wholly non-toxic and not at all pronouncedly narcotic; the cinnamate and (m) are not narcotic. Further evidence that these esters are not hydrolyzed in the organism was obtained by prepg. esters of acids which give characteristic color reactions and are known to pass through the organism unchanged; none of these color reactions was given by the products of excretion of the animals treated with such esters. The full pharmacological report is published simultaneously in *Arch. exp. Path. Pharm.* C. A. ROUILLER.

The Friedel-Crafts ketone synthesis in the pyridine series. RICHARD WOLFFENSTEIN AND FRANK HARTWICH. Charlottenburg. *Ber.* 48, 2043-9(1915).— $\text{C}_5\text{H}_5\text{N}$ and its salts, treated under the most varied conditions with AcCl or BzCl in the presence of AlCl_3 , never yielded the ketone sought; in some cases there was an energetic evolution of HCl but only tarry products resulted. The same is true of quinoline and isoquinoline, even when negative substituents are introduced into the ring (2,3,4-trichloro-, 8-hydroxy- and 5,7-dichloro-8-hydroxyquinoline). Even Halla's method, starting from pyridinecarboxyl chlorides and aromatic hydrocarbons (*C. A.* 5, 3688), failed when pure materials were used, and success was attained only when the SOCl_2 used in the prepn. of the acid chlorides was not quant. removed. With di- COCl compds., the reaction takes place easily even when the SOCl_2 is carefully removed. α -Pyridinecarboxyl chlorides differ from the others in forming with $\text{C}_6\text{H}_5\text{N}$ characteristic dyes with beautiful blue shades, a reaction also dependent on the presence of SOCl_2 . The tendency to form these dyes is so great that in prepg. α - $\text{C}_6\text{H}_5\text{NCOCl}$

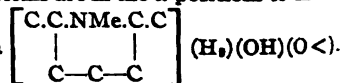
if it is attempted to remove the excess of SOCl_2 at a rather high temp. on the H_2O bath *in vacuo* apparently a small amt. of unchanged $\text{C}_6\text{H}_5\text{NCO}_2\text{H}$ loses CO_2 and the resulting $\text{C}_6\text{H}_5\text{N}$ combines at once with the chloride to give the dye. The intensely corn flower-blue dye is extraordinarily sensitive to light and air. The prepn. of α, α' - and α, β' - $\text{C}_6\text{H}_5\text{N}(\text{CO}_2\text{H})_2$ is rendered much easier by taking advantage of their slight soly. in H_2O , so that it is not necessary to purify the com. $\text{C}_6\text{H}_5\text{NMe}_2$ from which they are made by oxidation or to purify the acids through the Ag salts. The various chlorides, prepd. from the acids and SOCl_2 , are freed from most of the SOCl_2 *in vacuo* at room temp., warmed with several parts of the aromatic hydrocarbon (with some CS_2 if necessary) to incipient boiling and then treated with somewhat more than the calcd. amt. of AlCl_3 in small portions (with the di- COCl compds. it is best to prep. the AlCl_3 double compd. first by gently warming the components and then to add the hydrocarbon); the heating is continued as long as HCl is evolved, the excess of hydrocarbon distd. off, the residue decompd. with ice H_2O , the rest of the hydrocarbon removed with steam, the residue cooled, made alk. and extd. with Et_2O . In this way were obtained the following ketones: α -Pyridyl phenyl ketone, almost colorless oil, b_{14} 182° ; chloroplatinate, m. 193° (decompn.). Anisyl ketone, silky needles from alc., m. 93° ; chloroplatinate, m. 210° (decompn.); picrate, m. 176° ; phenylhydrazone, brownish druses, m. 103° . β -Pyridyl phenyl ketone, light yellow oil, b_{12} 180° , solidifies after months to crystals, m. 39° ; chloroplatinate, m. 267° (decompn.). Anisyl ketone, needles from alc., m. 99° ; chloroplatinate, m. 267° (decompn.); picrate, m. 185° ; phenylhydrazone, light yellow needles, m. 157° . Naphthyl ketone, brown resin; chloroplatinate, m. 213° (decompn.); picrate, m. 142° . α, β' -Dibenzoylpyridine, pointed crystals from alc. m. 123° ; chloroplatinate, from 25% HCl , decomp. into its components on treatment with cold HCl or on exposure to the air; diphenylhydrazone, m. 129° (not sharply). α, α' -Dibenzoylpyridine, needles from alc., m. 108° , so weakly basic that it forms no double salts; diphenylhydrazone, m. 183° .

CHAS. A. ROUILLER.

Preparation of aromatic tellurium compounds. KARL LEDERER. Brussels. Ber. 48, 2049-54(1915); cf. C. A. 9, 3235; Rohrbach, Ann. 315, 9(1901).—By the action of $p\text{-MeOC}_6\text{H}_4\text{MgBr}$ on TeBr_2 , L. has obtained a compd. entirely different from that prepd. by R. by heating in sealed tubes the compd. formed by treating TeCl_4 with PhOMe , and L. feels certain that R.'s compds. are not p -substituted derivs. When to the Grignard reagent from 143 g. $p\text{-BrC}_6\text{H}_4\text{Me}$ and 20.7 g. Mg in 500 cc. Et_2O is slowly added 60 g. TeBr_2 , the mixt. boiled 3 hrs., decompd. with ice H_2O , digested thoroughly with Et_2O , the ext. repeatedly washed with H_2O and distd., there are obtained, besides PhMe and a little $\text{BrC}_6\text{H}_4\text{Me}$, 4.7 g. $(p\text{-MeC}_6\text{H}_4)_2$ and $(p\text{-MeC}_6\text{H}_4)_2\text{Te}$ (a), converted in Et_2O into the dibromide (b) (54 g.); in the distg. flask remains the $(\text{MeC}_6\text{H}_4\text{Te})_2$, sepg. from Et_2O and alc. only in tarry form. From 108 g. $\text{BrC}_6\text{H}_4\text{Me}$, 15.9 g. Mg and 60 g. TeI_2 in the same way are obtained 3.1 g. $(\text{MeC}_6\text{H}_4)_2$ and 41 g. (b). From 100 g. (b) in about 15 l. hot H_2O treated with Na_2SO_3 , cooled, extd. with Et_2O and distd. over Cu powder is regenerated (a), b_{18} $211\text{--}2^\circ$, m. $69\text{--}70^\circ$. The o-compd., b_{18} $202\text{--}3^\circ$, m. $37\text{--}8^\circ$, is similarly obtained; yield of dibromide, 59 g. from 143 g. o- $\text{BrC}_6\text{H}_4\text{Me}$, 20.7 g. Mg and 60 g. TeBr_2 , and 51 g. from 108 g. $\text{BrC}_6\text{H}_4\text{Me}$, 15.9 g. Mg and 60 g. TeI_2 . When 25 g. TeCl_4 and 25 cc. PhOMe are rubbed together on a boiling H_2O bath and, after the reaction has ended (about 15 min.), are dissolved in 150 cc. of 10% NaOH , freed from excess of PhOMe with Et_2O , treated with 36 g. $\text{Na}_2\text{S}_2\text{O}_4$ in 150 cc. H_2O and 25 cc. of 10% NaOH , made distinctly alk. after the reduction has ended, the resulting telluride taken up in C_6H_6 , dried with CaCl_2 , boiled with Cu powder and evapd., there is obtained 21 g. of dianisole telluride (c) (L. gives $(\text{MeOC}_6\text{H}_3\text{-H})_2\text{Te}$ for its formula—ABSTR.), sepg. from 800-900 cc. petr. ether in dark red needles with metallic luster, m. 50° . In the same way from 25 g. TeCl_4 and 25 cc. PhOEt is ob-

tained 23 g. *diphenetole telluride*, orange-red leaflets from 650 cc. alc., m. 64°. From 2 g. (c) gently boiled 0.5 hr. with 1 cc. MeI is obtained a red-brown mass sol. in hot H₂O; addition of aq. picric acid to the hot soln. ppts. a red-brown product and then broad, yellow needles sepg. from alc. in yellow crystals, m. 126-7°, having the compn. (MeOC₆H₅-H)Me₂Te.C₆H₅O₇N₄. CHAS. A. ROUVILLER.

Degradation of scopoline. Scopoline → hyoscopoline → scopolinic acid. KURT HESS AND A. SUCHIER. Univ. Freiburg i/B. *Ber.* 48, 2057-67(1915).—From the evidence thus far available, scopoline (a) may be represented by the formula C₇H₉(NMe)(OH)(O<). Attempts to throw light on the structure of the residue C₇H₉ by oxidative degradation of (d) itself with CrO₃ failed. In the hope of converting norscopoline (b) into an amino ketone it was treated with HCHO (C. A. 10, 467). but (a) was quant. regenerated, and H. and S. conclude that in (b) and probably in (a) also the C atom to which the OH group is attached carries no oxidizable H atom, i. e., that the HO group is probably tertiary. Willstätter and Hug's chloroscopoline (C. A. 7, 78) also did not prove suitable for degradation expts., as the Cl atom is very resistant. When, however, 10 g. (a) is heated 4 hrs. at 115-20° with 50 g. HBr-AcOH (satd. at 0°), concd. to a syrup in CO₂ at 40-50° under 16 mm. and to a glassy, faintly yellow mass (12.6 g.) under 0.06 mm., dissolved in a little concd. HCl, again evapd. *in vacuo* over soda-lime and crystd. from just the necessary amt. of hot MeOH (about 150 cc.) there is obtained 8.7-9.5 g. of *hyoscopoline bromide hydrobromide* (c), C₈H₁₆O₂NBr₂, quadrangular prisms, m. 210-1° (decompn.), easily decompd. by boiling H₂O, exceedingly sensitive towards alkalis, especially on warming, the soln. quickly turning yellow, then red and finally brown. The mother liquors from (c), evapd. to dryness *in vacuo*, taken up in hot EtOH and cooled in ice-NaCl, yield *diacetylhyoscopoline bromide hydrobromide*, elongated crystals consisting of microscopic triclinic pyramids, changes color 250°, sinters 270-80°, m. 283-5° (gas evolution). From 9.2 g. (c) in 230 cc. of 20% H₂SO₄ slowly treated with 12 g. Zn dust at such a rate that the temp. remains at 29-30°, then warmed 1 hr. on the H₂O bath, filtered, neutralized with soda, evapd. to dryness at 40-3° under 18 mm. and extd. with alc. in a Soxhlet, is obtained 9.5 g. of the *zinc bromide double salt*, 2 C₈H₁₆O₂NBr.ZnBr₂, long spears from hot AcOH, m. 215-6°; 8.5 of this in 50 cc. H₂O made just alk. with 20% soda, filtered from the ZnCO₃, concd. to a few cc. at 40° under 18 mm., supersatd. with concd. NaOH and extd. with CHCl₃, yields 3.6 g. of *hyoscopoline* (d), C₈H₁₆O₂N, m. 165°, strongly alk. to litmus, reduces NH₄-AgNO₃, quickly decolorizes cold Br-H₂O, crysts. best from Me₂CO-MeOH. *Hydrobromide*, m. 260° (decompn.). *Picrate*, needles from alc., m. 232°. *Chloroaurate*, m. 200°. From 3 g. of (d) in 15 cc. H₂O cautiously warmed on the H₂O bath with 7.5 g. CrO₃ in 12 g. concd. H₂SO₄ and 150 cc. H₂O until there is a color change, then heated 2 hrs. at 85-90° and finally boiled 45 min., freed from excess of CrO₃ with SO₂ and from Cr with NH₄OH, evapd. to dryness *in vacuo*, boiled with dil. NaOH to remove the NH₃, acidified with HCl, evapd., extd. with alc. and concd., there is obtained *scopolinic acid hydrochloride*, C₈H₁₆O₂NCl, polygonal tables with 1 H₂O, m. 225-6° (decompn.), which with Ag₂CO₃ gives the free *acid*, identical with α,α'-N-methylhexahydrolutidinic acid (C. A. 10, 471). (a) is, therefore, an alkaloid of the piperidine series and the 2 extra C atoms are in the α-positions to the N atom, so that (a) may be represented by the formula



CHAS. A. ROUVILLER.

Crystals of maleic anhydride (MÜGGK) 8.

11. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

FRANK P. UNDERHILL.

Action of honey on the teeth. H. P. PICKERILL. *New Zealand Dental J.*; through *Chemist Druggist* 88, 55(1916).—Honey taken by itself has a bad effect on the teeth, but this is counteracted by adding 1% tartaric acid. Tables are given of the acid formed in the mouth 5 min. after eating various foods. C. O. EWING.

Permeability. I. Exosmosis of electrolytes as a criterion of antagonistic ion action. W. STILES AND I. JORHENSEN. *Ann. Botany* 29, 349-67(1915).—A study of the relations existing between plant tissue and a soln. surrounding it, by examn. of the changes in elec. cond. of the latter. The tissues used consisted of disks of potato tuber, having a diam. of 1 cm. and a wt. of 0.5 g. Twenty such disks were washed in distd. water, dried on filter paper, placed in 100 cc. of soln. in a stoppered bottle, and the cond. of the soln. was measured from time to time by Kohlrausch's method. In some cases living plants of bean were used. It is probable that within certain limits the rate of exosmosis is a measure of toxicity. A decrease in this rate when certain ions are added to solns. containing poisonous ions might be due to "antagonism."

B. HOROWITZ.

Serological studies of Leguminosae and Gramineae. A. ZADE. *Habil.-Schrift*, Jena 1914, 51 pp.; *Zentr. Biochem. Biophys.* 18, 285(1915).—Z. concludes that expectations for the practical utilization of the biological method of differentiation can only be provisionally accepted at the present time, although there is no reason to suppose that further elaboration of the method may not lead to results which are of practical value.

H. S. PAINE.

The activity of other enzymes which accompany β -glucosidase in emulsin in the synthesis of alcohol- β -glucosides. EMILÉ BOURQUELOT AND A. AUBRY. *Compt. rend.* 161, 463-6(1915).—Emulsion of almonds contains β -glucosidase, lactase, β -galactosidase, gentiobiase and cellobiase. β -Glucosidase synthesizes alcohol- β -glucoside from alcohol and β -glucose. Lactase and galactose are without effect in this synthesis. The hexobiases, i. e., gentiobiase and cellobiase exercise an inhibiting action on the alcohol-glucoside synthesis, by converting the glucose into disaccharides. The activity of the hexobiases is directly proportional to the concn. of glucose and inversely proportional to the amt. of H_2O used. The concn. of alcohol is immaterial in this reaction.

W. A. PERLZWEIG.

The mechanism of antagonistic salt action. JACQUES LOEB. *Proc. Nat. Acad. Sci.* 1, 473-7(1915).—A brief review of the theory. W. A. P.

Maltase. ALBERT ÖHMAN. *Upsala. Läkareförenings Förhandlingar* 20, 145-68 (1915).—Maltase prepared from yeast gradually loses its power to hydrolyze maltose upon dialysis. If to the dialyzed prepn. is added some of the maltase which has been boiled, the maltase dialyzed is activated provided that the dialysis has not proceeded so far that all of the enzymic activity has been removed. The activity of this maltase after dialysis is also increased by adding phosphate. $NaCl$, $NaNO_3$, $(NH_4)_2SO_4$, $CaCl_2$ and $MgSO_4$ do not increase the activity of the maltase. The action of the phosphate on the maltase is not the same as its action on zymase. The phosphate does not increase the cleavage of the maltose by virtue of keeping yeast proteins in soln. The cleavage is increased by diln. and inhibited by the increase of dextrose, fructose, mannose, and galactose in the reaction mixt. The presence of $CHCl_3$ does not hinder the hydrolysis. There is a German summary to the article. A. R. ROSE.

Carboxylase (BAU) 16.

B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

Estimation of sugar in urine with "nitro-propiol" tablets, and some other tests. F. WOLTER. *Pharm. Ztg.* 60, 634-5(1915).—W. finds that all urines yield with this reagent a more or less distinct blue color, *i. e.*, positive reaction; hence he pronounces it untrustworthy. Instead, Heine's soln. is recommended as being more dependable, the reagent and urine being boiled separately, whereupon the latter is added to the former drop by drop. The nitric acid test for albumin is likewise condemned on account of its failure to indicate small quantities of albumin. A better method consists in the addition to the sample of about 11 drops dil. AcOH and $\frac{1}{2}$ satd. NaCl soln. followed by boiling the mixt., traces of albumin being indicated through the formation of a distinct turbidity. In the blood benzidine test, better results are obtained by proceeding as follows: Dissolve the benzidine in concd. AcOH and shake with H_2O_2 , then cover with the urine. In the presence of blood a beautiful deep green ring appears at the surface of contact of the 2 liquids. In examg. the feces for blood, a satisfactory test is obtainable only after the patient has been denied meat for 3 days. W. O. E.

Method for the determination of arsenic in urine, blood and parts of cadavers. WILHELM KOSIAN. *Pharm. Post* 48, 321(1915).—Marsh's method involves preliminary ashing of the organic material, and the prepn. of a proper normal mirror for comparison, which is difficult for the inexperienced. The titrimetric method of Györy (*Z. anal. Chem.* 32, 415-21(1893)) can be used to det. As in org. or inorg. combination. Method: evap. 100-150 g. urine, blood, or serum to a sirupy consistency (parts of cadavers or stomach contents are ground up), place in 600 cc. flask, add 20 cc. fuming HCl and a small amt. $KClO_3$, and warm gently. Heat to expel Cl, add 10-15 g. $FeSO_4$ and dil. to 200 cc. with As-free HCl. Sat. with HCl gas, distil 80-100 cc. in a current of HCl into a cooled flask containing 50-100 cc. H_2O . Make up to 200 cc. and titrate 10 cc., to which 3 cc. concd. HCl has been added, with 0.1 or 0.01 N $KBrO_3$ soln., using Me orange indicator. (The indicator is decolorized at the end-point.) It is possible to det. 0.44 mg. As in 1 cc. per cc. blood or urine.

C. O. EWING.

The osazone method of locating sugars in plant tissues. SYDNEY MANGHAM. *Ann. Botany* 29, 369-391(1915).—The reagent employed is that introduced by Senft (*Süssb. Akad. Wiss., Wien, mathem.-naturw. Klasse* 113, Abt. I, p. 3). The phenylhydrazine hydrochloride is rubbed up with pure glycerol in a mortar, warmed and well shaken in a bottle kept stoppered to prevent undue access of air. When the soln. is fairly complete the reagent is warmed and filtered at least once. Sections of plant tissues are laid in a mixture of this reagent and a glycerol soln. of Na acetate, and heated at 98-100° for about 1 hr. Levulose readily yields an osazone, dextrose somewhat less readily. Cane sugar, if present in sufficient concn., may become partly hydrolyzed. Maltose, after being heated for 1 hr., forms a golden yellow sirup from which crystals may slowly form.

B. HOROWITZ.

Practical application of refractometry of blood serum. EMIL REISS. Frankfurt a/M. *Deut. Arch. klin. Med.* 117, 175-9(1915); *Zentr. Biochem. Biophys.* 18, 273(1915).—R. discusses critically the presumptions which are involved in a comprehensive application of refractometry to blood serum.

H. S. PAINE.

Differential stain for urine sediment. E. W. FITTIPALDI. *Gazz. ospedali clin.* 36, No. 81(1915); *J. Am. Med. Assoc.* 66, 231.—A triacid stain is used containing aniline blue w, aurantia and eosin. The aniline blue w soln. is made with 1 part stain to 100 parts of 10% alc.; aurantia with 0.2 part stain to 100 parts 10% alc.; eosin is used in a 1% soln. The triple stain is then prepd. by mixing the above solns. in the proportion of 45, 35, and 20 parts, respectively. By means of a glass rod a small amt.

of the stain is placed on the specimen to be examd. and a small drop of physiologic salt soln. containing 2% AcOH is stirred in; this decolorizes the vehicle while fixing the stain on the morphologic elements. The specimen is then slightly heated.

L. W. RIGGS.

Claudius' quantitative colorimeter test for albumin. A. NORGAARD. *Ugeskrift Laeger* 77, No. 47(1915); *J. Am. Med. Assoc.* 66, 318.—A thorough trial of this method, with 100 specimens of urine and other organic fluids, shows that with an albumin content below 1 per 1000 there may be a difference up to 10% as compared with gravimetric methods. With the albumin content above 1 per 1000 the difference may rise to 20 or 30%. For the exact technic of this method cf. *Hospitalstidende*, 58, No. 48(1915).

L. W. RIGGS.

New process of coloration of spermatozoa on suspected spots. SEMENOVSKI. Jurjev, Dorpat. *Pharmazetisches J.* 1915, 142; *J. pharm. chim.* 12, 297-8(1915).—Cut the suspected fabric into pieces 3 to 5 mm. long, dip them into a freshly prepared bath of iodococin 0.1, KOH 5.0, H₂O 100.0; for 10 or 15 seconds, then into 96% EtOH for 10 seconds. Dry between filter paper, shred the fibers with a needle, and exam. under the microscope. The spermatozoa are clearly stained an intense red upon the uncolored background of the fibers. Spots even 10 yrs. old show the test well, and the prepn. may be mounted in Canada balsam and kept indefinitely. Bengal red, erythrosin and even eosin may replace iodococin.

S. WALDBOTT.

A biological test for arsenic. ALBERT SCHNEIDER. *J. Am. Pharm. Assoc.* 4, 1307-9(1915).—A review of the work done by Gosio who showed that certain molds grown in and upon media containing very minute quantities of arsenic gave rise to gaseous compounds characterized by a garlic-like odor.

M. I. W.

Routine chemical laboratory tests; their description and significance. FRED L. LACKENBACH. *J. Am. Pharm. Assoc.* 5, 17-20(1915).—A review of biological, microscopical and chemical tests used for diagnostic purposes.

M. I. W.

The preparation of serums and antitoxins. CHARLES M. TWINING. *J. Am. Pharm. Assoc.* 5, 21-9(1915).—A review of the problems involved in the manufacture of sera, including a discussion of the difficulties encountered in the selection of animals.

M. I. W.

C. BACTERIOLOGY.

ERNEST D. CLARK.

The fermentative power of marine bacteria. H. COUPIN. *Compt. rend.* 161, 597-600(1915).—C. has studied qualitatively the fermentative action of 43 new species of marine bacteria upon some carbohydrates. Only 4 species were totally inactive.

W. A. PERLZWEIG.

Reaction of the medium and filtration of toxins. E. AUBEL AND H. COLIN. *Compt. rend.* 161, 506-8(1915).—Filtrates from alkaline cultures of diphtheria and dysentery bacilli were toxic; filtrates from acid cultures were not toxic. Dil. alkaline exts. of cultures when filtered were shown to be more active than neutral or acid exts.

W. A. PERLZWEIG.

D. BOTANY.

CARL L. ALSBERG.

Localization of acids and sugars in fleshy fruits. E. DEMOUSSY. *Compt. rend.* 161, 443-5(1915).—The physical structure of cells in fleshy fruits detrs. to a great extent their chem. compn. Acids and reducing sugars are expressed to the greatest extent with high crushing pressure on the fruits, whereas non-reducing sugars are obtained with slight pressure. No definite conclusions are reached as to the localization of acids and sugars in fruits.

W. A. PERLZWEIG.

Formation of anthocyan pigments in plants. A. GUILLIERMOND. *Compt. rend.* 161, 494-7, 567-70(1915).—A survey of the histological origin of anthocyan pigments. W. A. PERLZWEIG.

The displacement by water of the nitrogenous and mineral material in leaves (ANDRÉ) 15.

E. NUTRITION.

PHILIP B. HAWK.

NORMAL.

Nutritive value of corn from recent and older harvests. J. J. NITZESCO. Bucharest. *Compt. rend. soc. biol.* 77, 583-6(1915); *Bull. acad. Roumain.* 4, 42-54.—N. studied the nutritive value of corn of different ages with particular reference to the occurrence of pellagra in cases of practically exclusive maize diet. Rats, hens and cocks received a diet of new corn as well as corn which was 1-3 yrs. old. Total N, starch and uric acid were detd. in the excreta of the fowls; total N and urea were detd. in the urine of the rats, while total N and starch were detd. in the feces. New corn was found to be less digestible and assimilable than old corn. An exclusive corn diet of long duration was tolerated with greater difficulty by the rats than by the fowls.

H. S. PAINE.

F. PHYSIOLOGY.

ANDREW HUNTER.

Contribution to the chemistry of nervous tissue. II. Determinations of phosphorus in the ventral and dorsal medullary cord of the ox. G. BUGLIA AND D. MAESTRINI. Univ. Pisa. *Arch. farm. sper.* 18, 221-32(1915); cf. C. A. 8, 2181; 9, 478.—The total P contained in the dorsal is greater than that contained in the ventral medullary cord. It consists principally of organic P, phosphatide P in particular.

A. W. DOX.

Adaptation to low temperatures and death by chilling. A. MONTUORI AND R. POLLITZER. Univ. Rome. *Arch. farm. sper.* 20, 392-405(1915).—Defibrinated blood from an animal which had been slowly chilled, injected intraperitoneally into another animal of the same species, renders the latter more resistant to cold (8°) and prevents or retards a lowering of the body temp. On the other hand, if the first animal has been suddenly and intensely chilled so that there is no longer a corneal reflex, the injection of defibrinated blood diminishes the normal resistances of the second animal to low temps., and rapidly causes hypothermia.

A. W. DOX.

The function of the hypophysis. I. Influence of the hypophysis on the metabolism of carbohydrates. ORESTE MASI. Univ. Pisa. *Arch. farm. sper.* 20, 450-66(1915).—Injection of aq. ext., glycerol infusion or commercial prepn. of hypophysis causes a slight glucosuria. When adrenaline and hypophysis prepn. are administered simultaneously the glucosuria is more intense than that produced by adrenaline alone.

A. W. DOX.

Does the pituitary gland contain epinephrine or a compound similar to it? WALTER K. WATANABE AND ALBERT C. CRAWFORD. San Francisco. *J. Pharmacol.* 8, 75-88(1916).—Previous contributions on the subject seemed to suggest that epinephrine, or a compd. similar to epinephrine, was responsible for much of the pressor action of the pituitary gland, and that this might be modified by the presence of other compds. along with colloids, etc. For isolating epinephrine from the pituitary gland a modified form of Weidlein's method (C. A. 7, 1403) was used. Proof of the presence of epinephrine was sought by means of color reactions and physiological tests. It was found that pituitary exts. prepd. by certain methods give color reactions similar to those given by suprarenal exts.; slowing of heart rate (dog) was noted from a prepn. in which no pressor action was detected; pituitary exts. cause strong contraction of non-

pregnant cat uterus, and if a certain amt. of epinephrine is added to the pituitary ext., the characteristic action of pituitary ext. on cat uterus is not changed; after ergotoxin injection, pituitary ext. causes a lowering of blood pressure as by epinephrine; isolated intestine (cat and rabbit) was strongly contracted by pituitary ext. and relaxation was not obtained by the addition of a certain quantity of epinephrine to such exts.; by oxidation with MnO_2 pituitary exts. lose their pressor action and some of their color reactions, but retain in part their action for both non-pregnant cat uterus and rabbit and cat intestine. Physiologically the presence of epinephrine or an epinephrine-like compound in pituitary exts. is suggested, and certain color reactions indicate this also, but epinephrine has not as yet been isolated from the gland; this may be due to the small amt. present or inadequacy of the method.

P. J. HANZLIK.

Extraphysiological or putrefactive urea. G. DELGADO PALACIOS. *Am. J. Med. Sci.* 149, 267-77 (1915).—P. believes that in the common conditions in normal human subjects, a minimum of 300 mg. of NH_3 is produced every 24 hrs. in the large intestine as a result of putrefactive processes, and that this NH_3 , after having been absorbed into the blood, appears in the urine as a minimum of 0.5 g. and even 1 g. of putrefactive urea. To this daily amt. of putrefactive urea corresponds normally the production of several milligrams of acetone.

TULA LAKE HARKEY.

The lipoids contained in the ovary. C. SERONO AND A. PALOZZI. *Rass. clin. terap. sci. affini* 14, 293 (1915).—A chem. study of cow ovaries. Fresh glands were ground up and extd. with Et_2O , $EtOH$ and $CHCl_3$. The exts. were evapd. and the various lipoids sepd. according to their solubilities in acetone, Et_2O and $CHCl_3$. The lipoids were found to be similar to those of egg yolk. Their wt. varied from 3.05 to 4.89% of the total wt. of the ovary, the adult ovary being richer in lipoids on account of the corpora lutea which it contains. Chem. analysis of the lipoids showed the following av. compn.: cholesterol (free and combined) 3.68, lecithin 19.72, cerebrin and homocerebrin 4.47, fatty acids (oleic, palmitic, stearic, myristic) and glycerol 72.13, total 100%.

D. I. MACHT.

Lipoids of the corpus luteum. C. SERONO AND A. PALOZZI. *Rass. clin. terap. sci. affini* 14, 299 (1915).—Fresh corpora lutea of the cow were treated as described in the preceding abstract; they yielded 6.39% of lipoids (m. p. 44-45°). Dried corpora lutea yielded 18.59% lipoids. Analysis of the lipoids showed them to contain: cholesterol 13.62, fatty acids and cerebrosides 54.81, lecithin 28.58, loss 2.99, total 100.00%. Corpora lutea have no physiological function or internal secretion, except through decompn. products. Gall-stones, so common in women, may have a relation to the large amts. of free cholesterol eliminated monthly by the corpora lutea undergoing absorption. The authors regard lutein as an oxidation product and of no importance. Lutein is a chromogen common as an oxidation product of all lipoids. Ovary and ovum have therefore a very analogous lipid content, and a specific function is not attributable to them, but is to be sought rather in the internal activity of the ovary itself, which is rich in enzymes.

D. I. MACHT.

Phagocytes and respiration centers. Their behavior when acted on by oxygen, carbonic acid and fat-dissolving substances. Explanation of the excitement stage in narcosis. H. J. HAMBURGER. Groningen. *Proc. Akad. Wetenschappen* 17, 1325-52 (1915); *Verslag. Akad. Wetenschappen* 23, 1190-1206.—Expts. showed that phagocytosis was increased by decreasing the O supply, e. g., by exposing to an atm. almost O-free; complete removal of O results in a retardation of phagocytosis. KCN in great diln. also increases phagocytosis, as does the presence of a trace of CO_2 . The analogy between phagocytes and respiration centers is pointed out, and the observations, taken in connection with the fact that narcotics impede the O consumption of

cells such as the spinal centers, etc., affords an explanation of the excitement stage in narcosis.

GEORGE W. MORRY.

Function of the kidneys with reference to amino acids. R. LANZILLOTTA. Naples. *Arch. fisiol.* 12, 429-40; *Zentr. Biochem. Biophys.* 18, 117-8(1915).—L. studied the mechanism by means of which the concn. of amino acids in the blood is regulated, as well as the participation of the kidneys in this function. Proceeding on the theory that the concn. of amino acids in the urine depends on their concn. in the blood, L. performed a series of artificial perfusions in isolated dog kidneys; solns. of alanine, glycocoll, tyrosine, and aspartic acid were employed, and in each case the amino N in unit vol. of circulating liquid and product of renal secretion was detd. Perfusion with aspartic acid gave results somewhat different from those obtained in the other expts.; the total amino N (*i. e.*, that present in various portions of the circulating liquid and in the product of secretion) was found to be greater than the amino N introduced at the beginning of the expt. This result is probably due to the acid character of aspartic acid and its hydrolyzing action on kidney albumin. In the case of alanine, glycocoll and tyrosine the Van Slyke app. showed 0.8-19% less amino N than was originally dissolved in the Ringer soln. There was no appreciable difference between the amino N concn. in the perfusion liquid and kidney secretion. It is, therefore, probable that there is no selective secretion process on the part of the kidneys toward amino acids, but rather a simple filtration by the renal glomeruli. There exists, however, a destructive action of the kidney toward amino acids, the degree of which may be more or less pronounced for various amino acids and, in the case of different kidneys, for one and the same amino acid.

H. S. PAINE.

Physiological value of the suprarenal gland in depancreatized animals. E. GLEY. *Compt. rend. soc. biol.* 78, 1-3(1915).—The suprarenals of depancreatized diabetic dogs, as well as dogs which had received an injection of gelatin or tallow in the duct of Wirsung, were dried *in vacuo* and the vasoconstrictor action of the ext. was tested on dogs and rabbits; the values of arterial pressure produced by these exts. did not differ materially from those due to exts. of normal glands. These results fail, therefore, to substantiate the theory of a regulatory action of the pancreas on suprarenal function and intensification of the latter in cases of pancreatectomy.

H. S. P.

New experiments on the theory of the muscle machine. VIKTOR WEIZSÄCKER. Heidelberg and Cambridge. *Münch. med. Woch.* 62, 217-57(1915); *Zentr. Biochem. Biophys.* 18, 121-2(1915).—W. describes the results of study by exptl. pharmacol. methods (also myothermic expts. in salt solns.) of the phenomena of oxidation, heat production and performance of work in the muscle machine, the latter being regarded as a distinct and isolated system. The heat produced during contraction (the so-called "initial heat") remains the same regardless of whether oxidation occurs or not. Less heat is produced in the contraction of muscle (for contractions of the same extent) as the heat of the latter increases; this is an indication of the economic working of the muscle. The initial heat decreases by about 40% for each 10° increase in temp. Heat production and performance of work are quite independent of each other and are to be regarded as distinct functions. It may, therefore, be assumed that a non-oxidative process provides the energy for initial heat and work. The total activity of the muscle machine may be considered as due to a work-performing and a restitutive machine which act in a circle, so to speak; the former transforms potential energy into work and heat and the latter replenishes this energy through the action of oxidation.

H. S. PAINE.

Blood coagulation in infancy. H. L. K. SHAW AND F. J. WILLIAMS. Albany. *Albany Med. Ann.* 34, No. 12(1915); *J. Am. Med. Assoc.* 66, 219.—Blood from 108 healthy infants, under 2 years of age, was examd. by the Dale and Laidlaw method (cf.

C. A. 6, 1016) and found to coagulate in from 75 to 108 sec., the av. period being 90 sec., which is slightly shorter than that for adults. No difference was observed in the clotting time before and after eating, at different periods of the day, or in blood from different parts of the body. In a later paper the authors expect to compare these results with those obtained in various diseased conditions. L. W. RIGGS.

Galactose test of liver functioning. G. A. PARI. *Gazz. ospedali clin.* 36, No. 78(1915); *J. Am. Med. Assoc.* 66, 70.—P.'s work has confirmed the fluctuations in the response to the galactose test in the same person at different times, showing that a single test has but little significance. In the cases observed its functioning varied inversely with the amts. of ascitic fluid produced. L. W. RIGGS.

Liver formation of urea from amino acids. B. C. P. JANSEN. *Nederlandsch. Tijdschrift Geneeskunde* Nov. 20, 1915; *J. Am. Med. Assoc.* 66, 317.—J.'s expts. with cats and dogs and on the surviving liver after its vessels had been flushed clean with warm Ringer soln., show that the liver may play an important part in the formation of urea from amino acids. In the different tests from 0.3 to 0.5 g. of urea was found, corresponding to a production of from 7 to 8 g. per day. These findings do not agree with the results obtained by Folin under similar conditions, nor with those of Fiske and Karsner. L. W. RIGGS.

Suprarenal capsules and lactation. C. VERDOZZI. *Policlinico* 22, No. 11(1915); *J. Am. Med. Assoc.* 66, 155.—In observations on virgin and gravid and lactating guinea pigs, it was found that the cortical substance of the suprarenals increased regularly in size and wt. during lactation. V. believes that the cortex of the suprarenals represents an important factor in the development and general nutrition of the animal organism. L. W. RIGGS.

G. PATHOLOGY.

H. GIDEON WELLS.

Combined action of the liver and spleen. Study of the function of the spleen. L. ASHER AND G. EBNÖTHER. *Bern. Zentr. Physiol.* 30, 61-4(1915).—Liver exts. cause hemolysis and hemoglobin destruction; this process is greatly accelerated by the addition of splenic exts. The substances that cause hemolysis and hemoglobin destruction are different, the former being thermolabile, the latter thermostable. The splenic ext. itself does not give these reactions but only accelerates the action of the liver exts.; this property is specific for splenic exts. E. M. FRANKEL.

Functional tests in experimental tartrate nephritis. A. C. POTTER AND E. T. BELL. *Am. J. Med. Sci.* 149, 236-47(1915).—By subcutaneous injections of tartaric acid it is possible to produce in rabbits a form of acute nephritis in which the great majority of the convoluted tubules are necrotic and the rest fatty and granular, while the glomeruli and collecting tubules may be automatically intact. Evidence obtained from expts. with such kidneys suggests that a phthalein, indigo-carmin and methylene blue are excreted exclusively by the convoluted tubules, that KI and lactose may be excreted by the glomeruli, and that hemoglobin is excreted mainly by the tubules, but may pass slowly through the glomeruli. TULA LAKE HARKEY.

Studies on the concentration of blood-sugar in health and disease as determined by Bang's micro-method. ARTHUR H. HOPKINS. *Am. J. Med. Sci.* 149, 254-67 (1915).—In health a moderate rise in the amt. of blood-sugar occurs after feeding 100 g. of glucose. There is no constant blood-sugar level at which sugar appears in the urine. Where a disturbance in carbohydrate metabolism exists, there may be a normal sugar concentration associated with a most pronounced alimentary hyperglucemia. In diabetes alimentary hyperglucemia is pronounced and continues for a longer period. Pancreatic, nephritic and pituitary cases all give high figures for blood

sugar after feeding glucose. Edema and hepatic congestion do not influence blood sugar values. There is a rise in blood sugar in pneumonia, and this rise may be present in the absence of fever; apoplexy, typhoid and tuberculosis, in the presence of fever, and some cases of cancer also cause a rise in the amt. of sugar in the blood. The test affords a practical method for early diagnosis and control of dietary therapeutics.

TULA LAKE HARKEY.

Why the modern chemico-parasitic theory is untenable. RAGNAR ECKERMANN. Malmö, Sweden. *Dental Record* 36, 10-4(1916).—Seventeen reasons are advanced to prove untenable the chemico-parasitic theory of dental caries. "Whatever may be the primary cause of caries, a chemico-parasitic process is in any case excluded." The teeth are affected by such a process *after* the dental front is broken, and a way is opened through the enamel, or the gingival part of the tooth is exposed. JOS. S. HEPBURN.

The resistance of the blood corpuscles and the antihemolytic power of the blood plasma of splenectomized animals. ANDRÉ ROCCA VILLA. *Arch. méd. exper.* 26, 508-72, 636-726(1915).—The first part of the paper gives an extended historical discussion and a detailed description of the technic used. The second part gives exptl. results, theories and conclusions. R. worked with splenectomized dogs and rabbits, and studied the resistance of the red blood cells to hemolysins and the antihemolytic power of the blood plasma, before and after the removal of the spleen, and *in vivo* and *in vitro*. He employed the following hemolytic and antihemolytic substances: distd. H₂O, hypertonic NaCl solns., saponin, biliary salts (sodium glycocholate), heterogeneous sera (hog and eel), antidog and antirabbit hemolytic sera, head ext. of leeches, and staphylolysin. He concludes that the spleen plays an important part in physiological and pathogenic hemolysis. In every instance removal of the spleen increased the resistance of the red blood cells to hemolytic agents and increased the antihemolytic power of the plasma, even though the mechanism of the action of the various antigens employed was very different. R. thinks that hemolysis is based on physico-chemical changes and that the hemolytic substances absorb something and thus allow the proteins to dissolve. A detailed discussion of the theories as to the mechanism of hemolysis is given.

JOHN T. MYERS.

A case of pancreatic insufficiency. E. I. SPRIGGS AND A. J. LEIGH. *Quart. J. Med.* 9, 11-42(1915).—A patient with the symptoms of chronic disease of the pancreas was under observation 21 weeks in 5 periods extending over 18 months. The urine and feces were analyzed for 64 days and compared with the intake of food. Trypsin could not be detected in the feces. Formalin-hardened gelatin capsules containing CHI₃ were not digested. Diastase was present in the urine in normal amts. An av. of 1260 g. of feces was passed per day, on admission. With the reduction of unassimilable forms of fat in the food the quantity was reduced to 800 g. An av. of 302 g. of fat per day was lost in the stools on admission, thus from 25 to 59% of the calorific energy of the food being lost. The proportion of fat in the food which was lost in the feces varied from 55 to 99%. The fat of milk was much better absorbed than that of butter, meat, or cod liver oil. The percentage absorbed was less when a large quantity was given. The proportion of total fat in the feces which had been split and was in the form of fatty acids and soaps was rather more than normal throughout, the av. of 54 days figures being 87%. Variations and nature of the fat did not affect fat splitting appreciably. Nearly half the N of the food appeared in the feces. Sugar was present in the urine, but there was no evidence of acidosis. Various ferments were used in the exptl. periods. All except fresh pancreas and trypsinogen irritated the intestinal tract. With trypsinogen there was improvement in the absorption of fat, and with pancreon improvement in the absorption of N. The article has an excellent bibliography.

JOHN T. MYERS.

Anti-phenol serum. JANINA WISZNIEWSKA. *Compt. rend.* 161, 609-12(1915).—A substance was isolated from the products of intestinal putrefaction of proteins which reacts positively with phenolic reagents but does not correspond to any known phenol deriv. It is alkaline and possesses some characteristics of the leucomaines. When administered to animals with food it produced definite sclerotic effects upon the arteries. When injected intravenously into a horse, an antibody was produced in the horse serum which was employed with therapeutic success. W. A. PERLZWEIG.

The Abderhalden reaction in glanders. R. VLADESCO AND J. POPESCU. Bucharest. *Compt. rend. soc. biol.* 77, 586-7(1915).—In view of the observation of Stephan that the proteolytic action of serum disappears after heating for $\frac{1}{2}$ hr. at $53-56^{\circ}$ and reappears after addition of complement, V. and P. have repeated with due precautions their former expts. in which uncertain or negative results were obtained. The horses from which the blood was withdrawn were subjected to a previous fast of 24-36 hrs. and the serum was then dialyzed for 6-10 hrs. in order to eliminate dialyzable substances which give the reaction with ninhydrin; the serum was next inactivated at $53-56^{\circ}$ for $\frac{1}{2}$ hr. and guinea-pig complement was added in the proportion of 0.1 cc. to 1.0 cc. serum. Glanders bacilli obtained in the prepn. of mallein were employed as substrate. Ninhydrin was used in a diln. of 1:500 in the proportion of 1 cc. to 10 cc. dialysate. The results indicate the presence of sp. enzymes in the serum of glanderous animals. It was frequently observed that the serum of glanderous horses became opalescent on being heated to $53-56^{\circ}$. H. S. PAINÉ.

Residual nitrogen of the blood under physiological conditions and its behavior in nephritis, uremia and eclampsia, as well as its significance in the testing of kidney function. H. HOHLWEG. Giessen. *Med. Klin.* 11, 331(1915); *Zentr. Biochem. Biophys.* 18, 261(1915).—Purely unilateral kidney affections do not cause an increase in the residual N content of the serum; practically normal values of 40-61 mg. per 100 cc. are found. A normal residual N value simply shows, therefore, that at least 1 kidney is healthy and capable of function. After extirpation of 1 kidney the residual N values become normal in 4-6 weeks after the operation in case the remaining kidney is sound; when the latter is affected increased residual N values are observed for many weeks following the operation. The residual N value is increased in patients with bilateral renal suppuration or at least toxic impairment of the 2nd kidney. Residual N values of 75 mg. per 100 cc. do not contra-indicate extirpation of the affected kidney, since the process in the remaining kidney is capable of restoration or at least of amelioration. A residual N value of 100 mg. per 100 cc. indicates severe, irreparable alteration of both kidneys and forbids extirpation. H. S. PAINÉ.

Diazo and urochromogen reactions in pulmonary tuberculosis. A. N. SINCLAIR. Honolulu. *J. Am. Med. Assoc.* 66, 247-8(1916).—From a study of 146 cases S. arrives at results which disagree with those of Schaffle (cf. C. A. 9, 92) in that the negative diazo and positive urochromogen reactions proceed at low instead of high death rate; also when both reactions were positive the diazo reaction did not disappear before death. L. W. RIGGS.

Principles underlying the use of vaccines, bacterins, antitoxins and immune serums as agents for the prevention and cure of infectious diseases. F. E. STEWART. *J. Am. Pharm. Assoc.* 4, 1440-50(1915).—A review. M. I. W.

Nature and quantitative determination of reducing substances in normal and pathological cerebrospinal fluid. O. M. SCHLOSS AND L. C. SCHROEDER. New York. *Am. J. Dis. Children* 11, No. 1(1916); *J. Am. Med. Assoc.* 66, 219.—The results for normal fluids were obtained from 45 children on whom lumbar puncture was done as a diagnostic procedure. The reducing substance appears to be a fermentable dextrorotatory sugar, probably dextrose, which varied in amt. from 0.034 and 0.139%.

The belief that the reducing substance in the fluid is pyrocatechol is not supported.

L. W. RIGGS.

New researches on the proteases of leucocytes, in connection with Abderhalden's work on protective enzymes. NOEL FIESSINGER AND L. ROWDOWSKA. *Arch. mbd. exper.* 26, 459-81(1915).—F. and R. used the methods of Abderhalden in the study of the proteolytic enzymes of leucocytes for the purpose of studying their mode of digestive action and their physiological function. The leucocytes were obtained by collecting, from various human lesions pus, as free from blood as possible, and washing in physiological NaCl soln. by centrifugalization and decantation until free from amino acids by the ninhydrin test. As antigen they used human placenta, kidney, liver, and red blood cells, boiled and washed. They decide that the decompn. of the albumin by the protease occurs without the presence of a foreign albumin, even in high dilns. of the leucocytes. The protease was not specific. They conclude that the dialysis methods are inaccurate and very difficult to carry out, sometimes giving contradictory results. Therefore they made some expts. using the chem. method of Sørensen and Ronchese as modified by Bournigault and Bith. This method shows the strong digestive action of the proteases of the polymorphonuclears. This action manifests itself on the protein of the leucocytes themselves. It is more active in a concd. suspension of leucocytes. The formation of amino acids is proportional to the number of polymorphonuclears in the pus. By this method egg albumen did not hinder the reaction as it did when the less accurate dialysis method was used. As shown by both methods, heating to 80° for 10 min. attenuated the protease, and 1 min. at 100° destroyed it. The bibliography is brief.

JOHN T. MYERS.

The Wassermann and luetin reactions in leprosy. WM. FLETCHER. *J. Hyg.* 15, 102-28(1915).—A comparison of the Wassermann and luetin reactions was made, using a group of 100 lepers and 110 non-leprous persons. F. concludes that leprosy may cause complement deviation, but that it does not render the luetin reaction positive. A bibliography is appended.

JOHN T. MYERS.

A contribution to the experimental study of fever. J. L. JONA. *Lister Inst. J. Hyg.* 15, 169-94(1915).—The dried bodies of *B. coli* and *B. typhosus* were used, also "pyrotoxin" made according to Sebastian, as follows: heat a 3-day broth culture for 15 min. at 100°, make it acid, let it stand 15 days, ppt. it with Pb(OAc)₂ and remove the excess Pb with a 10% soln. of Na₂SO₄. Rabbits were injected in various ways. A definite rise in temp. is obtained by the injection of 0.000004 g. of bacterial substance in a small quantity of Ringer soln., and a definite collapse or even death with 0.002 g. The substance or substances in the bacteria responsible for the rise in temp. are either of a colloidal nature or adherent to colloids, and may be almost entirely sepd. by a colodion filter. They are not destroyed by boiling nor by dry heat at 110°. They are sol. in water or saline solns., insol. in ether and not affected by prolonged contact with it. Their potency is diminished by long contact with abs. alc. but they are insol. in it. The exact chem. nature of the substance is not known; it does not give the protein reactions. Autolysis of the bacterial bodies can yield this fever-producing substance. Ca forms an inert salt with it. The rise in temp. produced lasts a few hrs. and is principally due to a diminution in heat loss, heat production remaining sometimes unaffected and sometimes increased. The fall in temp. in collapse when large doses of the bacterial ext. were given is due to a diminution in heat production, heat loss being also diminished. In animals in which the brain stock had been severed distal to the optic thalamus no rise of temp. occurred after an ordinary pyretic dose. A two-page bibliography is given.

JOHN T. MYERS.

Toxins of intestinal worms. D. E. PAULIAN. *Presse medicale* 23, No. 49(1915); *J. Am. Med. Assoc.* 65, 1954.—Guinea pigs were injected with alc. exts. of various

intestinal parasites. Other tests were made with macerations of the bodies of the parasites. Severe toxic action followed the injections. P.'s findings confirm those reported by others, except that he never detected the lesions described by Rachmanov in the nervous elements. The organs most affected were the spleen, kidneys and liver. The suprarenals were always hyperemic and with intertrabecular hemorrhages.

L. W. RIGGS.

Etiology of dental caries. CARLO BRÜGNATELLI. Milan. *Thesis, Milan* (approx. 400 pp.), 1914; *Zentr. Biochem. Biophys.* 18, 96-7(1915).—B. attempted to ascertain whether saliva contains lactic acid and whether the 1st phase of dental caries, i. e., decalcification of dental tissue, can be attributed to the action of this acid. His results confirm the observations of Miller and show that the enzymic action of the saliva only extends to the formation of sugar. B. concludes that neither lactic acid, KCNS, nor the oxidizing enzymes of the saliva play any essential part in the process of dental caries, although they may favor the inception of the latter. From the material of carious teeth B. invariably isolated a polymorphic bacillus which could not be identified with known forms.

H. S. PAINE.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Mechanism of the action of aconite on the cardiovascular and respiratory systems.

ALFREDO CHISTONI. Univ. Naples. *Arch. farm. sper.* 20, 411-49(1915).

A. W. DOX.

The genesis of cardiac automaticity. DARIO MAESTRINI. Univ. Genoa. *Arch. farm. sper.* 20, 467-80(1915).—The application of cocaine-HCl (6%) to the sinus of the frog heart arrests the cardiac rhythm in a few minutes. During this arrest the heart is in abs. repose. When applied to any other region of the heart (auricle or ventricle) cocaine does not appreciably modify the rhythm. Successive applications do not produce as great a response as the first. The auricular contractions are the last to disappear and the first to reappear. Atropine is not suitable for restoring the cardiac rhythm after cessation of the latter through the action of cocaine. A. W. D.

The uric acid solvent power of urine containing hexamethylenetetramine as compared with that of normal urine. HOWARD D. HASKINS. Univ. Oregon. *Arch. Intern. Med.* 16, 1055-66(1915).— $(\text{CH}_2)_6\text{N}_4$ exerts a uric acid-solvent action in the urine only after the administration of excessive doses.

I. GREENWALD.

Some observations on the elimination of hexamethylenetetramine. K. GEORGE FALK AND KANEMATSU SUGIURA. New York City. *J. Pharmacol.* 8, 39-51(1916).—The object of this study was to observe the behavior of the drug in the human organism under normal and pathological conditions. A method for the quant. estn. of $(\text{CH}_2)_6\text{N}_4$ is described; it is carried out essentially as follows: To 50 cc. of the soln. is added, with stirring an alc. I soln. containing 3.6 g. I in 100 cc. 95% alc. Protein or other substances reacting with I must be excluded. If $(\text{CH}_2)_6\text{N}_4$ is absent, no ppt. is formed at first, but on further addition bluish black I ppts. If $(\text{CH}_2)_6\text{N}_4$ is present, a ppt. (at first brownish yellow, than reddish to dark brown) is formed. About 20% excess I is used, the amount needed being judged by the formation of the ppt.; as a rule 5 to 8 cc. of I are required. After all the I is added, the mixt. is allowed to stand 10 min. with occasional stirring; then it is filtered through a Gooch crucible with asbestos mat; the ppt. is washed 5 to 10 times with cold H_2O . The ppt. and crucible are dried *in vacuo* over CaCl_2 to const. wt. and weighed as tetraiodide. Better than the gravimetric procedure is titration of the I with 0.04 N $\text{Na}_2\text{S}_2\text{O}_3$ soln. For this method, the ppt. and crucible are transferred to a beaker, 50 cc. H_2O and 3 cc. glacial HOAc added, and the mixt. titrated with the $\text{Na}_2\text{S}_2\text{O}_3$, a few cc. starch soln. being added toward the end. If the liquid contains protein matter (albuminous urine),

an equal vol. of MeOH is added, the mixt. allowed to stand 1 to 3 hrs. at room temp., filtered by decantation through folded filter paper, evapd. to $\frac{1}{2}$ the vol. in a current of air or under diminished pressure, 1 soln. added and the detn. carried out as described above. The presence of glucose does not interfere; the error in aq. solns. is about 10%, in urine not more than 5%. The phloroglucinol test was used for free HCHO. The excretion in normal individuals was as follows: after 2 g. doses 81, 71 and 40%; after 1 g. doses in a larger number of expts. total excretion ranged from 11 to 74%; with smaller doses (0.33 to 0.67 g.) excretion was irregular and ranged from 10 to 66%. In general, the amt. normally excreted was found to be greater the lower the sp. gr. of urine. $(\text{CH}_2)_6\text{N}_4$ always appeared in the first hour's urine, and the amt. increased and reached a max. during the 2nd and 3rd hrs.; practically no more was excreted after 12-14 hrs. Certain pathological conditions of the kidneys appeared to greatly decrease the excretion of $(\text{CH}_2)_6\text{N}_4$, which ranged from none or a trace up to 88%. In some cases, when excretion of the drug was low, the phthalein excretion and non-protein N of the blood were within normal limits; in other cases the results with all the tests were practically in the same direction. HCHO was demonstrated in 20 out of 32 urines examd.; but only in 2 of these was enough present to indicate bactericidal action. In the human series, no deleterious action from the drug or HCHO in urine was observed. Following the administration of 3 g. per day for 4 days in a dog, hematuria was observed on the 4th day; this disappeared when no more $(\text{CH}_2)_6\text{N}_4$ was administered.

P. J. HANZLIK.

The comparative pharmacologic action of ethylhydrocuprein (optochin) and quinine. MAURICE J. SMITH AND BERNARD FANTUS. *Ann Arbor, Mich. J. Pharmacol.* 8, 53-74(1916).—Ethylhydrocuprein has been given considerable publicity abroad, but no systematic study of its pharmacologic action has been previously made, which might indicate its possible uses, limitations and dangers. S. and F. have found ethylhydrocuprein to be more toxic than quinine for unicellular organisms (*Stylonychia*), frogs and white mice. It is more irritating than quinine to rabbit conjunctiva and the local anesthesia produced by it here is also greater; depression of the central nervous system in frogs, rabbits and mice is about the same as with quinine; it has a greater toxic action on cardiac muscle than quinine, depressing both systole and diastole; blood pressure is lowered less by it than quinine, but a greater vasoconstriction is produced in frog vessels and those of dog kidney than with quinine; uterine action is essentially like quinine; as an antipyretic it is uncertain in small doses and in moderate doses is less efficient than quinine. Intravenous administration should be used cautiously in clinical cases. A fatal case treated with ethylhydrocuprein in which the drug probably played a part is reported.

P. J. HANZLIK.

Aconite as a vasodilator. WILLIAM H. THOMSON. *Am. J. Med. Sci.* 149, 77-8 (1915).—T. objects to all nitrites because their vasodilating effects are too transient. He regards aconite as the most efficacious vasodilator. The most important action of aconite in interstitial nephritis is the increase in the elimination of urea.

TULA LAKE HARKEY.

Use of fluid extracts of umckaloabo and chijitse in the treatment of pyorrhea avelaris. H. J. KAUFFER. New York City. *Dental Cosmos* 57, 1366(1915).—These South American herbs, which are employed as infusions by the natives as a specific for all diseases of an infectious nature, are non-toxic, and apparently do not contain any known alkaloid. A 5% solution of their tincture was a bactericide, and inhibited growth of a mixed culture of pyogenic bacteria from the pocket of a case of pyorrhea avelaris. A 10% solution of their tincture destroyed these bacteria in 10 min. Irrigation of pyorrhea pockets with the 10% solution of their tincture exerted a marked curative action with gradual diminution of pus.

JOSEPH S. HEPBURN.

Action of atophan on the kidney function. GEORG EISNER. *Deut. Arch. klin. Med.* 118, 125-8(1915).—The excretion of NaCl and N after giving 8 patients atophan was plainly decreased; it rose to normal when the atophan was stopped. In several cases there was later a compensatory increase. The excretion of uric acid was increased under the influence of atophan. A supposed analogy between the action of atophan and Ca was not established. The use of atophan as a functional renal test was uncertain.

JULIAN H. LEWIS.

The action of atropine and scopolamine on the cat eye. GEORG JOACHIMOGLU. Univ. Berlin. *Berl. klin. Wochschr.* 52, 910(1915).—The smallest dose of atropine sulfate which causes mydriasis, when dropped into a cat eye, is 0.000245 mg. The smallest dose of scopolamine-HBr is 0.00001855 mg. The scopolamine is therefore approx. 10 times more active than atropine.

JULIAN H. LEWIS.

Chemotherapeutic studies on the intravenous application of antimony trioxide in experimental trypanosome infections. G. L. HOFFMANN. Bern. *Z. Hyg.* 80, 261-78(1915).—The intravenous injection of Sb₂O₃, suspended in sugar, gum arabic, or sugar and gum arabic led to a sterilisans magma in rabbits experimentally infected with trypanosomes (nagana and dourine).

JULIAN H. LEWIS.

Pepper in the prophylaxis and treatment of filariasis. J. A. ROBERTSON. *Brit. Med. J.* 1915, II, 535.—Because of the freedom from filariasis of the Carib Indians, who consume large quantities of pepper, R. concludes that piperine is a prophylactic against this disease. Expts. with capsicum in filarial fever and lymphangitis support this view.

A. H. RAHE.

Action of radium on transplanted tumors of animals. F. C. WOOD AND F. PRIME, JR. New York. *Ann. Surg.* 62, No. 6(1915); *J. Am. Med. Assoc.* 66, 59.—Three factors only are important in the action of Ra on tumors: time of exposure, amt. of Ra, and distance between the Ra tube and the tumor tissue. The removal by filters of the larger part of the β rays diminishes proportionately the effect of the Ra, but the effect of the γ rays is in accordance with the same general law which governs the β rays. When only pure γ rays are used the necessary exposure is 8 times as long as that required when γ and hard β rays combined are employed, but as the latter are largely absorbed by 1 cm. of tissue, γ rays alone must be used for all deep work.

L. W. RIGGS.

Manufacture of nitrous oxide for anesthesia. A. R. WARNER. Cleveland. *J. Am. Med. Assoc.* 65, 1973-6(1915).—The gas as first manufactured frequently gave rise to serious toxic symptoms which were entirely prevented by bubbling the gas through concd. H₂SO₄. The toxic substances were found in the acid as ammonium salts, and are believed to exist in the gas as hydrazines or hydroxylamines. Full specifications for the construction, operation and cost of a N₂O plant suitable for a hospital are given. With the improvements noted it is practical, by skilled hands, to administer N₂O without the least cyanosis or the unpleasant effects which follow the use of Et₂O and CHCl₃.

L. W. RIGGS.

Occupational injuries due to radium. THOMAS ORDWAY. Albany Med. Coll. *J. Am. Med. Assoc.* 66, 1-6(1916).—Descriptions with photographic illustrations are given of 9 cases of Ra injury among physicians, medical attendants and physicists. The results of blood exams. are tabulated, showing in most cases a large increase in the lymphocytes (cf. Gudzent and Halberstaedter, *C. A.* 8, 2197). Marked changes may occur on the fingers of those engaged in routine work with radioactive substances, consisting chiefly of flattening of the characteristic ridges, thickening and scaling of the superficial layers of skin and even atrophy and intractable ulceration. To avoid injury special forceps and vises have been devised for use in handling the tubes, also

screening applicators to protect the operator. In routine work there should be a rotation in the staff so that persons affected can be freed at least for a time from such work.

L. W. RIGGS.

Action of "autolysin" on mouse tumors. F. C. WOOD. New York. *J. Am. Med. Assoc.* 66, 94-5(1916).—Twenty-one animals bearing spontaneous tumors were treated with "autolysin" supplied by Beebe and Horowitz. The prepn. appeared to be non-toxic, even in very large doses, to normal animals, and in small or large doses was without effect upon malignant tumors of mice.

L. W. RIGGS.

Resuscitation by means of preserved erythrocytes in experimental illuminating gas asphyxia. W. H. BURMEISTER. Univ. Ill. *J. Am. Med. Assoc.* 66, 164-7(1916).—A general review and discussion of the treatment of CO asphyxia is given with 18 references to the literature. In B.'s expts. the blood used was drawn from the femoral artery in case of dogs and received directly into a sterile flask at the rate of 225 cc. of blood to 25 cc. of 10% aq. Na citrate soln. To this were added 250 cc. of sterile Ringer soln. containing 2.5% of dextrose. After gently mixing its contents the flask was placed in the dark at 4° until the time of transfusion, when its contents were centrifuged and the top layer together with the layer of white corpuscles removed, leaving 125-150 cc. of erythrocyte suspension which would keep 3 or 4 weeks. Rabbit blood drawn by cardiac puncture was treated in a similar manner, except that 10 times as much Ringer soln. was used, the corpuscles remaining intact for 10 weeks. Full details are given for the asphyxiation of 40 dogs and 20 rabbits, and of the subsequent treatment of 15 of the dogs and 12 of the rabbits by injection of erythrocytes, the remaining animals being used as controls. This treatment proved successful in 75% of the cases in which transfusion was begun while cardiac contraction could still be elicited. A number of the control animals were treated by other methods of resuscitation. The establishment of emergency stations where human erythrocytes can be obtained is recommended.

L. W. RIGGS.

Has secretin a therapeutic value? A. J. CARLSON, *et al.* Univ. Chicago. *J. Am. Med. Assoc.* 66, 178-85(1916).—An extensive review of literature is given with 60 references. The author's expts. show that secretin is quickly destroyed by the gastric juice and by trypsin, that it is not absorbed in active form from the alimentary tract, and is without action when taken by the mouth. The presence of secretin or prosecretin cannot be demonstrated in the commercial prepn., "Secretogen," "Elixir secretogen" and "Duodenin" even when the therapeutic dose is given intravenously. In the case of "Secretogen" an intravenous injection of 100 times the therapeutic dose reveals occasionally a trace of secretin. "There is as yet no reliable evidence that lack of secretin is a primary or important factor in any disease. Even if this should be established, secretin therapy to be effective must be intravenous. Secretin has not yet been prepd. in sufficiently pure state to render possible intravenous injection in man without injurious effects." The results of the exptl. work are shown in 8 tables and 9 tracings.

L. W. RIGGS.

Comparative toxicity of various preparations of mercury. J. F. SCHAMBERG, *et al.* Phila. *J. Cutaneous Dis.* 33, No. 12(1915); *J. Am. Med. Assoc.* 66, 62.—Toxicity of Hg compds., whether mineral or organic, is directly proportional to the amt. of Hg present. Molecular structure appears to have little influence upon toxicity. HgCl₂ administered intravenously was fatal on the av. above 2 mg. per kg. of body wt.; intramuscularly it was fatal on the av. above 6 mg. per kg. Insol. prepn. of Hg were absorbed at a rate of a little over 1% of the injected amt. per day. At the end of 6 weeks 50% of the insol. Hg prepn. may be unabsorbed at the site of injection; hence the injection of usual doses of insol. Hg compds. at weekly intervals must lead to an accumulation of Hg in the tissues. Hg has a great affinity for the cells of the kidney,

this organ being one of the earliest involved in Hg intoxication. Calcification of the degenerated tubular cells has been found within 48 hrs. after administration of Hg, and always occurs in severe Hg nephritis, irrespective of the compd. administered, or the route of injection.

L. W. RIGGS.

Action of peptone on the heart, vessels, and blood pressure. S. A. PISSEMSKY. *Russ. Vrach* 14, No. 38(1915); *J. Am. Med. Assoc.* 65, 2128.—The peptone was passed through the vessels in solns. of 1:200, 1:1000, and 1:10000. The last 2 solns. caused weakening of cardiac contractions, while the 1:200 stimulated the heart to contract, the rhythm remaining uninfluenced. The strong soln. caused marked dilatation of the coronary arteries. The action on the peripheral vessels was studied on rabbit ears with the method of Kravkov. The action was vasoconstricting with all concns., and with any kind of peptone. In the vessels of the isolated kidneys of rabbits the blood pressure remained unchanged or rose, contrary to the observation with dogs in which the same dose (0.5 g. per kg. of body wt.) causes a fall in blood pressure.

L. W. RIGGS.

Case of boric acid poisoning. P. WILLSON. Washington. *Wash. Med. Ann.* 14, No. 6(1915); *J. Am. Med. Assoc.* 66, 63.—An 8 weeks old infant received 3 oz. of a satd. soln. of H_2BO_3 by mistake, nursed, vomited during nursing and received 3 oz. more of the acid. A severe gastro-enteritis followed, accompanied by rapid loss of wt. and the appearance of a slight miliary eruption. Peeling was completed in about 10 days, a rapid recovery following.

L. W. RIGGS.

Influence of oxyquinoline derivatives on purine metabolism and their therapeutic application. T. BRUGSCH AND R. WOLFFENSTEIN. Berlin. *Berlin klin. Woch.* 52, 157(1915); *Zentr. Biochem. Biophys.* 18, 253(1915).—The influence of oxyquinoline on excretion of uric acid in man cannot be detd., inasmuch as the compd. is poisonous. Expts. were therefore made with o-oxyquinoline salicylate which had the effect of reducing the amt. of uric acid excreted. Amts. of 3-4 g. per day in doses of 0.5-1.0 g. continued for 1 week were effective in this respect. No accumulation of uric acid in the blood was observed.

H. S. PAINÉ.

Pathological-anatomical investigation of Basedow's disease. H. RAUTMANN. Chemnitz. *Mitt. Grenzgeb.* 28, 489-618(1915); *Zentr. Biochem. Biophys.* 18, 111-2(1915).—Intoxication, rather than infection, is the primary factor in the etiology of Basedow's disease; a functional disturbance of the internal secretion is probably the source of the intoxication.

H. S. PAINÉ.

Synergic action of vasoconstrictors in local anesthesia. J. BURMANN. *Schweis. Apoth. Ztg.* 53, 478-9(1915); *Pharm. J.* 95, 360(1915).—Epinephrine in diln. of 1:1000 is added to advantage as vasoconstrictor to cocaine, stovaine, alypine or novocaine, etc. As its action in this diln. lasts only a short time, and greater concn. would be toxic, B. recommends that it be combined with uteramine ($p\text{-EtNHC}_6\text{H}_4\text{OH.HCl}$) which has 0.01 the activity of epinephrine. An efficient injection for dental use consists of novocaine 0.03 g., epinephrine 0.00005 g., uteramine 0.005 g., physiological soln. 1.0 cc. in sterilized 1 cc. ampoules. The dose is 1 to 2 cc. of this prepn.

S. WALDBOTT.

Thorium X and uric acid. E. KUZNITZKY. Breslau. *Berlin klin. Wochschr.* 52, 159(1915); *Zentr. Biochem. Biophys.* 18, 227(1915).—K. tested the action of Th X on uric acid in a case of deposition of uric acid crystals in the cornea of each eye. Five g. Th X were injected intravenously at weekly intervals. No decrease in uric acid was observed either before or after the injections and it appears that Th X has no direct action on uric acid.

H. S. PAINÉ.

Content of sugar in the blood under the influence of cocaine. E. W. E. SCHEAR. Columbia Univ. *Am. J. Physiol.* 38, 269-73(1915).—Injections of cocaine into cats

may cause a decrease in blood sugar provided the animal does not show excitement at, or subsequent to, the injection. When excitement is manifest blood sugar is markedly increased. Indirectly, cocaine may cause hyperglucemia by inducing an excited condition in the animal; hence the use of the drug in drawing blood for sugar analysis is attended by an element of doubt.

J. F. LYMAN.

Esters of tertiary trichlorobutyl alcohol and their pharmacology (WOLFFENSTEIN)
10.

I. ZOÖLOGY.

R. A. GORTNER.

Regeneration of the ovaries of *Polycelis nigra*. JULES ZWEIBAUM. *Arch. Entwickl. Organ.* 41, 430-70(1915); *Zentr. Biochem. Biophys.* 18, 269(1915).—Regeneration of the ovaries of *Polycelis nigra* is independent of the nutrition. Light accelerates regeneration at temps. (14-16°) which are favorable thereto; regeneration is inhibited in the dark at these temps. A salt medium has in general no definite influence. NaCl has a sp. retarding action on the sexual differentiation of germ cells. CaCl₂ and Fe₂Cl₆ have an accelerating action on the increase of oögonia. As₂O₃ produces a considerable stimulation of regeneration. A slight acid content promotes regeneration, while an alk. reaction retards it somewhat.

H. S. PAINE.

Acid sensitiveness of euglena. K. LINSBAUER. *Graz. Oest. bot. Z.* 65, 12-21 (1915); *Zentr. Biochem. Biophys.* 18, 99(1915).—Expts. with *Euglena intermedia* var. *Klebsii* Lemm. showed that the critical concn. for various organic acids (succinic, lactic, formic, malic, etc.) varies within rather wide limits; glycolic and citric acids constitute the 2 extremes for the acids investigated, the relative critical concns. being 17.3 and 3, resp. The critical concn. (expressed in % by wt.) for fatty acids increases with increasing mol. wt., while the toxicity varies in inverse ratio. The OH group of hydroxy acids is only capable of effecting a distinct decrease in toxicity in the case of monobasic acids, this observation being somewhat contrary to that of J. Loeb; no decrease in toxicity was observed in the case of dibasic acids. This result is probably connected with the fact that the molar limiting concn. decreases rapidly with increasing mol. wt. of hydroxy acids. Monohydroxy acids have the slightest toxic action, while the greatest toxicity is exhibited by the tetrahydroxy, tribasic citric acid; while the mol. wts. of glycolic and citric acids, the end members of the series investigated, are as 1:2.5, the reciprocal molar limiting concns. are as 1:8.

H. S. PAINE.

Influence of ultraviolet rays on the regeneration of the pigmentary apparatus of Triton. L. TORRACA. Naples. *Inat. Monatsschr. Anat.* 31, 410-33(1915); *Zentr. Biochem. Biophys.* 18, 104(1915).—T. discusses exhaustively the injury to the tissue which is caused by ultraviolet rays.

H. S. PAINE.

Physiological destruction of erythrocytes in birds. PRESTON KYRS. Univ. Chicago. *Inat. Monatsschr. Anat.* 31, 542-50(1915); *Zentr. Biochem. Biophys.* 18, 273(1915).—K. found, in the liver and spleen, cells of a definite type which gave a distinct Fe reaction. This is probably a case of phagocytosis of erythrocytes and it appears to be the normal function of these cells to destroy erythrocytes, thus liberating Fe.

H. S. PAINE.

Heat coagulation of muscles of northern and southern frogs. R. HOPKINS AND G. MANN. Tulane Univ. *Inat. Monatsschr. Anat.* 31, 552-8(1915); *Zentr. Biochem. Biophys.* 18, 265(1915).—The muscles of northern frogs exhibit heat rigor and coagulation at higher temps. than do the muscles of southern frogs; nicotine and atropine have no influence on the varied behavior with respect to temp. Acids which are formed in the muscle as a result of fatigue cause coagulation to occur at a lower temp.

H. S. PAINE.

Asphyxia and narcosis. A. MONTUORI. Rome. *Z. allgem. Physiol.* 17, 18-27 (1915); *Zentr. Biochem. Biophys.* 18, 290-1 (1915).—Tadpoles of *Bufo vulgaris* which were gradually habituated to temps. as high as 18° by daily temp. increases of 2° became more resistant to asphyxiation and showed a simultaneously increased resistance to narcotics. M. concludes that there is a definite connection between narcosis and asphyxiation.

H. S. PAINE.

Origin of recent forms of melanism in butterflies and the significance of the Hamburg forms in the explanation thereof. K. HASEBROEK. Hamburg. *Zool. Jahr., Abt. System. Geogr. Biol. Tiere* 37, 567-600 (1914); *Zentr. Biochem. Biophys.* 18, 99-100 (1915).—The origin and distribution of melanistic forms of butterflies are closely connected with the extension of industries and are probably primarily dependent upon the greatly increased production of smoke and flue gases. It is not certain what chem. influences have played a part in elaborating the hypertrophy of black pigment as a hereditary characteristic. The SO₂ with which the atm. of industrial sections (especially in and around large cities) is impregnated probably plays a considerable role in view of its affinity for O and the consequent inhibition of oxidative processes (which has already been shown to cause an increase in the black pigment of butterfly scales).

H. S. PAINE.

Vital staining in insects by "soluble carmin." A.-CH. HOLLANDE. *Compt. rend.* 161, 578-80 (1915).—Acid and alkaline solns. of carmin behave differently when injected into insects. The acid-carmin compds. are absorbed chiefly by digestive cells, leucocytes, cells of the pericardium, and renal cells. The alkaline carmin compds. are absorbed only by leucocytes and pericardial cells. While the "acid carmins" only traverse the cells, the alk. carminates may remain in the cells for many months. This latter fact H. explains by the transformation of the alk. carminate into pure carmin, which is insol. in H₂O and alc., but is sol. in dil. acids and bases. It is because of the amphoteric properties of carmin compds. that living cells absorb them with ease.

W. A. PERLZWEIG.

Genetic factors and enzyme action. RICHARD GOLDSCHMIDT. Yale Univ. *Science* 43, 98-100 (1916).—After reviewing the work of others G. gives an account of his observations on the pigmentation of the wings of the moth *Lymantria monacha*. All gradations were found between a white animal with the characteristic zigzag bands and a completely black one. Breeding expts. show that these intermediates are to be explained by combinations of some partly sex-linked factors for pigmentation and "there corresponds to every combination of factors, an enzyme reaction, definite in quantity." A study of the different grades of intersexuality produced by breeding of hybrids shows that every step leading from a normal female through the different grades of "intersexes" to a male or *vice versa*, is characterized by a definite intermediate step of wing pigmentation. In the different intersexes a certain amt. of pigment-producing oxidase, parallel to the quant. behavior of the sex factors, is furnished by the veins, varying from 0 in the female to 100% in the male. The results of this study confirm independently the conclusions of others, "that the hereditary factor is a determiner for a given mass of enzymes; and that a quant. difference in the potency of hereditary factors causes a parallel quantitatively different enzyme production."

L. W. RIGGS.

The tension of oxygen in the body fluids of the coelenterata in the sea and in aquaria. E. LOUIS BACKMAN. *Upsala Läkare förenings Föreläsningar* 20, 287-302 (1915).—The body fluid of the *Rhizostoma cuvieri* is osmotically isotonic with the sea water but not with regard to the O₂, which is less within the animal, indicating O respiration in its cells. B. is of the opinion that the gastrovascular system, cilia movements and muscular contractions may be considered to serve in respiration.

In captivity the animals grow to a smaller size and the O_2 tension in them is less, though the O_2 content in the tanks is kept as high as in the sea water. The value of the O_2 tension of the body fluids of the medusa are not in conflict with the theories of gas diffusion in explaining respiration. There was no evidence of the secretion of O_2 within the body cavity. The body fluids indicate an O_2 -consuming property which though small is greater than that of sea water but not so large as that of the blood of the selachii. The conserving property of the animal is not due to presence of plankton but to the functions of the cells of the animal. This may be suppressed by KCN.

A. R. R.

12. FOODS.

W. D. BIGELOW, F. F. FITZGERALD.

"Sozolit." JON ALFRED MJOEN. *Tidskrift Kemi Farm. Terapi* 12, 349-59, 369-73(1915).—"Sozolit," a mixt. of salts, largely Na_2SO_3 and NaCl, is used as a preservative for meats. After an investigation and discussion of the question of preservatives for food materials, "Sozolit" in particular, M. urges that this preservative be permitted in Norway. He contends that it lends itself to control from the govt. chem. laboratories and recommends that when it is used it should conform to a minimum as well as a max. percentage in the foodstuff.

A. R. ROSE.

Caffeine content of Java tea. J. J. B. DEUSS. *Chem. Weekblad* 12, 938-43(1915).—D. favors the use of the refractometer for the detn. of caffeine in tea. The detn. of the amt. of caffeine can be used to judge the quality of tea. The minimum quantity of caffeine in good Java tea is 3%. The amt. of caffeine in tea bears no relation to the place where it is cultivated.

J. A. SAMUELS.

Casein from India. ANON. *J. Roy. Soc. Arts* 64, 69-70(1915).—Milk, in parts of India, especially in Baroda, cannot be distributed in a fresh condition, and is made into casein for export. One of the important uses for casein is in making galolith, a celluloid-like substance which is non-inflammable, and in tropical climates does not soften like rubber.

H. S. BAILEY.

Use of the "lactodensimeter." M. SIROT AND G. JORET. *Ann. fals.* 8, 123-4(1916).—With the "lactodensimeter" it is practicable to det. the d. of milk at 15°. The use of tables for calcg. the values obtained at higher temps. than 15° leads to errors.

H. S. BAILEY.

Nutritive value of boiled milk. A. L. DANIELS, *et al.* *Madison. Am. J. Dis. Children* 11, No. 1(1916); *J. Am. Med. Assoc.* 66, 220.—Rats fed on boiled milk grew about half their normal size and failed to reproduce. Boiling for 1 min. appears to render milk an inadequate food, the change taking place at about the boiling temp. Heating milk to 114° makes it even less valuable as a food. Care should be taken in the pasteurization process not to exceed the proper temp.

L. W. RIGGS.

The present status of the pasteurization of milk. S. HENRY AYERS. U. S. Dept. Agr., *Bull.* 342, 16 pp.(1915); cf. *C. A.* 9, 1353.—A discussion of the term pasteurization, its value, extent in the U. S., methods used, temp. and methods most suitable, operation and cost. A classification and diagram of bacteria in milk as affected by pasteurization is included.

E. H. INGERSOLL.

Fermented milks. L. A. ROGERS. U. S. Dept. Agr., *Bull.* 319, 30 pp.(1916).—A brief résumé of the present knowledge of fermented milks, embodying a discussion of the therapeutic value and various forms of fermented milk. A bibliography of the more important papers on the subject is included.

E. H. I.

The smoking temperatures of edible fats. KATHERINE BLUNT AND CLARA M. FRENEY. Univ. Chicago. *J. Home Economics* 7, 535-41(1915).—The smoking temp. of a fat is defined as the temp. at which it gives off visible fumes. This is found to be lower as the free fatty acid increases. Data are given for a number of fats and oils. An increase of 1.10% free oleic acid lowered the smoking point of neutral olive oil from 234 to 168°. The smoking point was found lower with increase of surface exposed. Finely divided foreign matter, as flour or animal charcoal, lowered the smoking point.

P. M. GIESY.

The determination of the origin of hydrogenated fats and the color reaction of Tortelli and Jaffe. J. PRESCHER. *Z. Nahr.-Genussm.* 30, 357-61(1915).—(1) Hydrogenated fish oils are present when the Tortelli-Jaffe reaction (*C. A.* 9, 1255) and either the Kreis-Roth test for arachidic acid or the cholesteryl acetate test are positive. (2) Simultaneous positive results of the Kreis-Roth and phytosteryl acetate tests may show rape oil as well as peanut oil. (3) Positive Soltsien and Baudouin tests prove the presence of sesame oil. A very low sapon. no. indicates rape oil. (4) Hydrogenated coconut and palm kernel oils can be detected by their high sapon. nos. (above 230) and by the Reichert-Meissl nos. and Polenske nos. which are peculiar to the crude oils. (5) In the detection of hydrogenated castor oil and cottonseed oil the hydroxyl no. of the former and the Becchi and the Hauchecorne reactions on the latter are of value. (6) The ratio of the I no. to n is not the same with hydrogenated fats as with animal fats. Coconut fat of a tallow-like nature is recognizable from other hydrogenated fats by its low I no. If other fats have a low I no. they must be tallow-like fats of unusually high m. p. (7) The Bellier reaction has only the most limited application to the detection of hydrogenated fats.

L. D. ELLIOTT.

The examination of honey by the precipitin method. HANS KREIS. Basel. *Mitt. lebensm. Hyg.* 6, 53-62(1915); through *Chem. Zentr.* 1915, II, 437.—The method of Thöni (*C. A.* 7, 3169) has been included in the Swiss "Lebensmittelbuch." K. has used the method on a large number of samples to det. the limits within which the ppt. can fluctuate for pure honey. After a discussion of the method and the results obtained by it, he concludes that the method, when carefully followed, gives reliable results, which, when considered with the results of analysis, clearly show whether the honey is adulterated, heated or spoiled. An examn. of 32 honeys gave values for the amt. of ppt. from 26.5 to 38.8 cu. mm., which agree very well with the results of Thöni.

H. E. WOODWARD.

The estimation of the color of flour and the detection (rendering visible) of bran particles in flour and grits. ORTO RAMMSTEDT. *Pharm. Zentralhalle* 56, 291-3(1915).—Official export type samples of wheat and rye flours are prepd. each year by the German Millers Assn. with the sanction of the Imperial Treasury Dept. These types are used for color comparison. Bran particles are rendered visible by staining the lignified portions with 1% alc. phloroglucinol soln. and concd. HCl, according to the method of Holz (*Apoth. Ztg.* 1892, No. 7).

C. O. EWING.

The identity of the proteins extracted from wheat flour by the usual solvent. C. H. BAILEY AND M. J. BLISH. Minnesota Agr. Expt. Sta. *J. Biol. Chem.* 23, 345-57(1915).—One% NaCl exts. from flour an amt. of gliadin equal to more than half the total protein in the ext. With 10% NaCl and 5% K_2SO_4 the exts. contain only approx. 15% of the protein as gliadin. The use of 5% K_2SO_4 is recommended for the detn. of the non-gluten proteins. Extn. with 50% alc. by vol. for 20 hrs. at room temp. yields an ext. containing a higher % of protein than when either 30 or 70% alc. is used. Complete sepn. of the gliadin occurs only when the extn. is made at 83-4°; this procedure is recommended. 93% of gliadin N (proportion of gliadin to non-gliadin N) is present in the exts. irrespective of the temp. of extn. (room temp. or 83°). The

amt. of non-gliadin proteins extd. by 50% alc. is const. regardless of the % of these constituents in the flour extd. The sepn. of gliadin from non-gliadin proteins by coagulation in H_2O at 100° is not quant. as considerable gliadin is not coagulated.

A. P. LOTHEROP.

Determination of corn meal in admixture with wheat flour. J. TRAMBICKS. *Chem. Ztg.* 39, 636(1915).—The ungelatinized starch of corn meal is much less sol. in malt ext. than that of wheat flour. 20 g. samples of meal of various compns. were digested with 200 cc. malt ext. and 200 cc. water for 2 hrs. at 65° and the solns. tested with a Zeiss refractometer, the reading for the malt ext. alone being subtracted from the total in each case. The refractometer reading for corn meal was 9.6, for wheat flour 16.6. Mixts. containing 50, 60, 70, 80 and 90% corn meal gave the following readings, resp.: 13.6, 12.9, 12.8, 11.9, 9.5.

E. H.

The determination of the alcohol extract in meat extracts. A. HEIDUSCHKA. München. *Z. öffent. Chem.* 21, 120-1(1915).—There is a misprint in the "Vereinbarungen zur einheitlichen Untersuchung und Beurteilung von Nahrungs und Genussmitteln usw. für das deutsche Reich," vol. 1, p. 50, in Liebig's method for detg. alc. ext. in beef ext. The corrected sentence should read: "2 grams of ext. is weighed into a beaker, dissolved in 9 cc. (not 90 cc.) of water, and treated with 50 cc. of 93% alc."

H. E. WOODWARD.

Harmful effects of beet fodder upon milk. J. ROLLE. *Z. Nahr.-Genussm.* 30, 361-2(1915).—The betaine in beet roots produces a bitter taste in milk. Betaine, by uniting with the lactic acid formed, retards the souring of the milk for some time. Such a milk can be used only for cheese making.

L. D. ELLIOTT.

The composition of some foods from Bulgaria. D. WESSOW AND M. NIKOLOW. *Z. Nahr.-Genussm.* 30, 362-74(1915).—Tables of analyses of hog fat, butter, honey, beeswax, and especially wines.

L. D. ELLIOTT.

The mineral matter content of the food-rations for working horses. W. VÖLTZ. *Z. Spiritusind.* 38, 177-8(1915).—V. shows that the oat substitutes sometimes are very low in mineral matter; the lacking salts are to be added to such feed.

L. W. H.

Biochemical comparison between mature beef and immature veal. WM. N. BERG. *Bur. Animal Ind. J. Agr. Research* 5, 667-711(1916).—No physiologically significant differences in chem. compn. between mature beef and immature veal (from calves 7 days old or younger) were detected. In a large number of artificial-digestion expts. immature veal digested as fast as mature beef. Cats were fed on a diet in which immature veal was the sole source of N. The young animals grew normally on the diet; the older ones became fat. A pair of cats, after living $\frac{1}{2}$ of a year on the diet, produced a litter of healthy kittens which, after the nursing period, continued on the immature veal diet with excellent growth. The work indicates that immature veal, when properly prepared, is fit for human food, especially when its deficiencies in fat and possibly in small amts. of undetd. constituents are counterbalanced in the ordinary mixed diet. A bibliography is appended.

W. H. FRY.

Detection of horse flesh in preserved sausage by means of the biochemical precipitation method. C. DUMITRESCU AND A. MANULESCU. *Buletinul Chimie* 17, 61-7; *Chem. Zentr.* 1915, II, 761-2.—For the prepn. of the precipitating serum of seroprecipitins, rabbits are injected subcutaneously at intervals of 5 days with increasing amts. (5, 10, 20, 40, 60, 80 cc.) of horse serum. After the third injection the activity of the rabbit serum is tested and the injections continued until a minimum of 1 in 10,000 is reached when the serum is obtained in the usual manner and preserved in ampules of 1.25 cc. in a cool place of even temp. The seroprecipitin keeps its strength about 4 months after which it slowly loses its activity. In applying the test, the skin

and 1-2 mm. of the outer layer are removed from about 20 g. of the sausage to be tested and the remainder, freed as much as possible from fat, is ground fine, mixed with 9% physiologic serum to a thick broth in an Erlenmeyer flask and allowed to stand in ice 50 hrs. with occasional stirring. The liquid is then pressed out, centrifuged and the fat layer removed from the clear serum. To each of 2.5 and 5 cc. portions of this serum are added 25 cc. physiologic serum, the mixts. centrifuged until perfectly clear and set aside for comparative material in case of failure. To 4 uniform 12 cm. test tubes is added as follows: Nos. 1 and 2, about 1 cc. of the undiluted serum as obtained above from the sausage containing horse flesh, to No. 3 1 drop of horse serum and 1 cc. physiologic serum and to No. 4 1 cc. of a serum from a sausage free of horse flesh. To each of the tubes 1, 3 and 4 is added 0.1 cc. of seroprecipitin and to 2, 0.1 cc. of the serum of an untreated rabbit. In tubes 1 and 3 after agitation a cloudiness appears which increases in course of 30 min. to a ppt. Tubes 2 and 4 remain clear. This test detects 2% of horse flesh with a seroprecipitin of 1 in 18,000 activity. A seroprecipitin of 1 in 1000 activity gives almost no reaction with sausage containing 2-3% of horse flesh. Clean work is essential to success.

L. W. RIGGS.

The use of the blood of the stock-yard animals as food. E. SALKOWSKI. Univ. Berlin. *Berl. klin. Wochschr.* 52, 597-9(1915).—The use of the blood of the stock-yard animals for food is advocated. Three ways of preserving it are suggested: (1) with antiseptics, as CHCl_3 , formalin, salicylic acid, boric acid, etc.; (2) with a large amt. of sugar; (3) by drying and pulverizing it.

JULIAN H. LEWIS.

Homogenizing milk. N. J. NIELSEN. U. S., 1,168,823, Jan. 18. Milk is passed rapidly through 2 systems of piping in the first of which a much higher temp. and pressure are maintained than in the second, so that the fat globules are burst and the product sterilized.

Pasteurizing bottled milk. L. J. CRECELIOUS. U. S., 1,168,789, Jan. 18.

Pasteurizing liquids containing gas. E. KRAFFT. Ger., 285,488, Feb. 27, 1912.

Solid fruit conserves in stick form. H. KOCH. Ger., 285,727, Jan. 30, 1914. Hot liquid fruit mass is poured into molds wherein it solidifies and shrinks upon the application of cold H_2O to the forms, thereby permitting ready removal. As a further result of the shrinking a combination of the gelatinous matter and the H_2O takes place in such manner that a light-colored, interiorly moist and exteriorly smooth solid product is obtained, which upon soln. in a little H_2O yields the usual readily spreading jelly.

Food preparation. F. J. HOWITT. Brit., 19,803, Sept. 15, 1914. A food prepn. is made by baking a dough of ground maize, ground peanut cake containing 20-25% of oil, flour, and preferably sugar, salt, etc. The maize may be ground with or without the cob, and in the latter case the bran and germ may be removed. The prepn. may be in the form of biscuits or meal, and may be given to dogs, etc.

14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

Analysis of drinking water. WILLIAM A. PEARSON. Hahnemann Medical College, Phila. *Hahnemannian Monthly* 51, 19-21(1916).—Bacteriologic analysis does not reveal the dangerous character of a drinking water. Evidences of contamination are best detd. by estn. of the products of protein decompn.

JOSEPH S. HEPBURN.

Report on water. W. W. SKINNER. *J. Assoc. Official Agr. Chemists* 1, 458-61 (1915); cf. *C. A.* 7, 524; 9, 3310.—As a result of a study of the method for sepg. Ca and Sr, it is suggested that the method be modified by substituting a 1% soln. of $(\text{CO}_3\text{NH}_4)_2$

for the cold water prescribed for washing the mixed oxalates, and that at least 2 extns. of the mixed nitrates with the ether-alc. solvent be made. E. BARTOW.

The disinfection of water in war-times. H. KUEHL. *Deut. Vierteljahr. offenl. Gesundh. Pflege* 47, 38(1915); *Wasser u. Abwasser* 10, 65-6(1915).—K. discusses the purification of water by filtration, boiling, chemical pptn., disinfection, ozonization and ultraviolet-ray treatment. Boiling constitutes an abs. safeguard. The portable field app. provides for subsequent aeration to do away with the stale taste. The Berkefeld and Hansa filters are likely to diminish in efficiency as time goes on. The candles either have to be exchanged or brushed at certain intervals. K. does not consider Cl disinfection as particularly suited. For ozonization the water must first be clarified. Ultraviolet-ray treatment is too expensive. Not every supply is adapted to it. ARTHUR LEDERER.

Influence of weather conditions on amounts of nitric acid and of nitrous acid in the rainfall near Melbourne, Australia. V. G. ANDERSON. *Report Brit. Assoc.* 1914, 338-9; *Quart. J. Roy. Met. Soc.* 41, 99-122(1915).—The results of analyses of rain-water collected at Canterbury, near Melbourne, under different conditions of weather, showed that the amts. of nitrates and nitrites in the rain are very much greater with tropical than with antarctic types. With antarctic types of weather the amts. of N were from 0.002 to 0.005 kg. per hectare. Of tropical rains, the spring and autumn types gave 0.018 kg., the summer type 0.027 kg. and the heat-wave type 0.039 kg. per hectare. Intermediate results were obtained in antarctic depressions, with more or less tropical influence, and in tropical depressions with antarctic influence. E. J. C.

New spring in Fiuggi. G. AMPOLA AND G. LIBERI. *Ann. chim. applicata* 4, 205-30(1915).—The H_2O is very limpid, perfectly neutral, and remains clear in the test glasses, without giving the least opalescence; it is perfectly colorless, odorless, and without taste. The number of colonies of bacteria counted in clear cultures in gelatin, kept at 20° for 7 days, and in cultures of albumose agar, kept at 20° for 15 days, were, per cc. of H_2O : liquefying *Schisomyces*, 7; non-liquefying *Schisomyces*, 31; *Hyphomyces*, 14; suspected pathogenic colonies, none. The temp. of the H_2O was quite const. oscillating between 11.5 and 12°. The sp. gr. was within 1.0002. The f. p., compared to that of the purest distd. H_2O , was a few hundredths of a degree lower. The sp. elec. cond. K_{18} was 80.2×10^{-8} . Measurements of radioactivity were made. They were calcd. for the H_2O at the spring. The av. current of satn. per l. was 4690×10^{-8} abs. electrostatic units, or 1894.7×10^{-18} amp.; the av. emanation per l. was 2131.1×10^{-12} Curie units or 1278.7×10^{-12} cu. mm. The radioactivity is due solely to Ra emanation dissolved in the H_2O , and not to the presence of solid radioactive substances. The activity diminishes with lapse of time, is also lost on boiling the H_2O , and was not acquired again after keeping the boiled H_2O a month in a closed bottle. The residue from the evapn. of 100 l. of the H_2O was perfectly inactive. No liberation of gas was noted in the H_2O at the spring, nor on standing. Using Reichardt's and Frankland's methods, it was found that the H_2O contained the following dissolved gases per l.: 36.80 cc. CO_2 , 3.71 cc. O, 15.90 cc. N. In 100 l. of the H_2O there were found present (all wts. in g.): total CO_2 , 10.36; combined CO_2 , 0.8323; semi-combined CO_2 , 0.8323; free CO_2 , 8.6954; Na, 0.4427; K, 0.1327; Li, 0.00001; Ca, 0.6327; Sr, 0.0112; Mg, 0.1914; Fe, 0.0238; Al, 0.0248; Cu, 0.0005; Mn, 0.00002; Cl, 0.8688; SO_4 , 0.4822; NO_3 , 0.0865; PO_4 , 0.0019; CO_3 , 1.1349; TiO_2 , 0.0036; V_2O_5 , 0.0010; SiO_2 , 1.0740; total fixed residue at 180°, 5.1500. The residue is free of alk. carbonates. The authors believe the H_2O to be excellent for table use, on account of its distinctly saline character, its very slight mineralization, its strong radioactivity, the traces of Li it contains, and the relatively large amts. of Sr present. In an appendix a comparison is made of this H_2O with the H_2O of the well-known and old "Fiuggi Spring." The slight differences between

the 2 are probably due to the variation of the last layers traversed by the waters.
S. LEVY.

Public water supplies. PERCY GRIFFITH. *Surveyor* 48, 331-2, 371-4(1915).—A lecture discussing sources, reservoirs, and pumping machinery. For a gravity system in England storage capacity should be provided for from 120 to 250 days. Loss by evapn. may amount to 12 to 27 in. per year over the whole water-shed. W. D. C.

Slate beds. ANON. *Surveyor* 48, 411(1915).—Quotations from a pamphlet issued by the Slate Bed Biological Sewage Disposal Co., Limited. At Devizes about 680 tons of pressed sludge were produced in a year when chem. pptn. was used while from slate beds only 50 tons of inoffensive mold were obtained during a similar period.
W. D. C.

London's water supply. ANON. *Surveyor* 48, 307(1915).—According to the twelfth annual report of the Metropolitan Water Board the av. daily supply for the district in 1914-15 was 36.08 gallons per capita. Of the daily av. of 245 million gallons the Thames furnished 58.5, the Lee 23.1, and springs and wells 18.4%. W. D. C.

The water supply of Copenhagen. SVERRE MALM. *Intern. Z. Wasserversorg.* 1915, 1-3, 9-11, 24-5; *Wasser u. Abwasser* 10, 74-5(1915).—Since 1893 ground water has been used exclusively. Part of it contains Fe which must be removed by aeration and filtration. The plant at Lake Soender consists of 74 wells, 50 m. and 30 m. deep, which furnish a max. of 30,000 cu. m. per day. The plant in the Harestrup-brook valley also furnishes approx. 30,000 cu. m. per day. The 2 supplies are combined and aerated. The supply from the Veil-brook valley furnishes approx. 33,000 cu. m. per day. The first 2 supplies mentioned are filtered and the Fe is removed. The water consumption in Copenhagen during the fiscal year of 1912-13 amounted to 124 l. per capita.
ARTHUR LEDERER.

The water supply of Berlin. EGGERT. *Wasser u. Gas* 5, 158-60(1915); *Wasser u. Abwasser* 10, 76(1915).—E. discusses the development and present status of the water supply. The enlarged plants will furnish 480,000 cu. m. per day. Up to the present time the total cost of all works is about 124 million marks.
ARTHUR LEDERER.

Brief notes of experiments in sewage purification by forced aeration. J. P. WAKEFORD. *Surveyor* 48, 132-3(1915); cf. *C. A.* 9, 2785.—At Wakefield expts. were carried on in a tank 30 ft. by 12 ft. by 6.5 ft., with $\frac{1}{2}$ hr. for filling, 2 hrs. for blowing, 2 hrs. settling, and $\frac{1}{2}$ hr. for emptying. Results were satisfactory, but several engineering difficulties must be overcome before the process can be worked on a large scale. When this is done it is safe to assume that the treatment will be less offensive, more rapid, will require less filter area, and be less expensive to maintain than present processes on account of the omission of chemicals, greater fertilizing value of the sludge, and less expense for attendance.
W. D. COLLINS.

The sludge problem. Standards for effluents recommended by the Royal Commission on Sewage Disposal, and sewage purification by aeration in presence of activated sludge. H. M. WILSON. *Surveyor* 48, 74-6(1915).—Attention is called to various processes which successfully deal with sludge, though little is known as to the economy of them. W. believes that in recommending standards for effluents the Commission decided against the weight of evidence placed before them and made a mistake. A short account of the development of the activated sludge method and the results of its use leads to the conclusion that the process produces satisfactory purification, but the cost of operation has not yet been fully worked out.
W. D. COLLINS.

Non-septic house and town sewage drainage and sewage-drainage ventilation systems. ISAAC SHONE. *Surveyor* 48, 80-3(1915).—Illustrated description of ventilatic flushing system.
W. D. C.

Sewage works operation and analytical methods. SANITARY ENGINEERING SECTION OF AM. PUBLIC HEALTH ASSOC. *Surveyor* 48, 322-3(1915).—Committee report. W. D. C.

Treatment of sewage by aeration in the presence of activated sludge. E. BARTOW. *Met. Chem. Eng.* 13, 901-4(1915); cf. *C. A.* 9, 1521.—Description of the status of the activated sludge process of sewage treatment in America, with details of the work done at the Illinois State Water Survey. F. W. MOHLMAN.

The oxidation of sewage without the aid of filters. III. E. ARDERN AND W. T. LOCKETT. *Surveyor* 48, 450-4(1915); see *C. A.* 10, 502. W. D. COLLINS.

The destructive distillation of feces. J. MENZIES. *Surveyor* 48, 498-501(1915).—The av. results from laboratory distn. of 48 samples of press cake from sewage sludge gave per ton, oil 9 gallons, NH_3 (as $(\text{NH}_4)_2\text{SO}_4$) 60 lbs., "spirit" 0.75 gal., gas 5,500 cu. ft., residue 750 lbs. The av. from 12 samples of crude feces was, oil 16 gallons, NH_3 (as $(\text{NH}_4)_2\text{SO}_4$) 88 lbs., gas 3200 cu. ft., residue 240 lbs. per ton. Sewage sludge is so poor a conductor of heat that for successful distn. it must be dried before feeding to the retort. Caking must be prevented either by mixing with inert material or by some appliance in the retort. A description, with drawing, is given of a destructor which will take care of feces from about 2,000 men. The material is fed to the top plate of a series of five, one above the other inside a gas-tight box 6 ft. by 4 ft. by 5 ft. high. The plates are hollow and heated by gas from a producer, which also provides the necessary power by means of a gas engine. Rakes stir the material and gradually carry it down from one plate to another till at the bottom the carbonaceous residue is removed. The NH_3 liquor recovered contains pyridine bases and when it is sprinkled over feces no flies will approach the material. The NH_3 liquor has been tested as a protection against Cl gas. A spray of NH_3 in front of a trench united with Cl gas liberated at 25 lbs. pressure from a perforated pipe 15 ft. from the trench. No discomfort was experienced by men in the trench. W. D. COLLINS.

The destructive distillation of sewage. ANON. *Chem. Trade J.* 57, 453(1915); cf. preceding abstract.—Notes on an app. described by J. Menzies before Inst. Sanit. Engrs. in Nov., 1915. A thin layer of feces constantly agitated on hot plates in a still undergoes rapid destructive distn., yielding useful distillates without nuisance. The oil contains less than $\frac{1}{4}\%$ S and is good for fuel. The first fraction from oil is colorless spirit of 0.760 sp. gr., the 2nd fraction a pale, burning oil and the last fraction is an excellent lubricant with good viscosity. NH_3 is recovered as 6 oz. liquor. R. B. D.

Sewage works for military camp. ARTHUR W. SMITH. *Eng. Record* 73, 82-3 (1916); *Surveyor* 48, 516-7(1915).—The plant built at Ripon, England, to treat the sewage of an army corps of 42,000 men with 10,000 horses consists of 2 screening tanks, 4 Dortmund tanks and 4 long subsidence tanks, percolating bacteria bed, 10,000 sq. yd. in area, 6 ft. deep, having slag and gravel as filter media. The effluent from the filters is settled in Dortmund tanks and then discharged into the River Ure. The total tank capacity is 500,000 imp. gal. per day. FRANK BACHMANN.

Sewage gas tank utilized for light and heat. CHARLES C. HOMMON. *Eng. Record* 73, 182-3(1916).—The vents of the Imhoff tanks at the Peachtree sewage treatment plant at Atlanta, Ga., were capped and sufficient gas collected for the use of the laboratory and for domestic needs. About 30,000 cu. ft. of gas per day is available from the decompn. of the sludge in the tanks. Photographs accompany the article showing the collectors over gas vents of the tanks and a gas holder of 1400 cu. ft. capacity. F. B.

Sanitary progress in Peru and Bolivia. H. J. BINGHAM POWELL. *J. Roy. Sanitary Inst.; Surveyor* 48, 412-4(1915).—P. describes waterworks and sewage installations in several cities and towns. Most of the water supplies of Peru are from wells in gravel.

Some Bolivian supplies are from storage reservoirs. In Peruvian coast cities there is practically no rainfall so provision is made only for domestic sewage. In Bolivia, sewer capacity is provided for precipitation at the rate of $\frac{3}{4}$ in. to 1 in. per hour with $\frac{1}{2}$ to $\frac{1}{3}$ of this reaching the sewers. At present, refuse of towns in Peru is conveyed by carts to tip-heaps, some of which are as old as the towns, 300 to 400 years, so that all org. matter in the bottom layers has been decomposed. W. D. COLLINS.

The soot- and dust-fall of English towns and cities. J. B. C. KERSHAW. *Chem. Trade J.* 57, 363-4(1915).—A summary of serial detns. made by a committee for the investigation of atm. pollution, monthly reports of which have been published in the *Lancet* (London). A cast-iron funnel enameled on the inside and having a collecting area of 4 sq. ft. is protected from birds by a wire guard, and is drained into bottles. Rain washes soot and dust into bottles. The collected rain water is tested for insol. matter, tar, carbonaceous matter, ash, dissolved matter, combustible ash, chloride, sulfate, ammonia. The dust-fall in a year averaged in tons per sq. mi. per month at Oldham, 79.79; Ancoats, Manchester, 71.39; Technical School, Manchester, 45.08; Birmingham, 59.46; Sheffield, 55.55; Liverpool, 47.89; Embankment Gardens, London, 49.84; Golden Lane, London, 32.89; York, 23.14; Malvern, 5.45. R. B. DOLG.

Choice of alloys for water work design (CARPENTER) 9.

Disinfectant. M. ENSELMANN and B. MERKEL. U. S., 1,167,642, Jan. 11. A stable, whitish powder, sol. in H_2O and insol. in alc. and ether, is made by grinding together NaOH with about twice its wt. of mercurichlorophenyl sulfate, mercuriphenyl acetate, mercuribenzoic acid, mercurichlorobenzoic acid or mercurized *p*-nitrophenol. All these products are sol. in dil. alk. solns.

15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

Soil colloids. O. REITMAIR. *Wiener Landw. Ztg.* 65, 455-8(1915).—A descriptive article pointing out the importance and the nature of the action of colloids in the soil. C. F. MILLER.

A comparison of methods for the determination of soil phosphorus. W. O. ROBINSON. *Bur. Soils. J. Ind. Eng. Chem.* 8, 148-51(1916).—The fusion methods of Washington and of Fischer give accurate results. V interferes with the P detns. in soils. This influence can be avoided by reducing the V with $FeSO_4$ and pptg. at low temps. with shaking. With soil solns. it is not necessary to add H_2SO_4 to prevent the reoxidation of the vanadyl salt. The influence of V is also avoided by using the gravimetric method, provided precautions are taken for complete pptn. and the NH_4MgPO_4 ppt. is not allowed to stand too long. W and Ti do not interfere with the detn., by the gravimetric method, provided precautions are taken to make the pptn. complete. The compn. of the feathery ppt. is dependent on the nature of the bases in the soln. before pptn. Proper pptn. and washing of the yellow ppt. prevents the formation of the feathery ppt. or reduces it to a negligible amt. W. H. FRY.

Nitrification and total nitrogen as affected by crops, fertilizers, and copper sulfate. C. A. JENSEN. *J. Am. Soc. Agron.* 8, 10-22(1916).—This paper deals with a study of changes in nitrification and total N under field conditions at Rocky Ford, Colo., during the summers of 1911 and 1912. The object of the NO_3 detns. was to find some method of counteracting the detrimental effect of excessive NO_3 accumulations which

gave promise of becoming a serious factor in beet culture on certain soils in Colo. In 1911 mustard had some effect in checking the accumulation of NO_3 in the field. CuSO_4 at rate of 100 lbs. per acre on fallow land reduced the av. accumulation to 60% of the amt. found in the check. Molasses decreased and manure slightly increased nitrification. Waste Ca from the beet factory strongly increased nitrification. Active nitrification began about June 1st, reached its max. about July 15th, and ceased after Aug. 15th. The mustard plot contained less total N than any other plot. The fallow plots treated with CuSO_4 and molasses contained less total N than their checks. In the cases of the Ca and manure fallow plots less total N was found than in the checks. The reverse was true in regard to NO_3 . Nitrification in 1912 was less than in 1911. In 1912 nitrification was decreased by general fertilizing materials. There was not much change in nitrification during the summer season. J. J. SKINNER.

The displacement by water of the nitrogenous and mineral material contained in leaves. G. ANDRÉ. *Bull. soc. chim.* 17, 429-41(1915).—A. endeavored to find the amts. of certain of their constituents that leaves lost while lying on the ground during the winter. The rains, aided by insects and bacteria, make available the N from the proteins, the P from mineral and org. P compds. and the K from salts of org. acids. On Oct. 17, 100 leaves of the chestnut tree were analyzed and on the following 21st of Apr., a second hundred, which had wintered on the ground, were analyzed and a loss of 7.5% N, 67.4% P (calcd. as H_3PO_4), and 87.7% K was found. Dead leaves after wintering in piles on the ground contain about twice as much N and the same amt. of H_3PO_4 as a good farm manure but the K is almost entirely lacking. This N does not, however, nitrify as readily as that in the manures. To find the influence of H_2O alone, a known wt. of leaves was covered with H_2O and a few drops of formalin added and after a certain period of time the solns. were decanted off, replaced by more H_2O and the solns. analyzed. The last portion (extd. 255 days) contained 6.27% of the total amt. N, 74.14% of the total H_3PO_4 and 94.58% of the K_2O . The N evidently exists in the leaf as a protein which does not readily hydrolyze. It was observed that the younger the leaf, the larger % of N, PO_4 , and K was extd. in the first week. The same expts. were carried out with respect to the SO_3 , CaO and MgO content. After 1 month's immersion in H_2O , 56.8% of the total S, 50.72% of the MgO but only 20.03% CaO had passed out. R. L. SIBLEY.

Sampling device (SHAW) 1.

Fertilizer from molasses refuse. E. HERZKA. U. S., 1,168,255, Jan. 11. Dry fertilizer is prepd. by evapg. molasses refuse *in vacuo* to 44° B $\acute{\text{e}}$., adding about 30-50% its wt. of mineral phosphate, guano or bone meal to the concd. material and treating the mixt. with sufficient concd. H_2SO_4 to react with the phosphate added and also to decompose the K_2CO_3 of the concd. molasses refuse and form K_2SO_4 .

16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Spanish apple-wine. WARCOLLIER. *Ann. fals.* 8, 27-33(1915).—A description of the Spanish methods of making apple-wine, followed by a tabulation of the analyses of 9 samples. The % of EtOH varies from 3.8% to 9.1%, reducing sugars from 21.5 to 75.4 g. per l., total acid as H_2SO_4 from 1.8 to 3.9 g. per l., and volatile acids as H_2SO_4 from 0.9 to 2.51 g. per l. The amt. of apple-wine exported in 1910 from Spain to various countries is given. H. S. BAILEY.

Influence of sulfurous acid upon the fermentation processes due to yeasts and bacteria in wine, perry and cider. H. MÜLLER-THURGAU AND A. OSTERWALDER. *Landw. Jahrb. Schweiz.* 28, 480-528(1914); *Bull. Agr. Intelligence* 7, 977-80(1915).—The action of SO_2 upon wine, perry and cider was investigated by introducing it in the form of $\text{K}_2\text{S}_2\text{O}_5$ into the juice of grapes, pears and apples. After 1 hr. (or longer) the amt. of free and fixed SO_2 was detd. (by titration with 0.02 N I soln.). The increased fixing power for SO_2 shown by the juices of over-ripe pears and apples and of grapes infected by *Botrytis*, probably depends upon the amt. of AcH they contain. The juice from normally ripe fruit is free from aldehyde and fixes SO_2 to a far less extent, forming an unstable compd. with dextrose. Whatever the state of maturity of the fruit, free SO_2 is always found in the juice after treatment, and this undergoes oxidation during the storage period before fermentation. The compd. of SO_2 and dextrose also undergoes decompn. during this period. During fermentation the SO_2 -AcH compd. remains unchanged, but the SO_2 -dextrose compd. is decompd. with the liberation of free SO_2 , which, however, becomes fixed very quickly, and is subsequently oxidized to SO_3 . AcH produced as an intermediate product and the aldehyde originally present in the juice, undergo reduction to EtOH during fermentation, hence most of the SO_2 added remains in the free state, but as the production of aldehyde increases it gradually becomes fixed. As fermentation proceeds, the free SO_2 is oxidized by the atm. O to SO_3 , but some may be fixed by the AcH produced by oxidation of the EtOH. Only free SO_2 has a retarding or inhibiting action upon fermentation. The resisting power of yeasts to SO_2 differs with different varieties. The inhibition of alc. fermentation is dependent upon the kind of juice, the initial yeast flora, and probably also upon the oxidase content. The effect of SO_2 is greater if it be added to the fresh grape juice than if introduced after fermentation has set in; with the juice of "sleepy" pears the reverse holds good, owing to the acid combining with aldehyde. The decompn. of malic acid in wines by *Bacterium gracile* is prevented by smaller amts. of free SO_2 than are necessary to inhibit alc. fermentation. To prevent such decompn., SO_2 should be added before fermentation. Small amounts of free SO_2 will prevent a wine from tasting of lactic acid. Perry rich in aldehydes will require more, but an undue excess should be avoided, as the sensitive lactic bacteria would be adversely affected.

L. W. HAAS.

Carboxylase. ARMINIUS BAU. *Wochschr. Brau.* 32, 405-6(1915); cf. C. A. 9, 2284.—B. studied the action of dried yeast on free CH_3COCOOH in the presence of K_2HPO_4 , Na_2HAsO_3 and H_3BO_3 , respectively, as "puffer." Expts. with beer in all its stages of manufacture (from pitched wort to the finished product) did not furnish any indication of the presence of carboxylase; this experience confirms C. Neuberg's statement that from living yeast no carboxylase diffuses into the surrounding liquid.

L. W. HAAS.

Changes in the physiological conditions of brewery yeasts. O. FÜRNROER. *Z. ges. Brauw.* 38, 297-9, 305-7, 313-6, 345-7, 353-5, 361-4(1915).—The detn. of the fermentative energy serves as a convenient means of information as to the enzymic and physiological condition of yeast. F. examined continuous yeast propagations of different types of yeast for a considerable period to show the gradual degeneration of practice yeast, if no measures are taken against it, and investigated the regeneration of degenerated yeast by means of different yeast stimulants. The yeasts were washed with tap-water and distd. water without and with the addition of asparagine, glycerol, tartaric acid, CaSO_4 , MgSO_4 , KH_2PO_4 , K_2HPO_4 , K_3PO_4 , Na_2HPO_4 , MgCO_3 , CaC_2 , CaCl_2 , MgCl_2 , NaCl , KI and H_2SO_4 (soaked for 1 hr. and subsequently neutralized with NaOH or Ca(OH)_2), resp. After this treatment the fermentative power was detd. for all compounds tried, CaSO_4 effected the highest increase in fermentative

power. The tap-water was much superior to distd. water in this respect. The above facts explain the comparatively rapid degeneration of yeast in breweries using soft water. To guard against this trouble, it is best to use the pitching yeast from brew to brew unwashed or to wash it with water to which CaSO_4 has been added. In another series of expts. the stimulants were directly mixed with the pressed out yeast (0.4 to 1.0 g. per 5 g. pressed yeast) and then the fermentative power detd. CaSO_4 again produced the best results. Some of the salts showed a reverse effect to that observed when employed in dil. soln. for washing; especially detrimental were H_2SO_4 and H_3PO_4 and even K_2PO_4 (which, dissolved in the wash water, produced a beneficial effect). The differences in the stimulating power of different stimulants disappeared nearly entirely when they were dissolved in the same wort; furthermore, their effect was practically negligible for all stimulants tried with the exception of MgCO_3 , which distinctly depressed the fermentative power. These results have some practical significance, as they show that an addition of CaSO_4 to the mashing water for the purpose of stimulating the yeast is unnecessary. The effect of stimulants on the physical and chemical properties of yeast was also studied. All expts. led to the conclusion that CaSO_4 is not only a cheap, but also the best, and when not properly applied, the least harmful among all yeast stimulants.

L. W. HAAS.

Yeast and attenuation. M. H. DALY. *Brewers' J.* 51, 508(1915).—The different factors influencing attenuation are briefly reviewed.

L. W. HAAS.

Some facts concerning yeast. TH. BOKORNY. *Allgem. Brau.-Hopfen-Ztg.* 55, 1653-4(1915).—B. reports on expts. on hydrolysis of yeast protein by means of H_2SO_4 (N and $0.1 N$) and by NH_4OH (N and $0.1 N$) and on the proteolysis by yeast (in the presence of H_3PO_4 , H_2SO_4 and organic acids, resp.) of different animal and vegetable protein material (pea flour, soy-bean flour, rape-seed flour and meat meal).

L. W. HAAS.

Yeast fat. TH. BOKORNY. *Allgem. Brau.-Hopfen-Ztg.* 55, 1803-5(1915).—The more important investigations on the quantity and nature of fat in yeast, and the factors influencing both are reviewed and the feasibility of the technical production of fat from yeast is discussed. B. points out that the fat content of yeast can only be increased to a commercially feasible height by plentifully administering carbohydrates and protein to the growing yeast. The conditions for increasing abnormally the fat content of yeast are not fully known. Extensive study of "fat-yeast" (fat-producing yeast) is still required, if to the advocates of its commercial employment not more is known than that published in the literature.

L. W. HAAS.

Diastase preparations and their application in practice. I. POLLAK. *Brau.-Malzind.* 17, 14-7(1916); cf. *C. A.* 9, 2568, 2570, 3116, 3326.—Review.

L. W. H.

Gluten turbidity. F. EMSLANDER. *Wochschr. Brau.* 33, 20(1916).—The designation "gluten" for the substance causing the well-known turbidity of beer on cooling is incorrect, as this substance is not identical with the animal gluten (or gelatin), both behaving differently to yeast endotryptase. It is also incorrect to call above turbidity "gluten turbidity." E. proposes to call it most correctly "protein turbidity."

L. W. HAAS.

Potato starch as malt adjunct in the production of beer and its working in practice. E. JALOWETZ. *Brau.-Malzind.* 17, 2-5(1916).—Potato starch is a suitable malt adjunct and may be employed in proportions up to 20%, depending upon the condition of the malt used.

L. W. HAAS.

Determination of moisture in bitter principles in hops. Ö. WINGER. *Wochschr. Brau.* 33, 11-2(1916).—Another reply to D. Wiegman's criticism of W.'s work on above subject (cf. *C. A.* 10, 248).

L. W. HAAS.

Working of sugar beets in Austro-Hungarian distilleries. A. P. KOŁOCZEK. *Z. Spiritalind.* 38, 9-10(1915).—The following points are briefly discussed: (1) Prevention of fermenting over by addition of oil, (2) steaming of beets, (3) prepn. of yeast, (4) conducting of fermentation, (5) procedure in working sugar beets and potatoes simultaneously, (6) degree of fermentation, (7) distn., (8) nutritive value of beet-slop, and (9) mode of delivering slop to cattle.

L. W. HAAS.

Sucrose as adjunct to malt and its inversion during the brewing process. F. SCHONFELD AND H. KRUMHAAR. *Wochschr. Brau.* 33, 9-11(1916).—The suitability of sucrose in the production of beer is discussed and the changes in the brewing process involved by its use are indicated. Expts. on the inverting action on sucrose of the brewing processes led to the following conclusions: Boiling for 1 hr. of wort contg. cane sugar does not effect inversion of the latter. During pasteurization a more or less complete inversion takes place according to duration of pasteurization. In resting beer sucrose usually disappears within a short time, whether it be added before or after principal fermentation. In beers pasteurized shortly after the addition of sucrose, the latter may be met in considerable quantities.

L. W. HAAS.

Barleys of crop 1915. R. HEUSS. *Z. ges. Brau.* 38, 411-3(1915); cf. C. A. 10, 660.—The extreme values are given of the analyses of barleys so far published by the different investigators and the results are briefly discussed.

L. W. HAAS.

Regeneration of pitch. R. HEUSS. *Z. ges. Brau.* 38, 413-4(1915).—Waste pitch is heated in a kettle to about 200°, and this temp. maintained until spattering and foaming have ceased. The foam and impurities on the surface of the molten mass are then removed by a large ladle, 10% paraffin added, well mixed and then allowed to settle for some time, after which the liquid pitch is poured through a fine meshed sieve into suitable receptacles (pitch boxes). Thus regenerated, "old pitch" was found a suitable adjunct to fresh pitch in proportions up to 50%, provided that the regenerated pitch originally was a good grade product.

L. W. HAAS.

Effect of disinfectants on pitch. R. HEUSS. *Z. ges. Brau.* 39, 1-3, 9-11(1916).—As typical specimens a rosin oil pitch (A) and a paraffin pitch (B), further "regenerate" (R), "mammut" (M), A + 10% R and A + 10% M were exposed to the action of 2% CH₃O, 5% antiformin, 5% montanin, 5% technical NH₄F.HF., 1% HF and 3% pyricite, resp. Oak-wood blocks coated with above pitches or mixts. were partially immersed in the solns. of the disinfectants and the effect noted from time to time. Antiformin attacked all coats so strongly that they usually were completely destroyed after 2-3 hrs. exposure; a very slight action within 24 hrs. was noticed with HF on A, B and A + 10% R. All other disinfectants, though frequently renewed, did not produce the slightest effect within 24 hrs. on any of the pitches. The effect of sulfuring on pitch also was investigated. Dry S vapors did not produce any perceptible effect, while in the presence of moisture bluish white depositions of S were noticed at the damper spots after 24 hours. The resistance of pitching mixts. to the disinfectants commonly employed in the brewery (with the exception of antiformin and HF) suggests sterilizing of trade packages by disinfectants and dispensing with repitching after each use. Expts. in this direction proved entirely successful, provided the coat of pitch was not injured and the disinfectant was applied in the proper way. The best results were obtained with Röder's "automatic barrel cleaning and disinfecting app. with adjustable atomizer."

L. W. HAAS.

Pharmacopeial standards for whiskey and brandy (BERINGER) 17. Composition of some Bulgarian wines (WESSOW) 12.

17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

Two hydrastinines of commerce. EDUARDO FILIPPI. Univ. Camerino. *Arch. farm. sper.* 20, 371-91(1915).—No appreciable difference was found between hydrastinine procured from Bayer and that procured from Merck. A. W. DOX.

Note on the melting point of salicylic acid and a test for the presence of *p*-hydroxybenzoic acid. HENRY L. SMITH. *Analyst* 41, 3-6(1916).—The m. ps. of samples of salicylic acid from a number of sources were detd. after drying *in vacuo* over H_2SO_4 , recrystn. from water and again drying. In all cases the acid m. 158.5° , both before and after crystn., which is distinctly higher than the figures usually given. The addition of *p*-hydroxybenzoic acid lowers the m. p. of salicylic acid. A mixt. of 99 parts salicylic and 1 part *p*-hydroxybenzoic m. $155-6^\circ$; 90 parts and 10 parts at $146-7^\circ$. The microscopic characters of the 2 acids if crystd. on a slide from dry ether are very dissimilar. Salicylic acid crystallizes in the well-known feathery or leaf-like crystals, the *p*-acid in small dense tufts. From a very dil soln. in commercial ether it may crystallize in a feathery form, due to the presence of water, but this is very different from salicylic acid. 5% of the *p*-acid can easily be detected by microscopic examn., but it is not easy to be certain if only 1% of the impurity is present. In the latter case, the formation of the basic Ca salt of salicylic acid $(OC_6H_4COO)Ca \cdot H_2O$, which is less sol. than the Ca salt of the *p*-acid, may be made use of to conc. the *p*-acid. A small amt. of the acid to be tested is mixed with $Ca(OH)_2$ and water, evapd. to dryness, and heated to 110° for an hr. After cooling, the mixt. is extd. with a little water. The aq. ext. is acidified and extd. with ether. The ethereal ext. is filtered and evapd. to dryness. The dry residue is then taken up in dry ether and prepd. for microscopic examn. as above described. P. B. DUNBAR.

Testing ether for narcosis. F. DIETZE. *Apoth. Ztg.* 30, 165-6(1915).—Pure ether tested in accordance with the method of Rogais (detection of H_2O_2) yields colorless ethereal layer, the aq. layer showing only a very faint yellowish color, while commercial Et_2O gives under similar treatment a reddish layer. As a result of D.'s expts., he would impose the following conditions: On treating 5 cc. Et_2O for narcosis with 1 cc. 0.1 *N* NH_4CNS soln. and shaking with 2 drops of a boiled and cooled (exclusion of air), acidified oxide-free $FeNH_4(SO_4)_2$ soln. (1 + 19), there should be no immediate reddening of the ethereal layer. W. O. E.

The active principle of *Baccharis cardifolia* (mio-mio). J. BRANDL AND G. SCHAEFTEL. Univ. Munich. *Arch. Pharm.* 253, 195-201(1915).—Administration of an aq. ext. of this Argentinian plant is fatal to rabbits, inducing hemorrhoidal gastroenteritis in these animals. An aq. ext. evapd. to dryness with $Ca(OH)_2$ and MgO , then treated with $C_6H_{11}OH$, *via* P. Arata, yielded colorless, non-toxic, non-alkaloidal crystals. The yellowish green mother liquor, however, proved to be toxic, as was also the ppt. formed on the addition of $Pb(OAc)_2$ to the aq. ext. Two kg. of the dried plant yielded to petr. ether 10 g. toxic, yellowish green baccharis oil (acid no., 7.19; sapon. no., 66.99; acid no. of the vol. fatty acids, 2.5; I no. of an old sample of oil, 93.56; of freshly prepd. oil, 81.60); 1.9 g. colorless, cryst., non-toxic compound ($C_{29}H_{48}OH$, m. 80° , stable toward alc. KOH, $KMnO_4$, CrO_3 , acetylating agents and nascent Br) and 2 g. non-toxic yellowish green resin. The toxic principle of the oil is destroyed by dil NaOH soln. W. O. E.

Oil from the seeds of *Strychnos nux vomica*. II. A. HEIDUSCHKA AND R. WALLENREUTER. Univ. Munich. *Arch. Pharm.* 253, 202-13(1915); cf. C. A. 7, 210.—The principal results of the investigation are summarized as follows: The unsaponifiable portion of the oil may be sepd. into the fractions, (a) a resinous portion, (b) a

phytosterol, m. 158° , (c) an alc., $C_{28}H_{47}OH$ (C_nH_{2n-12O}) or $C_{28}H_{49}OH$ (C_nH_{2n-10O}), m. 90° , $[\alpha]_D +90^{\circ}$, mol. wt. 496. The alc. contains no double bond and is probably related to amyirin. Esters of AcOH, propionic, benzoic and salicylic acids were prepd. Of the AcOH ester the mol. wt. = 512, $[\alpha]_D = +74.47$. The alc., $C_{28}H_{49}OH$, possesses a double bond in the side chain; its properties coincide in many respects with those of the sycoceryl alc. of De la Rue and Mueller. No sepn. of the unsaponifiable portions of the oil could be effected according to the method of Darmstaedter and Lifschuetz.

W. O. E.

Adaptability of the Röse-Gottlieb method for the estimation of fat and oil in certain pharmaceutical preparations. C. A. HACKMAN. *Chemist Druggist* 87, 19 (1915).—The Röse-Gottlieb method for fats involves the use of only very simple app. and affords the most rapid and accurate means for the detn. of oil in many pharm. preps., e. g., ext. of malt with cod liver oil, emulsions, etc.; it can also be used for the accurate detn. of cocoa butter in cocoa and chocolate. In adapting the method to substances other than milk (for which it was originally devised), it is important to keep the relative proportions between the water and the immiscible solvents const. Drawings of app. and detailed directions are given.

C. O. EWING.

Cinchona assay. P. J. KRUYSE. Amsterdam. *Chemist Druggist* 87, 155 (1915).—Moisten 6 g. coarsely ground bark with 1.5 cc. NH_4OH and 1.5 cc. H_2O , add 6 g. sand and grind to a fine powder; add 3 g. slaked lime mix, and add 3 cc. H_2O ; ext. $\frac{1}{2}$ hr. by boiling with 174 cc. Me_2CO , cool, make up to original vol., filter, evap. 150 cc. (= 5 g. sample) on a water bath. To the alkaloidal residue add 1 or 2 cc. HCl in 20 cc. H_2O , filter and shake out with Et_2O or $CHCl_3$ to remove fat. (This is optional with *Cinchona ledgeriana* but is essential with *C. succirubra*.) Neutralize to litmus with NH_4OH , boil, add 0.5 g. $(CO_2NH_4)_2$. If a large amt. of quinine is present, as in the case of *C. ledgeriana*, crystals of the oxalate ppt. as the soln. cools; if no ppt. appears in 5–10 min., as in the case of *C. succirubra*, add 220 mg. of quinine-HCl (in this case deduct 0.5% from the result), again boil and cool. The crystals, which in the case of *C. ledgeriana* consist of pure quinine oxalate, are filtered, washed (amt. of wash water not stated), dried and weighed. The wt. multiplied by 1.2 plus 20 mg. (allowance for soly. of quinine oxalate in wash water) gives equiv. of quinine sulfate in the bark. In the case of *C. succirubra*, the ppt., which consists of approx. 72.5% quinine oxalate, 23.6% cinchonidine oxalate, and 4% impurities, is dissolved in acid, neutralized, and 0.5 g. Na nitroprusside added; the pptd. quinine nitroprusside is filtered off, dried and weighed. The wt. multiplied by 1.04 plus 50 mg. (allowance for soly. of the oxalate and nitroprusside of quinine) gives the equiv. of quinine sulfate. "If the quantity of cinchonidine and cinchonine is also required, the cinchonidine can be detd. by pptg. it from the united filtrates as cinchonidine tartrate. The cinchonine can then easily be detd., as it is insol. in Et_2O ."

C. O. EWING.

Quantitative determination of salicylic acid in the presence of o-acetoxybenzoic acid. G. N. WATSON. *Druggists Circ.* 60, 7 (1916).—W. finds that Freyer's method for salicylic acid (*Chem. Ztg.* 20, 820 (1896)) can be used in the presence of $AcOC_6H_4CO_2H$.

C. O. EWING.

Otto of rose constants. ANON. *Perfumery Essent. Oil Record* 6, 275–6 (1915).—Genuine oils contain 65 to 75% geraniol and 30 to 40% citronellol. Limits of variation of physical consts. are as follows: sp. gr. 0.851 to 0.862, optical rotation -2 to -4° , n 1.458 to 1.862, m. p. is no longer important in detection of adulterants. A table shows the yearly variations in the consts. from 1909 to 1915.

C. O. EWING.

Colloidal silver for purposes of injection. FRITZ WISCHO. *Pharm. Post* 48, 469–70, 481–2 (1915).—Chemically pptd. colloidal Ag is superior to electrolytically prepd. Ag in that it can be dried without losing its colloidal state. After drying it

can again be taken up with water to form a colloidal soln. Dispargen is a chemically pptd. colloidal Ag prepn. of equal value with "electrargol" for purposes of injection. It contains about 30% of Ag, is not affected by strong mineral acids and but little by alkalis. It possesses bactericidal properties, an aq. soln. becoming sterile within half an hour. It is not hemolytic.

C. O. EWING.

The preparation of the volumetric solutions of the German Pharmacopoeia V. München Pharm. Assoc. *Pharm. Zentralhalle* 56, 403-6(1915).—Directions are given for prepg. the various volumetric solns. required. (No directions are given in the G. P.—ABSTR.)

C. O. EWING.

Volumetric solutions of the (German) Pharmacopoeia. WIEBLITZ. *Pharm. Zentralhalle* 56, 515-6(1915); cf. preceding abstract.—W. calls attention to improvements in some of the procedures above outlined.

C. O. EWING.

The composition of plagin. PRIESS. *Berl. klin. Wochschr.* 52, 552(1915).—Plagin is a parasiticide which has the following compn. by chem. analysis: Powdered anise 2, sugar 1, CaCO_3 2 and Na_2SiF_6 95%.

JULIAN H. LEWIS.

Candy medication. BERNARD FANTUS. Chicago Univ., Ill. *J. Am. Med. Assoc.* 66, 26-8(1916).—Directions are given for the prepn. of over 50 different medications for administration in candy form.

L. W. RIGGS.

Application of the biochemical method to the study of the kernels of cherry-laurel. MARC BRIDEL. *J. pharm. chim.* 12, 249-52(1915).—After destroying the enzymes by means of boiling alc., amygdalin (3.16%) and sucrose (2.26%) were extd. from the kernels, confirming Lehmann (1885). The march of optical rotation of aq. exts. (100 cc. from 100 g.) of kernels of cherry-laurel and bitter almonds and cherry-laurel leaves under the successive influence of invertin and of emulsin is tabulated. The compn. of the kernels of cherry-laurel and of bitter almonds is very similar, except that the former contain 19.2% more amygdalin than the latter, and the latter 23% more sucrose than the former. The glucoside of the leaves is prulaurasin (cf. C. A. 2, 1996).

S. WALDBOTT.

Preparation and physical properties of the essential oil of cadier (*Juniperus oxycedrus*). R. HUERRE. *J. pharm. chim.* 12, 273-83(1915).—The oil does not sep. easily from the woody tissue upon distn. with H_2O over direct fire. Prolonged maceration with H_2O (8 days) after 4 fractions were taken, raised the yield of the 5th. The total yield by the steam method, at different seasons from wood of the same territory (Var in S. France) was 3.1, 1.6 and 2.4%, the latter two 1 yr. apart. For good yield, the wood should be distd. soon after cutting. The crude oil gave $d_{15} 0.915-0.927$; $[\alpha]_D -31.42$, detd. in 10% soln. of 95% alc.; b. p. of 73% of the oil $260-280^\circ$; 50° , $b_{150} 158-161^\circ$. Cade oil is readily sol. in Et_2O , Me_2CO , CHCl_3 , sol. in 1 vol. of abs. EtOH , 95% EtOH , amyl alc., CCl_4 , cryst. AcOH , $\text{C}_6\text{H}_5\text{NH}_2$, xylene, C_6H_6 , toluene, with slight turbidity in 1 vol. of oil of turpentine, petroleum ether, CS_2 . Sol. in 12 vols of 90% alc. and 20 vols. of MeOH . In cade oil are readily sol. Me, Et and amyl salicylates, terpineol, eucalyptol, an equal wt. of camphor, $1/3$ its wt. of $\alpha\text{-C}_6\text{H}_4(\text{OH})_2$, 0.1 of homopyrocatechol. In less than their vol. of cade oil are sol.: creosote, liquid guaiacol the heavy wood creosote oils, veratrol, MeEt pyrocatechol, creosol, Me creosol, Et creosol, Et and Pr guaiacol, eugenol. To det. the best method of rectification of the oil, the relative vols. of distd. oil + H_2O were measured. If a mixt. of oil and H_2O is to be rectified over a direct fire, normal and not reduced pressure must be employed. Far better results are obtained when the steam is generated separately and conducted into the oil. Then reduced pressure (e. g., 400 mm., temp. of oil 86°) is of greater advantage than normal pressure. A higher temp. favorable theoretically, is not advised, due to possible color changes.

S. WALDBOTT.

Stainless iodine ointment (*unguentum iodi denigrescens*). W. R. PLATT AND HENRY L. SMITH. *Pharm. J.* 95, 544-6(1915).—This consists of a mixt. of free I, I compds. and soft paraffin. The proportions of the free and combined I vary according to the nature of the paraffin. It is not possible to make an ointment containing 5% I, combined or free, by the directions of the Brit. Pharm. Cod. If I is required to be combined, a soft paraffin with a sufficient amt. of unsatd. hydrocarbons should be chosen, and a "carrier" should be used. But even with ICl_3 , complete absorption does not occur for many hrs. If I is required in the free state, a more satd. paraffin, *e. g.*, one m. 35-36° and with I no. 2.80 (Wijs' soln.) makes an excellent prepn. Whether the I should be free or combined is an open question, but in the latter case, the I seems to be too firmly combined to be therapeutically available. S. WALDBOTT.

Cheltenham spa. ANON. Cheltenham. *Pharm. J.* 95, 571-2(1915).—Three waters are offered: Magnesian H_2O contains in grains per gal.: NaCl 27.980, NaBr 0.015, NaI 0.037, Na_2SO_4 60.893, Na silicate 1.469, K_2SO_4 4.779, LiCl traces, CaCO_3 36.372, CaSO_4 63.460, MgSO_4 117.659, MnCO_3 0.023, FeCO_3 0.038, AlPO_4 0.011 NH_4NO_3 0.018, org. matter, traces. This H_2O is also put up in concd. form, 16:1. Na_2SO_4 -water contains chiefly NaCl 390 and Na_2SO_4 155; an alk. water NaCl 466, Na_2SO_4 115, NaHCO_3 39 grains per gal. S. WALDBOTT.

Brazilian jalap. E. M. HOLMES. *Pharm. J.* 95, 671(1915).—Specimens diverted by the war from Hamburg to Liverpool, were recognized as the root of *Piptostegia pisonis* Mart., the true Brazilian jalap. F. W. Passmore obtained from it 20% of resin of which only 0.85% was Et_2O -sol. Thus, as a source of jalapin it is twice as valuable as Vera Cruz jalap, by the Brit. Pharm. standard. Its value is not lessened by its high content of ash, 8.9%. S. WALDBOTT.

Proposed substitute for preparations of valerian. THOMSON. Petrograd. *Pharmazeuticheski J.* 1915, 273; *J. pharm. chim.* 12, 358-63(1915).—*Bornyval* is bornyl isovalerate, sol. in EtOH, Et_2O and CHCl_3 , insol. in H_2O ; d_{15} 0.955, $[\alpha]_D$ -30.78 (+27.40, M. Siedler). Sapon. no. of commercial article 211.41, theory 235.29. It is sedative and tonic, but is decompd. by HCl in the stomach. *Neobornyval* is permanent towards HCl, decompd. by alkali. It is formed by heating equimol. amts. of bornyl chloroacetate and Na or K valerate. It is a colorless, odorless, tasteless, neutral liquid, sol. in organic solvents, insol. in H_2O , b. 284-6° with partial decompn., d_{15} 1.031, $[\alpha]_D$ +20.33°, sapon. no. 365.87, theory 378.38. Sapon. with KOH yields $\text{Me}_3\text{CHCH}_2\text{CO}_2\text{K}$ and $\text{CH}_2(\text{OH})\text{CO}_2\text{K}$; the latter may be pptd. by CaCl_2 . *Valissane*, bornyl bromoisovalerate, is a colorless, tasteless, aromatic liquid, of same solubilities as bornyval; $[\alpha]_D$ -25.31°, sapon. no. 331.55, theory 353.31; Br 23.4%, theory 25.2%. *Adamone*, bornyl dibromohydrocinnamate is prepd. by treating an EtOH soln. of borneol with $\text{C}_6\text{H}_5\text{CH}:\text{CHCO}_2\text{H}$ in presence of H_2SO_4 . The sepd. ester is treated cold with Br. Adamone is a white cryst. powder, insol. in H_2O , sol. in warm EtOH, Et_2O , CHCl_3 , m. 72°. Sapon. yields $\text{C}_6\text{H}_5\text{C}::\text{CCO}_2\text{K}$ which gives an orange color with alkali after oxidation with HNO_3 . S. WALDBOTT.

Composition of some specialties analyzed in Russia. *Pharmazeuticheski J.*; *J. pharm. chim.* 12, 269-71(1915).—*Modjardbe*. FeCO_3 15, essence of cubebs 3.73, alum 3.73, powdered ratanhia root 15, Canada balsam 15 g.; mix the first 4 in a mortar, gradually add and mix in the balsam, divide into pills each of 0.3 g. *Autobritt* (for shaving). BaSO_4 12, starch 46, ZnO 40, saponin 2 g.; powder and mix. *Bispol*. BiONO_3 2, powdered H_3BO_3 4, ZnO 4, Bi subgallate 2, lanolin 10, vaseline 20, Peru balsam 3 g. *Captol*. Vanilla 1, lactose 5, cryst. sugar 10, powdered cola 3, quinine-HBr 3, aspirin 6.6, salophen 6 g. Triturate vanilla with the sugars, screen through silk, mix in the other substances and divide into 1 g. packages. *Maltavène*. Mix equal wts. of barley flour, malt ext., goat's milk and eggs, add 15% of sugar and 17% of baker's yeast,

allow the paste to rise, form into cakes which are then dried and powdered. *Aniodol*. Dissolve 2.5 g. $(\text{CH}_2\text{O})_2$ with heat in 7.5 g. of glycerol, filter, mix with 2.5 g. essence of mustard, bring up to 1 l. with H_2O . 20 g. of this prepn. dild. in 1 l. of H_2O , is an antiseptic for surgical instruments, clothes, etc. S. WALDBOTT.

Color standards and cudbear. H. V. ARNY AND C. H. RING. *J. Am. Pharm. Assoc.* 4, 1294-99(1915).—A further report on the use of "Co-Fe-Cu" solns. of CoCl_2 , FeCl_3 and CuSO_4 in 1% of HCl , and of "Co-Cro-Cu" (*C. A.* 9, 2492) and of "Cro-Manganate" blends. For the latter a 0.001 *N* permanganate soln. and a 0.01 *N* dichromate soln. are used. These blends are unstable and must be used for matching within 1 or 2 hrs. after mixing. M. I. W.

Stability of preparations containing yellow phosphorus. H. ENGELHARDT AND O. E. WINTERS. *J. Am. Pharm. Assoc.* 4, 1450-7(1915).—A further report on the use of Cu salts in the estimation of yellow P (*C. A.* 9, 1553). CuCl_2 was found to be unsatisfactory while the $\text{Cu}(\text{NO}_3)_2$ method previously outlined gives uniformly trustworthy results. From a systematic study of a number of pharmaceutical prepn. containing yellow P the authors conclude that these prepn. keep well under ordinary conditions. Only those prepn. which contain org. matter are easily decomposed. M. I. W.

Sempervirine from gelsemium root. A. E. STEVENSON AND L. E. SAYRE. *J. Am. Pharm. Assoc.* 4, 1458-63.—Sempervirine may be sepd. from a mixt. of the combined alkaloids of gelsemium root by converting the alkaloid into the nitrate which is quite sol. in water and practically insol. in solns. containing NaNO_3 . Methods for the purification of sempervirine and for preparing the free alkaloid and some of its salts are discussed. From some preliminary pharmacological observations it would appear that salts of the alkaloids have no immediate toxic effect but 1 mg. of sempervirine-HCl in solns. was found to kill a 90 g. guinea pig in 48 hours. M. I. W.

Color reactions. E. A. RUDDIMAN. *J. Am. Pharm. Assoc.* 4, 1467-8(1915).—A review of the probable reasons for the widespread differences in the statements concerning the color produced by a given reagent on a given compound. M. I. W.

Estimation of atoxyl. H. ENGELHARDT AND O. E. WINTERS. *J. Am. Pharm. Assoc.* 4, 1468-71(1915).—A modification of the Ph. Germ. V. method for the estimation of atoxyl as outlined by Rupp and Lehmann (*C. A.* 5, 2694) works well and gives satisfactory results with simple tablets containing atoxyl. Bland's mass was found greatly to disturb the estn. with all of the available methods. M. I. W.

Tinctures. WILBUR L. SCOVILLE. *J. Am. Pharm. Assoc.* 4, 1472-6(1915).—A report of a comparative study of the relative stability of tinctures made by percolation of drugs and by diluting fluidextracts. The results are presented in the form of a table. M. I. W.

The estimation of morphine in pills and in tablets. H. W. JONES. *J. Am. Pharm. Assoc.* 4, 1477-9(1915).—A review of various methods proposed for extg. morphine with immiscible solvents. The method proposed by Williams (*C. A.* 8, 2920) which depends on the conversion of morphine into diacetylmorphine has been modified using NaHCO_3 instead of NH_4OH to liberate the alkaloid. The method so modified was found to give accurate and uniformly concordant results. M. I. W.

The retarding effect of certain substances on pepsin digestion. C. F. RAMSAY. *J. Am. Pharm. Assoc.* 5, 30-3(1916).—R. finds that comparatively small amounts of quite a number of salts in combination with pepsin interfere with or negative the test for pepsin but that the elixirs of iron and pepsin and of bismuth and pepsin of the National Formulary do not contain enough iron or bismuth to inhibit the activity of the pepsin, at least in so far as the pharmacopeial test is concerned. M. I. W.

Resin of jalap. J. PAUL SNYDER. *J. Am. Pharm. Assoc.* 5, 34-7(1916).—The U. S. P. standard of 35% of CHCl_3 -sol. matter in resin of jalap is indefinite, because the amt. depends entirely on the method employed for extg. the resin. Seven samples of resin of jalap yielded from 69.7 to 95.5% of CHCl_3 -sol. matter by the Soxhlet method and from 26.4 to 53.1% by the reflux method. The pharmacopeia should state definitely the amt. of sample and CHCl_3 to be used, the method to be employed and the length of time the resin should be treated with the solvent. M. I. W.

Pharmacopoeial standards for whiskey and brandy. GEORGE M. BERRINGER. *J. Am. Pharm. Assoc.* 5, 54-65(1916); *Am. J. Pharm.* 88, 49-65(1916).—Proposed monographs including definitions, descriptions and tests for whiskey and brandy with a table giving a synopsis of the examn. of 40 samples of distd. spirits. M. I. W.

The nephelometric determination of small amounts of essential oils. A. G. WOODMAN, R. T. GOOKIN AND L. J. HEATH. *J. Ind. Eng. Chem.* 8, 128-31(1915).—When the methods most commonly employed to det. essential oils (extrn., pptn. and subsequent measuring) are not applicable because of the small amts. of oil present, dependable results may be had with oils that form an emulsion with water by detg. the amt. of light reflected from a column of this emulsion. The candle turbidimeter was not found suitable for this purpose. A nephelometer as described by Kober (*C. A.* 7, 3981) was found to give satisfactory results. Peppermint oil, nutmeg oil, anise oil and oil of rose can be detd. with great accuracy by the nephelometric method in concns. up to 1%. The method is not applicable to essential oils which do not form an emulsion on adding water to their alc. solns. The detn. ordinarily requires less than half hour for its completion. M. I. W.

On the chemical constituent of "Amacha" (*Hydrangea tunbergii*). HIDEO MANIWA. *J. Pharm. Soc. Japan* 1915, 1399.—The dried leaves contain a characteristic sweet substance having the formula $\text{C}_{16}\text{H}_{14}\text{O}_6$. This substance contains 2 hydroxyl groups and yields a diacetyl derivative (m. 144°) and a dibenzoyl derivative (m. 162°). The phenolic character of the substance is further characterized by its yielding a violet color with FeCl_3 and by being sol. in a cold soln. of alkali. M. I. W.

Approved methods of physiologic standardization of drugs. CHARLES S. CHASE. *J. Am. Pharm. Assoc.* 4, 1289-93(1915).—A review. M. I. W.

Tobacco. J. K. PROBST. U. S., 1,168,029, Jan. 11. Cured tobacco leaves are subjected to vapors generated from salt water and from an NH_4OAc soln. to promote "after-fermentation."

Tyrosine-mercury compound. H. BUCHTALA. U. S., 1,167,622, Jan. 11. A compd. of the formula $\text{C}_9\text{H}_9\text{O}_2\text{NHg}$ is prepd. by heating a soln. of tyrosine with Hg oxide or acetate and is employed in an alk. soln. prepd. with 1% NaOH or KOH as a medicinal agent in the treatment of gonorrhea.

Plastic compositions. W. HARBUTT. Brit., 19,211, Aug. 28, 1914. A plastic compn. comprizes a mixt. of permanently plastic material of the kind usually employed for modelling, such as "plasticine," and fibrous material, such as wool or cotton-wool. "Plasticine" is stated to have as its chief constituents S and pure vegetable oils. Suitable proportions are 1 lb. of wool per cwt. of "plasticine." The compn. is applicable for ear-stoppings for preventing gun deafness, for resetting broken bones, and, when rolled into sheets, as surgical bandages.

Urethans of the phenyl glyceryl ethers. BAYER & Co. Ger., 284,975, Sept. 2, 1913. These urethans are obtained when phenyl glyceryl ethers, in which the phenyl groups can be substituted by homologs and substitution products, are converted into simple or substituted urethans according to the usual methods.

Carbonic acid derivative of sodium 2-phenylquinoline-4-carboxylate. CHEM. FABRIK AUF ACTIEN (v. E. SCHERING). Ger., 285,499, Dec. 28, 1913. This product is obtained by acting on Na 2-phenylquinoline-4-carboxylate with CO_2 , or by treating 2-phenylquinoline-4-carboxylic acid with Na_2CO_3 , or with NaHCO_3 , or by effecting a reaction between NaHCO_3 and 2-phenylquinoline-4-carboxylates. Cf. C. A. 9, 1097.

Bismethylaminotetraaminoarsenobenzene. C. F. BOEHRINGER & SÖHNE. Ger., 285,572, May 14, 1912. Cf. Brit., 996, 1913 (C. A. 8, 2603).

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

Perkin medal award (to Dr. L. H. Baekeland). Introductory address. W. M. GROSVENOR. *J. Ind. Eng. Chem.* 8, 177-8(1916). Presentation address. C. F. CHANDLER. *Ibid* 178-82.—A review of the life and works of Dr. L. H. Baekeland is included in this address. Address of acceptance. L. H. BAEKELAND. *Ibid* 182. The discovery of Dr. Baekeland. RICHARD A. ANTHONY. *Ibid* 182-3. An appreciation of Dr. Baekeland. E. H. HOOKER. *Ibid* 183-4. Practical life as a complement to university education. Medal address. L. H. BAEKELAND. *Ibid* 184-90.

E. J. C.

The role of chemistry in the war. ALLERTON S. CUSHMAN. *J. Franklin Inst.* 181, 163-90(1916).

E. J. C.

The graphics of blending in chemical industries. F. G. DONNAN. *J. Soc. Chem. Ind.* 35, 3-7(1916).—A general geometric method is indicated for the solution of a certain class of problems occurring in technical chemistry. Such concrete illustrations as are given refer to the soap mfg. industry.

E. J. C.

A further innovation in the manufacture of hydrochloric acid. H. FRIEDRICH. Biebrich. *Chem. Ztg.* 40, 10-11(1916); cf. C. A. 7, 3201.—The app. is designed to wash and cool the HCl gas and remove As without loss of HCl . The gas enters at the top of a central chamber, passes to the bottom and out into side chambers, to the top of these then down the next adjoining chamber, from the bottom of which it goes to the absorber. In the top of each chamber are sprays through which H_2SO_4 is circulated until it becomes satd. with As when it is removed and the As removed with H_2S , a fresh lot of H_2SO_4 being used in the meantime.

J. H. MOORE.

Conversion of ammonia into nitric acid. KARL KAISER, Charlottenburg; BRUNO WÄSER, Brieg; BERLIN-ANHALTISCHE MASCHINENBAU AKT.-GES. *Chem. Ztg.* 40, 14(1916).—Wäser's statement to the contrary notwithstanding (cf. *Chem. Ztg.* 39, 916(1915)), Kaiser claims to oxidize NH_3 at a cost of 1.25 kg. coke per kg. NH_3 , plus power to drive fans, with a guaranteed yield of 90-5%. The B.-A. Masch. A.-G. built over 30 plants during last yr. capable of oxidizing over 12 million kg. NH_3 by the Frank-Caro process, equalling Kaiser's guaranteed yield and have under construction app. for oxidizing 17 mill. kg. per yr. Cf. C. A. 6, 2302; 7, 2456; 8, 214, 2605; 9, 356.

J. H. MOORE.

The acetic fermentation of *Fucus evanescence* (Hibatsunomata). E. TAKAHASHI. *J. Chem. Ind. Japan* 19, 30-41(1916).—T.'s expts. show that *Fucus evanescence*, a seaweed which grows along the eastern coast of Hokkaido, will ferment with the production of AcOH if allowed to stand with a little lime and some water added occasionally. The AcOH obtained contains a small amt. of propionic acid. The proper amt. of lime to add is about 3-5% of the dry matter and it is advisable to add it 3-4 times in small quantities. The suitable time needed for fermentation is about 2 weeks at

30° and 3-4 weeks at 20°. As the quantity of acid is increased by the addition of fucose to samples this sugar probably has some relation to the acid fermentation.

E. J. C.

Production of ammonia from cyanamide. W. S. LANDIS. *J. Ind. Eng. Chem.* 8, 156-60(1916); *Met. Chem. Eng.* 14, 87-90(1916); cf. *C. A.* 9, 2699, 3333.—The raw materials are cyanamide or lime nitrogen (cf. *C. A.* 9, 1719), containing about 25% of N as CaCN_2 , 12% CaO , 12% C, the remainder being impurities derived from the raw materials used in its manufacture, Na_2CO_3 and $\text{Ca}(\text{OH})_2$, 3.5 and 2%, respectively, of the wt. of cyanamide used. On treating CaCN_2 with steam NH_3 is evolved according to the equation $\text{CaCN}_2 + 3\text{H}_2\text{O} = \text{CaCO}_3 + 2\text{NH}_3$, which is almost quant. when carried out as described for this process. A unit of the app. consists of a steel autoclave 6 ft. in diameter and 21 ft. high, capable of withstanding a pressure of 300 lbs. per sq. in., and furnished with an effective stirring app. Into this autoclave are charged 12,000 lbs. of mother liquor from a previous operation (fresh water to start) and 7000 to 8000 lbs. of cyanamide are fed in over a period of about 1 hr. with constant stirring. As a slight amt. of CaC_2 is present, C_2H_2 is formed during the charging and must be removed by a ventilating system which will insure non-explosive mixts. with air. Na_2CO_3 and $\text{Ca}(\text{OH})_2$ are next added to increase the efficiency of NH_3 evolution, principally by preventing the formation of polymeric forms of cyanamide compds., which are more difficult to transform into NH_3 . The autoclave is then closed and steam is admitted for about 15 min. until the pressure reaches 3-4 atm., which gives a temp. sufficient to start the reaction at a fair rate of speed. This reaction is strongly exothermic, generating steam and NH_3 in the autoclave so rapidly that the pressure rises to 12 or 15 atm. in about 20 min. even with the relief valve open. The pressure then slowly decreases, the rate of discharge being regulated so as to maintain a constant pressure in the NH_3 line. At about 90 min. from the start the evolution of gas ceases. Live steam is next admitted up to 6 or 8 atm. and the NH_3 valves opened for a second discharge. A third steaming rarely yields over 2% of the total NH_3 . The mud is run from the bottom of the autoclave to filters of the "Nutsche" type, the filtrate and washings being used to dissolve the next batch. The lime sludge when dried contains 65% CaO as CaCO_3 and $\text{Ca}(\text{OH})_2$, and less than 0.2% of NH_3 . Methods of handling the NH_3 for the production of different chemicals are given, also descriptions of plants with operating costs. Very pure NH_3 is obtained much cheaper by this process than from gas liquor or by-products of coke ovens.

L. W. RIGGS.

Potash in certain copper ores and tailings. B. S. BUTLER. *Mining Eng. World* 43, 935-6(1915).—A commercially successful method for recovering K_2O from silicates would make available the large amts. contained in the finely ground tailings produced by concn. methods of Cu reduction. Analyses show the K_2O content of certain tailings from Western mining regions to be as high as 6.81%.

H. L. OLIN.

The fused "foundry salt" of the Heilbronn salt works, and its suitability for food and confection purposes. K. B. LEHMANN. *Würzburg. Chem. Zig.* 40, 6-7, 28-9(1916).—The salt, containing 99.88-99.95% NaCl , is prepd. by crushing rock salt and fusing it in a 2-stage Siemens furnace. On the upper stage the fused NaCl runs away from most of the impurities and collects in the lower, basin-shaped stage where it is treated with compressed air for 15-20 min., with addition of small amts. of CaO , to remove org. matter and Fe and Al. After settling, the H_2O -clear melt is discharged through Fe troughs into rotary Fe pans provided with rakes, where it is slowly granulated. Scrapers in the pans discharge it into revolving screens which sep. it into 4 or 5 sizes; it then goes to mechanical packers. Comparative analyses of this and crystd. NaCl are given, and the results of an investigation of the impurities show it to be especially suitable for food purposes.

J. H. MOORE.

The application of compressed nitrogen. ANON. *Naturwissenschaften* 3, 674 (1915).—Until recently the price of N was 1 to 2 marks per cu. m. The Braun method of cheap N production (see Ger. pat. No. 215,608 (C. A. 4, 653)) has brought the price in Berlin down to about $\frac{1}{4}$ c. per cu. m. for very highly compressed N (150 to 200 atms.) and $\frac{1}{10}$ c. for N at 6 to 8 atms. Compressed N is used in place of air in compressed air motors; 1 h. p.-hr. requires about 10–12 cu. m. N. The N motor is decidedly safer and cleaner than the gasoline motor. Another application of this N is in the preservation of foodstuffs. C. G. F.

History of the manufacture of hydrogen for military purposes. A. SANDER. *J. Gasbel.* 58, 637–43 (1915).—A review of the principal processes for the manuf. of H_2 on the large scale, and of the methods for handling it in the field. W. L. B.

New combinations for various artificial products. H. PUFÄHL. *Kunststoffe* 6, 7–9 (1916).—A brief review and discussion of the processes for making artificial ivory, wood products, horn, amber, etc., from such materials as celluloid, wood meal, paper refuse, papiermaché, galalith, copal, etc. F. W. SMITHER.

Annual report of the chief inspector of factories and workshops for 1914. 133 pp.; *J. Soc. Chem. Ind.* 34, 1230–2 (1915).—The total number of factories and workshops registered (British Isles) at the end of the yr. was 276,855; 1287 fatal and 51,276 non-fatal accidents are reported. Accidents due to "scaffolds" and "slips" in blast furnaces appear to be more common in Scotland than in England, probably owing to the greater use of coal and increase in the quantity of small ore. The tendency to form "scaffolds" may be diminished by briquetting or nodulizing fine ores, but serious results to workmen as a result of explosions following "slips" can be prevented only by installation of automatic charging app. *Explosions of dust, gas, etc.* Tests by Wheeler (C. A. 7, 2686) at Eskmeals showed that samples of dust from paper-tube works yielded 24 to 54%, and dust from rag chopping and sorting rooms of paper mills yielded 27 to 77% of ash; those yielding less than 32% of ash were classed as dangerous. Tapioca dust, though yielding only 2% of ash was not dangerous, the gases evolved on heating containing about 30% CO_2 . Dusts from the mixing and spice rooms of a cattle-food factory and from the grinding room of a provender mill proved to be dangerous dusts. Pitch dust is more highly inflammable than coal dust and almost as dangerous as sugar dust. Two explosions are reported where "diazo-dye substances with aniline and naphthalene bases" were being dry ground in drum grinders. Some of these substances appear to undergo mol. change when heated, and it is suggested that frictional heat generated during grinding might be sufficient to start chem. action which, in a closed space, might become so violent as to burst the machine. A serious coal-dust explosion occurred at a cement works in S. Wales; difficulty was experienced in closing a large valve at the bottom of a coal-dust storage hopper, and the cover of the valve-box was removed before the valve was closed, whereupon a large quantity of coal dust escaped, and fell over the edge of the working platform onto the rotary kiln below, where it immediately ignited. In addition to the provision of padlocks for the valve covers and efficient means of escape from each floor of the kiln house, it is recommended that screens be installed below the coal-dust shoots to remove foreign material liable to cause obstruction in conveyors, valves, etc., and that the coal grinding and feeding plant be completely sepd., by concrete partitions, from the rotary kiln. An explosion of picric acid dust caused 8 deaths and injuries to many persons; dry picric acid was being ground in a small hand grinding mill in a room which was impregnated with fine dust, and it is presumed that a spark was generated (cf. C. A. 9, 716, 1995). To prevent explosions arising from the use of compressed gases in cylinders, it has been suggested that different gases should be stored in differently colored cylinders, but a case is cited to show that this precaution is not adequate. It is recommended that

(1) Residual gas or air in cylinders returned to the works should be removed before the cylinders are re-charged. (2) Cylinders of different shapes should be used for different gases. (3) The cylinders should be numbered and registered. (4) Cylinders for different gases should have screwed connections differing in diameter as well as in direction of thread. Two explosions of air receivers connected with air compressors were due to the ignition of a mixt. of air and finely divided lubricating oil or oil vapor (*C. A.* 8, 824). Attention is directed to the need of great care in dealing with old drums and tanks which may have contained acids, chemicals, or inflammable spirits. In a works in the Swansea district, an old drum, which had contained H_2SO_4 , was being pierced by a pick prior to charging into a steel furnace. The drum contained H_2 , which was ignited by a spark or otherwise, and the workman was killed by the resulting explosion.

Factories working under regulations. Out of 111 coarse-ware potteries, raw lead is now used in only 18; and out of 465 other potteries, including general fine household earthenware and chinaware manufactories, leadless glazes or glazes containing not more than 5% of "soluble lead" (see Thorpe, *J. Soc. Chem. Ind.* 20, 475(1901)) are used in 106. The av. efficiency of the local exhaust app. used in potteries for removing dust showed a decided increase during 1914. In brass-casting establishments the use of mechanical ventilation for removing fumes is extending, but this is not always satisfactory when the roof is low and flat. Bronzing is becoming more concd. in larger factories equipped with modern machines and benches provided with exhaust ventilation. The quantity of bronzed ware has diminished since the outbreak of war, as all the powder used was imported from Germany. The use of leadless glaze in vitreous enamelling is extending.

Lead poisoning. The total number of cases in 1914 was 445 (28 fatal). Poisoning has markedly diminished in industries where periodical medical examn. is required and where exhaust ventilation can be applied locally, *e. g.*, in the smelting of metals, tinning, white lead, pottery, and paints and colors, whereas little alteration in the figures is shown in industries where these precautions can be applied only to a slight extent, *e. g.*, printing, plumbing, painting, etc. The principal cause of Pb poisoning is the inhalation of fumes or dust of the metal or its compds. Goadby and Oxley (*C. A.* 9, 824) found that the treatment in a bi-polar elec. bath, recommended by Oliver (*C. A.* 8, 1162, 1333, 3126), was of no value for removing Pb from the animal system, and this conclusion has been confirmed in works where the treatment has been systematically tried.

Phosphorus poisoning. The manufacture of H_2 by the action of NaOH on ferro-silicon is associated with grave danger owing to the liberation of PH_3 (*cf.* Pellew, *C. A.* 8, 3532), and the following precautions should be observed: (1) The NaOH and Fe-Si should be stored in sep. places. (2) The Fe-Si in store should be kept dry. (3) It should not be manipulated by workmen whose hands or clothes are soiled with NaOH. (4) Waste material from the H_2 -generating tank should be conveyed into the open air through a closed pipe. (5) Free ventilation should be provided whenever gas is being generated. (6) Workmen should be warned of the danger of inhaling the gas.

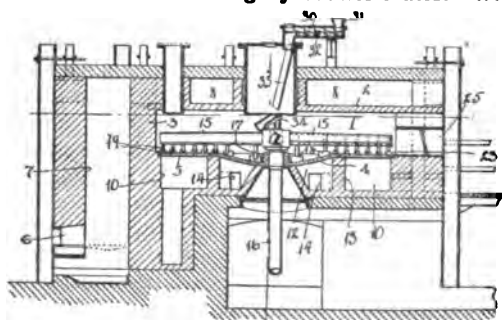
Arsenic poisoning. One case occurred during the cleaning of an $(\text{NH}_4)_2\text{SO}_4$ saturator in a shale-oil works. The acid liquor contained 179.5 grains As_2O_3 per gal., and poisoning was probably due to AsH_3 produced by the action of this liquid on a galvanized Fe pail used by the workman. It is now required that wooden pails be substituted for metal pails in the sulfate house and in tanks which have contained H_2SO_4 or HCl .

Mercury poisoning. Of the 10 cases reported, 4 occurred in the manufacture of thermometers, 2 from Hg fulminate dust in the filling of detonators, 2 in the manufacture of felt hats, and 1 each in the manufacture of $\text{Hg}(\text{CN})_2$ and HgO paint.

Anthrax. 54 cases (7 fatal) are reported. **Fumes and gases.** Cases are reported as follows (number of deaths given in parentheses): CO: blast-furnace gas, 20 (6); power gas (suction, producer, Moud, Dowson), 21; coal gas, 7 (1); other cases, 14 (2); CO_2 , 3 (1); H_2S ,

22 (3); SO_2 , 1; Cl and HCl fumes, 2; nitrous fumes, 9 (2); NH_3 , 4 (1); C_6H_6 , naphtha, and petrol, 4 (2); NO_2 and NH_3 derivs. of C_6H_6 , 38 (2); trichloroethylene, 1 (1); tetrachloroethane, 25 (4); other cases, 3. Administration of O from cylinders fitted with pressure-reducing devices has frequently proved effective not only in cases of CO poisoning, but also in poisoning from H_2S and nitrous fumes. Of the 38 cases of poisoning by NH_3 and NO_2 derivs. of C_6H_6 , 28 were due to the use of dinitro-compds. in the manufacture of a particular explosive in 1 factory. To render the explosive safer for use in mines, a certain percentage of a deliquescent substance was added and this rendered the product more easily absorbed by the skin. *Industrial eczema.* The following precautionary measures are recommended for use where workers come in contact with chromic acid or its salts: (1) Daily inspection of the hands and arms of the workers. (2) Even the smallest abrasion should be washed in running H_2O and immediately covered by collodion or by a dressing of boracic lint or cyanide gauze under an impervious waterproof dressing; the dressing should be changed daily. (3) Long rubber gloves should be worn. (4) The arms of the workmen should be smeared with a suitable ointment, *e. g.*, a mixt. of 3 parts of paraffinum molle, B. P., and 1 part of lanolin, with the addition of 5 drops of 90% phenol to every 4 oz.; or a mixt. of "mineral lard," 3 lbs.; paraffin wax, 7 oz.; and "cyllin," 1.5 oz. For protecting the skin against oil of turpentine a mixt. of lanolin and castor oil (equal parts, or 50:100), to which 1-2% of phenol is added, is recommended. *Results of five years' notification of lead poisoning.* It appears from the tabulated figures that the continued diminution in the number of cases has not been accompanied by a corresponding fall in the number of deaths reported, and this is attributed to the fact that, following on the operation of the Workmen's Compensation Act of 1906, deaths of Pb workers suffering not only from chronic nephritis, but also from phthisis and pneumonia have been certified more frequently than formerly as due to Pb poisoning. *Tetrachloroethane poisoning.* The following precautionary measures have been adopted: (1) Operations in which varnish containing tetrachloroethane is used are carried out in a separate shop or a screened-off portion of a larger shop. (2) Exhaust fans are provided at the floor level. (3) No work people are allowed to remain in the shop during meal times. According to expts. made by Lehmann in Germany, the vapor of tetrachloroethane is about 9 times as poisonous as that of CCl_4 and about 4 times as poisonous as that of CHCl_3 . Cf. Gray, *J. Soc. Chem. Ind.* 34, 1125 (1915). F. W. SMITHER.

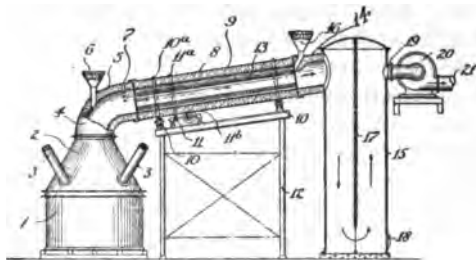
Furnace for making hydrochloric acid. W. M. KRICKBAUM. U. S., 1,167,763,



Jan. 11. A charge of NaCl and H_2SO_4 is fed into the shallow pot 4 through chutes 33 and 34 from a feed conveyor 32. This pot is heated from two fire boxes 6 and shovels 19 gradually move the charge toward the outer calcining bed 5, from the edge of which it is finally ejected into a discharge chute and the gaseous reaction product is led off through a conduit in the upper wall of the reaction chamber.

Phosphoric acid. I. HECHENBLEIKNER. U. S., 1,167,755, Jan. 11. A charge of phosphate rock, SiO_2 and C is heated in the electric furnace 1 with electrodes 3 to form CaSiO_3 , CO and P and the CO and P are passed through a mixt. of phosphate rock and SiO_2 in the passage 9 (which is lined with fire-brick) and oxidized to CO_2 and P_2O_5

by air admitted through the inlets 7, passed through the dust collector 15 and led off to make H_2PO_4 . C is fed in at 6 and phosphate and SiO_2 at 16, passing in a continuous stream to the furnace 1. The conduit 9 is rotated on rollers 10.



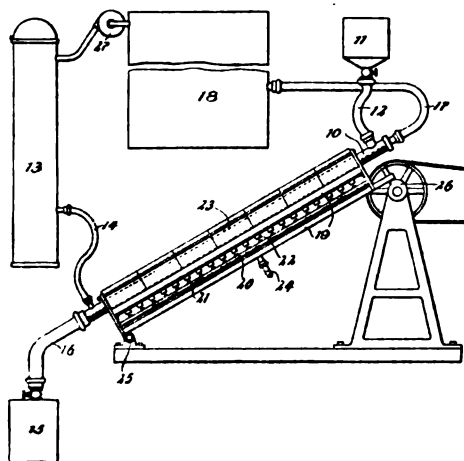
Ammonium phosphate. F. S. WASHBURN. U. S., 1,167,788, Jan. 11. A portion of crude phosphoric acid

soln. is treated with steam carrying an excess of NH_3 to produce a soln. high in $(\text{NH}_4)_2\text{HPO}_4$ and the unabsorbed NH_3 is passed into an excess of similar crude H_2PO_4 to form $\text{NH}_4\text{H}_2\text{PO}_4$. The latter is returned to the supply of crude acid for further treatment and the $(\text{NH}_4)_2\text{HPO}_4$ soln. is treated with H_2PO_4 slightly in excess of that required to produce a soln. of $\text{NH}_4\text{H}_2\text{PO}_4$ free from $(\text{NH}_4)_2\text{HPO}_4$. Cf. C. A. 9, 1978.

Phosphorus and phosphides. J. J. GRAY, JR. U. S., 1,168,495, Jan. 18. A blast furnace is charged with a mixt. of $\text{Ca}_3(\text{PO}_4)_2$ with sufficient SiO_2 to liberate all or a portion of the P, and with sufficient Fe_2O_3 to combine with about 40-50% of the liberated P to produce phosphide and give fluidity to the slag formed. C is added to the charge and air is supplied in limited amts. so as to maintain a reducing atm. in the furnace. CaF_2 and CaCO_3 are used as flux.

Producing ferrous sulfide. N. PETINOT. U. S., 1,169,093, Jan. 18. Fe and Fe pyrites ore are smelted together with slag-forming materials in an elec. furnace.

Apparatus for preparing nickel for use as a catalyzer. C. B. MOREY and C. R. CRAINE. U. S., 1,167,915, Jan. 11. An inert carrier impregnated with a catalytic



metal salt or compd., *e. g.*, diatomaceous earth impregnated with $\text{Ni}(\text{OH})_2$, is passed from a hopper 11 through a tube 10, heated by Bunsen burners and encased in fire brick, while H or other reducing gas is circulated through the tube from the gas holder 13 to which the excess is returned after passing through a purifier 18. The catalyzer produced is collected in the chamber 15 without exposure to the air.

Lampblack and hydrogen. R. H. BROWNLEE and R. H. UHLINGER. U. S., 1,168,931, Jan. 18. Natural gas or other gaseous or gasified hydrocarbon is passed over highly heated refractory material in a reaction tower, under pressure and with exclusion of air, and

the C and H produced are sepd. by cooling and washing. Cf. C. A. 9, 516.

Treating kelp. J. W. CHENEY. U. S., 1,168,785, Jan. 18. Kelp is dried and roasted below an incinerating temp. to drive off volatile constituents such as creosote, acetone and alc. The residue is incinerated to ash while constantly agitated, salts are dissolved out and recovered by crystn. and I is distd. from the remaining material.

Heat insulating material. J. E. LAPPEN. U. S., 1,169,079, Jan. 18. Degummed flax fiber and shives, mixed with short-fibered straw, beaten to consistency of "half

stock" with H_2O 500, is mixed with melted petroleum tailings 40, crude paraffin 20, mineral wool 500, and alum 7 parts, and the mixt. is molded into sheets or boards. Cf. C. A. 9, 722.

Internal-combustion engine cleanser. W. F. C. M. McCARTY. U. S., 1,167,770, Jan. 11. A mixt. of acetone 1 gal., ether 3-5 gals., H_2O_2 12 oz., CH_3NO_2 4 oz. and nitroglycerin $1/2$ oz. is added to the fuel used in internal-combustion engines, in the proportion of about 1 to 10, to clean the cylinders. The nitroglycerin may be omitted and the compn. used as a solvent of oils, fats or waxes.

Phenolic condensation product used in gear-wheels. F. CONRAD. U. S., 1,167,742-3, Jan. 11. Gears are formed of laminations of cloth or paper with a binder of phenolic condensation product.

Phenol resin phonograph record. J. W. AYLSWORTH. U. S., 1,167,468, Jan. 11. The main portion of the records is formed of a mixt. of a fusible phenolic resin with a filler such as wood flour and the surface of the record is made of hard infusible phenolic resin sufficiently plastic when heated to be pressed and molded. Cf. C. A. 9, 2432.

Casein. L. H. REUTER. U. S., 1,167,434, Jan. 11. Buttermilk is treated with a soln. of Na_2CO_3 and $NaCOOH$, filtered, and H_2SO_4 mixed with $HCOOH$ is added to the filtrate, the ppt. is washed with dil. $HCOOH$, dried, ground and mixed with CaO or borax to prepare it for use as a glue or in paints.

Charges for extincteurs. F. C. PALETHORPE and D. ROWE. Brit., 19,096, Aug. 26, 1914. In charges for extincteurs of the kind in which a foam-producing substance, such as *Quillaia* or Panama bark, is employed, the alk. charge consists of approx. 1 oz. of *Quillaia* bark to each lb. of $NaHCO_3$. This quantity of the mixt. is used with about 1.25 gals of H_2O .

19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

The influence of the thermal coefficient of expansion of hard porcelain on the burning temperature. R. RIEKE AND W. STEGER. *Sprechsaal* 48, 297(1915).—Underburned porcelain frequently shows crazing which disappears on reburning. The coeff. of expansion of a body ($20-100^\circ$) decreased with increased burning temp. Repeated burning also decreased the coeff. Since difference between the coeff. of body and glaze increases with higher burning temp. the crazing of underburned ware is not due to the effect of the coeff. of expansion of the body. R. K. HURSH.

The viscosity of porcelain bodies high in feldspar. A. V. BLEININGER AND C. S. KINNISON. Bur. Standards, *Tech. Paper* No. 52(1915); see C. A. 10, 516.

R. K. HURSH.

Observations on blisters. H. KNOBLAUCH. *Sprechsaal* 48, 185-6(1915).—Some methods of overcoming and preventing blisters in glass, due to incomplete decompn. of Na_2SO_4 . Fine charcoal of the proper amt. should be moistened and mixed with the Na_2SO_4 before adding the sand and lime. Both excess and deficiency of C are detrimental to the glass. The proper amount depends upon the temp. and the compn. of furnace gases. R. K. HURSH.

Kilns and kiln burning. ANON. Brit. *Clayworker* 20-23(1912-1915).—An excellent general summary covering kilns of all kinds as follows: single up-draft, *idem* 20, 153-6; shaft, *idem* 20, 178-82; flues, bags, etc., *idem* 20, 205-8; rectangular and round down-draft, *idem* 20, 237-9, 256-9, 282-5; 21, 4-6, 38-41; kiln bottoms, crowns and flues, *idem* 21, 64-8; double and horizontal draft, *idem* 21, 90-4; semi-continuous. Cassel, *idem* 21, 117-20; New Castle, Two-Stage Kilns, *idem* 21, 142-5, 168-70; triple

and connected round kilns, *idem* 21, 170-1, 194-7, 220-1; connected rectangular kilns, *idem* 21, 221-3, 246-9; tunnel kilns, *idem* 21, 249, 272-5, 298-302; 22, 4-8, 60-1, 86-9, 112-5; Haigh kiln, *idem* 22, 113-4; Buhner kiln, *idem* 22, 114-5, 138; Chamber kilns, *idem* 22, 138-42, 164-8; hot-air flues, *idem* 22, 190-4, 216-20; steam flues, *idem* 22, 243-6; oil-fired kilns, *idem* 22, 277-8; gas-fired kilns, *idem* 22, 278-9, 294-7, 320-3; 23, 4-7, 30-3, 60-4, 116-7, 140-1, 164-6; semi-gas-fired kilns, *idem* 23, 7; Dunnachie and Mendheim kilns, *idem* 23, 140-1, 164; gas-fired muffle kilns, *idem* 23, 166, 188-9; coal vs. gas firing, *idem* 23, 189-90, 212; tunnel kilns, *idem* 23, 212-5, 235-9, 260-3; 24, 4; Dressler kiln, *idem* 23, 262-3; muffle kilns, *idem* 24, 5, 21-2, 40-1, 60-1, 80-2; gas-fired muffle kilns, *idem* 24, 61, 80-2; rotary kilns, *idem* 24, 100-3; Summary of types of kilns, *idem* 24, 100-1. The most suitable kilns for the various industries are as follows: Pottery (including glazed tiles) up-draft or connected ovens, or possibly tunnel kilns; terra-cotta facing bricks and roofing tiles, round down-draft or Newcastle kilns, or preferably continuous chamber kilns, if the output is sufficiently large; red bricks from Staffordshire marls, muffle kilns must be used; sanitary pipes (salt-glazed), round down-draft kilns; glazed goods of large size, muffle kilns, preferably connected; firebricks, Newcastle or gas-fired continuous chamber kilns; engineering bricks, rectangular kilns, similar to Newcastle type, but with side fires, or true Newcastle kilns. If the output is large, a special type of continuous chamber kiln is preferable; common bricks, Scotch or Newcastle kilns, but if the output is sufficiently large continuous kilns are in every way preferable.

C. H. KERR.

Theory of the origin of clays (SROUT) 8. Thermal insulation of high-temperature equipment (BOECK) 4.

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY..

The experimental determination of the effect of varying the percentage of water in concrete. R. K. SKELTON. *Surveyor* 48, 328-30(1915).—Tables and curves are given to show variations in strength of briquets, 6 in. cubes, and 2 in. by 3½ in. by 3 ft. bars reinforced by two 1⅛ in. round rods, when made with amounts of water varying from 20 to 42.5%. The mixt. was 1:2:4, cement, sand and stone. The 27.5% mixt. was best; those with more and less water were weaker. The 42.5% mixt. cube had only about 0.25 the strength of the 27.5% cube at the end of 7 days, but after 60 days was nearly half as strong. Where very wet mixts. are used, as with chuting devices, allowance should be made for the less strength of the very wet concrete and the removal of the forms should be delayed.

W. D. COLLINS.

Plaster of Paris and the effect of foreign substances. E. L. TROXELL. Univ. Mich. *Am. J. Sci.* 41, 198-210(1916).—This paper has especial reference to the use of plaster of Paris in mending and restoring paleontologic specimens. Briquets used in this study were 1 sq. in. in cross section. Pure plaster briquets possessed an av. strength of about 400 lbs., those made with a minimum of water being about 100 lbs. stronger than those in which an excess of water was used. Plaster is most sol. and mixes most readily with water at 80°. Briquets made with hot water showed an av. of 60 lbs. in strength above those made with cold water. Soaking in water produces temporary weakening but if the briquets are not handled while wet, the strength is fully regained on drying. Plaster once started to set hardens very rapidly after being disturbed, as each crystal already formed furnishes a nucleus around which the mass quickly accumulates. A quick-setting plaster may be made by mixing in dust ground

from a piece of set plaster, thus supplying the nuclei. Pure plaster can be retempered provided it is soft enough to be worked. Fifty min. appears to be the time limit. Dry colors mixed with dry plaster give best results. Bone black, burnt and raw sienna, and Venetian red are recommended. Plaster made up with dextrin soln. is much weakened; even "a $1/48$ soln." reduced the strength nearly one-half. Gum arabic reduces the strength somewhat as dextrin, but is valuable for surface hardening, and is used in restoring small irregular bodies where the surface area is large in proportion to the vol. Although glue weakens plaster decidedly, it has many applications in mending specimens. Its chief objection is its hygroscopic character, which may frequently be overcome by covering the glue seam with shellac. Expts. with water glass for hardening plaster gave unfavorable results. $MgOHCl$ promises to be more efficient in some special uses than plaster of Paris.

L. W. RIGGS.

Aggregates and fillers for bituminous road construction. E. J. LOVEGROVE. *Surveyor* 48, 428-9(1915).—The object of the paper, illustrated by 14 photomicrographs, "is not to place in respect of suitability any one class of aggregate material mentioned above another," but "rather to urge the need of careful selection and grading of the aggregate."

W. D. COLLINS.

Preserving wood. O. P. M. GOSS. U. S., 1,167,492, Jan. 11. Wood is immersed in preservative liquid and heated to 110° , then the preservative is drawn off and the wood is subjected to a vacuum of 23-28 in. while heated for 30 min. The vacuum is broken and preservative liquid reintroduced into the treatment chamber and allowed to act with heat and pressure for 1-6 hrs. It is then withdrawn and the wood is again subjected to a vacuum while still hot, to remove surplus liquid.

Impregnating wood. R. LAMB. U. S., 1,168,944, Jan. 18. Wood is treated with steam under pressure and while still under this steam treatment the impregnating liquid is forced in contact with the wood, under greater pressure than that of the steam. The unabsorbed liquid is then withdrawn from the treatment chamber so that the steam expels excess liquid from the wood on release of the pressure.

Making cement and sulfur dioxide. L. P. BASSETT. U. S., 1,168,046, Jan. 11. A mixt. of clay, $CaSO_4$, and coal is heated in a furnace to form cement and air is injected into the furnace at a point where the temp. is about 900° to oxidize the gases to CO_2 and SO_2 , the latter being recovered as a by-product. Cf. C. A. 9, 365.

21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

Notes on the use of low-grade fuel in Europe. R. H. FERNALD. Bur. Mines, *Tech. Paper* 123, 35 pp.—Incomplete notes (owing to outbreak of the war), with numerous illustrations, analytical data, costs, descriptions of plants, etc., to indicate the trend in Europe of some of the important fuel problems that are conspicuously before the U. S. The subject matter is given under the captions: (a) the utilization of high-ash coals; (b) the use of wood refuse and other similar material; (c) the recovery from fuel of by-products, $(NH_4)_2SO_4$, tar, pitch, etc.; (d) the recent developments in the prepn. and use of peat; (e) the results of low-temp. distn. of fuels; (f) the possibilities of the slagging type of gas producer; (g) the use of powdered fuel. F. W. S.

Progress in coal-dust firing. ANON. *Stahl u. Eisen* 35, 965-70(1915).—App. for pulverizing and drying the coal is described and precautions necessary in firing are touched upon.

CARLE R. HAYWARD.

The development in the United States of the manufacture of products derived from coal. H. W. JORDAN. *J. Ind. Eng. Chem.* 8, 172-4(1916); *Chem. Eng.* 23, 56-9(1916).—An address. E. J. C.

Naphthalene and its applications as a fuel for explosion engines. K. BRUHN, Essen. *J. Gasbel.* 58, 579-82, 592-5(1915).—A general review covering types of engines, details of design, test data, and costs. W. L. BADGER.

Smoke problems. KONRAD W. JURISCH. *Chem. Ztg.* 40, 25-6(1916).—Comments on problems resulting from substituting lignite and briquets for coke. J. H. MOORE.

Substitution of heating value for candle power as a standard of gas quality. R. S. McBRIDE. *Am. Gas Light J.* 104, 99-103(1916); see *C. A.* 10, 112. E. J. C.

Sampling and analyzing flue gases. H. KREISINGER AND F. K. OVTZ. U. S. Dept. Interior, Bur. Mines, *Bull.* 97, 64 pp.(1915).—The collection of flue gases with open-end and perforated tube samplers, and the analysis of the gases with the Orsat app. is described in great detail, followed by a discussion of the application of flue gas analysis in reducing boiler room losses. K. and O. find that for water tube boilers, the open-end sampler placed in the center of the cross-section of the boiler uptake, gives satisfactory samples. With fire tube boilers, the perforated tube sampler is necessary for the collection of av. samples. When the flue gas is collected in sample bottles satd. brine should be used instead of water, the gas should not be bubbled through the brine, the shaking of gas and liquid must be avoided, and the gas analyzed as rapidly as possible after collection. E. A. TSCHUDY.

The determination of benzole in gas. C. NEUBECK. *J. Gasbel.* 58, 616-7(1915).—Absorption in paraffin oil followed by distn. of the oil at 120° gave good checks when known amts. of benzole were evapd. into a current of air and absorbed (24 g. taken, 22.5 found; 12 g. taken, 11.35 found). There is so much difficulty in keeping rubber stoppers and joints tight during distn. that the method is not recommended. A modification of the "Claire Deville" method is described and recommended. The inlet tube of the condensing spiral is considerably enlarged to prevent stoppages. On the exit end of the coil is a small wash-flask containing paraffin oil. Flask and coil are weighed and then placed in a Dewar flask covered with felt. The coil is packed in CO₂-ether mixt., a CaCl₂ tube being attached to the inlet during cooling. The Dewar flask is closed by a loose cork with an alc. thermometer; the temp. should be -78°. Up to 400 l. of gas are passed through with a velocity which may be as high as 50 l. per hr. The coil is removed, carefully freed from the freezing mixt., allowed to warm up to room temp., and weighed. 4.6 g. benzole evapd. into a current of air gave 4.70 recovered; 8.136 g. in 108 l. air gave 8.15 recovered. W. L. BADGER.

Gaseous viscosity. I. T. HOLGATE. *Gas World* 63, 266-7(1915).—A discussion of the general principles relating to gaseous viscosity preparatory to an exposition of its practical applications. II. *Ibid* 293-5.—H. gives the following formula for expressing the viscosity of a gas as a function of the temp.: $\mu = KT^{1/2}/1 + C/T$ where μ = abs. viscosity, T = abs. temp., and K and C are consts. characteristic of each gas. Knowing K and C for air, H, CO and C₂H₄, H. calculates the viscosity of each gas at temps. from 0° to 1752°. Air and CO increase in viscosity to about the same extent by increasing the temp. from 0 to 1752°; H less, and C₂H₄ more. The best values for the abs. viscosity of the common gases at 0° are tabulated. Thus from the analysis of a sample of any gas, the viscosity at 0° can be roughly calcd., and the influence of change in compn. upon the viscosity can be predicted. Practical applications of viscosity relationships in technical problems can be made to (1) the resistance to flow—
ough distributing pipes as a function of the compn. of the gas and (2)

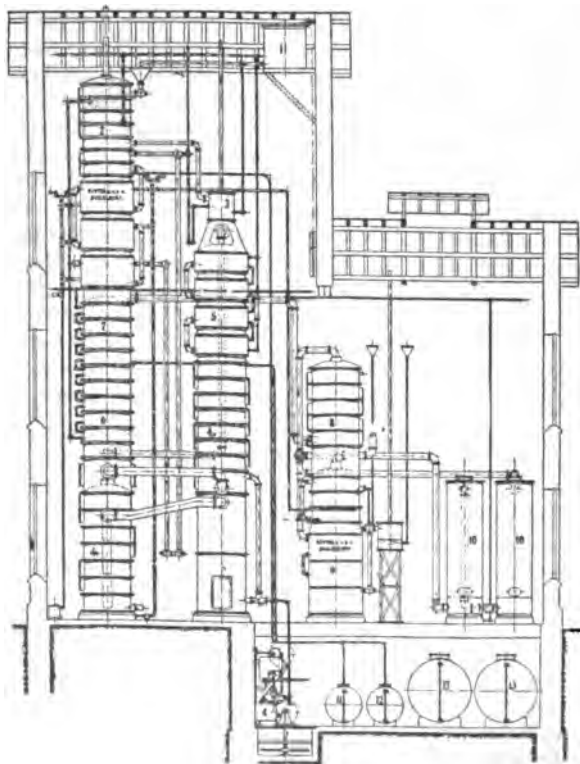
the change in adjustment of gas and air necessary in a recuperative inverted burner after heating up, and the part that changes in viscosity of the constituent gases with temp. play in this phenomenon.

F. L. GROVER.

The influence of water vapor on the yield of ammonia in the decomposition of solid fuels in gas producers. KURT P. SACHS. *Stahl u. Eisen* 35, 801-10(1915).—The expts. were conducted in lab. app., and a gas producer using coke, anthracite coal, and lignite. The lab. tests showed that with a small quantity of water vapor 900° was the most favorable temp. while with much vapor 800° was better. Furthermore, with increasing moisture content in the blast the NH_3 production increased. The results were greatly improved by passing the gas through tubes which caused its sudden chilling. This method of treatment showed more satisfactory results when the temp. was high and the amt. of water vapor low. The tests showed that it is possible to recover all the N of the fuel in the form of NH_3 . The use of the cooling tubes is an important factor and may cause this process to supersede the Mond process.

CARLE R. HAYWARD.

New apparatus for the manufacture of ammonium hydroxide from raw gas liquor. R. W. HILGENSTOCK. Düsseldorf. *J. Gasbel.* 58, 709-14(1915); *Am. Gas Light J.* 103, 241-3(1915).—The raw liquor goes to a const.-level regulator (1) and then to a short column (2) in the lower sections of which the liquor is heated to 98-100°. This decomposes carbonates and sulfides; the CO_2 and H_2S rise through the upper sections, are washed with H_2O to remove NH_3 , and finally escape. Vacuum formation in the app. is prevented by 3 which admits air if less than atm. pressure is produced.



The liquid residue goes to the free NH_3 still (4a), and from this, after mixing with CaO , to the fixed NH_3 still (4b). The NH_3 vapors from (4b) are returned to (4a), and from (4a) they pass to a reflux condenser (5) where they are freed from steam, and then to a H_2O washer (6), and a NaOH washer (7). In 6 enough H_2O is used to give only sufficient cold satd. soln. to dissolve most of the CO_2 and H_2S remaining. In most cases the amt. of H_2O may be so regulated as to give a pure NH_3 gas. The soln. of CO_2 and H_2S is returned to 2 so that no loss of NH_3 takes place. The gas is finally washed with a very small amt. of NaOH soln. in 7 and then passes to an oil washer (8) where tars and empyreumatic substances are removed. If commercial NH_4OH is de-

sired, the gas goes from 8 to a saturator (9) fed with condensed H_2O from the heating coils of 2. If c. p. NH_4OH is to be made the gas is filtered through charcoal and then bone-black after 8 and then sent to 9. Advantages claimed are a pure product, the use of a minimum amt. of $NaOH$ and CaO , and the avoidance of an alk. waste containing S and pyridine to be disposed of, as CO_2 , H_2S , pyridine, etc., are discharged as gases. Estimates for a plant to work up 100 cu. m. gas liquor of 2% NH_3 per 24 hrs. are: cost of building, \$9500; of app., \$14,300; for every cu. m. of gas liquor 275 kg. steam and 2 cu. m. cooling H_2O ; for every kg. NH_3 worked up 0.7 kg. CaO , 10–15 g. of 70% $NaOH$ soln., 10–20 g. oil for washers, 0.1 c. for bone-black; 3 men on each 12-hour shift. W. L. B.

Naphthalene and gas washing. T. GLOVER. *J. Gas Lighting* 132, 581–2(1915).—In working the "C" process the $C_{10}H_8$ content of gas is dependent on 3 factors: (1) the $C_{10}H_8$ content of tar used as a washing medium. This in turn depends on the conditions of coal carbonization. Small charges with high heat produce high $C_{10}H_8$ and tar. (2) Proportion of light hydrocarbon vapors to the vapors of $C_{10}H_8$ present in gaseous carbonization products. The light vapors are first produced by incomplete decompn., and as a secondary product, $C_{10}H_8$ is formed by exposure to hot surface and radiant heat. (3) Temp. of washing. The capacity of tar to absorb $C_{10}H_8$ and naphthas increases as temp. diminishes. All trouble with $C_{10}H_8$ is avoided by using a heavy charge in the coking oven for a 12-hr. period; also the production of light oils is at a max. It is suggested, if small charges must be used, to introduce naphtha vapors of approx. the same vapor tension as $C_{10}H_8$ at whatever point $C_{10}H_8$ deposits are giving trouble. An alternative is the use of vaporized petroleum. R. H. S.

Petroleum vaporized for preventing naphthalene deposits. ANON. *J. Gas Lighting* 132, 582(1915).—Extn. of C_6H_6 , $CH_3C_6H_5$, etc., from the gas removes the natural solvent for $C_{10}H_8$ and hence the latter is deposited. The obvious remedy is to replenish the solvent. For this purpose the gas is passed through a carburetor fitted with a high-pressure steam coil on which petroleum oil is dropped from a distributor, and vaporized. This not only furnishes the necessary solvent but slightly enriches the gas. In case the gas accidentally becomes low in value it can be greatly enriched by using petrol or C_6H_6 in the app. Under av. conditions it has been found that 25 gals. of petroleum will deal satisfactorily with 1,000,000 cu. ft. of gas. R. H. SAWENS.

Evaporation of naphthalene in coal gas. J. S. G. THOMAS. *Gas World* 63, 644–7(1915); *J. Gas Lighting* 132, 701–3(1915).—The vapor pressure of $C_{10}H_8$ was detd. by a method of evapn. as follows: first a sample described as "pure" was further treated alternately with H_2SO_4 and KOH , then 3 times steam-distd., sublimed, and finally dried *in vacuo*. The gas (either air or coal gas), thoroughly dried by passage through H_2SO_4 and $CaCl_2$ tubes, was brought to the temp. desired by passage through a long glass tube immersed in a const. temp. H_2O bath. From there it passed through another $CaCl_2$ tube and 2 tubes of weighed $C_{10}H_8$, all three of which were enclosed in a water-tight metal jacket immersed in the water bath. A H_2SO_4 bottle to remove the $C_{10}H_8$ from the satd. gas and an aspirator completed the app. After passing through a measured quantity of gas the $C_{10}H_8$ was reweighed, and from the loss, its vapor pressure calcd. Coal gas and air gave concordant results. T. observes that his results agree with those of Schlumberger throughout, but that Allen gives much higher figures for temps. between 0° and 30° . Suggestions as to the possible cause of this discrepancy are given. A comparison with results calcd. from an empirical formula shows very close agreement. Tables and curves giving values at from 0° to 60° are given.

R. H. SAWENS.

Distillation of gas liquor without lime. J. S. UNGER. *Gas Age* 36, 301(1915); *J. Gas Lighting* 132, 144(1915).—The still described recovers the free NH_3 , and is so arranged that a "lime leg" and additional sections may be added when it is desired to

recover the total NH_3 . The essential feature is a heating arrangement at the top which brings the weak liquor to about 190° before entering the still proper, the liberated gases being washed by coal liquor passing through a washer. This absorbs the NH_3 and allows the gases to escape, making possible a concentrate of 20% NH_3 without the use of lime.

R. H. SAWENS.

The economy of the "combined oven" for gas works. SCHADECK. *J. Gasbel.* 58, 543-9(1915).—A discussion of the Koppers oven as arranged for firing with either coal or producer gas. It would be economical if the price of coke were 16 to 20% higher than coal, depending on the value of by-products. The important advantages of the combined oven over a standard by-product oven are: (1) The entire plant may be kept in full operation the year round, as one oven at a time may be shifted from coal to producer gas or *vice versa*. All ovens operating on coal gas will give a yield of salable gas of 55 to 60% of the yield when using producer gas, and if the demand is very low the time of coking can be lengthened to give about 30% of the max. output. The result is greatly increased life of the ovens. (2) The production of gas can be made to correspond exactly to the demand. (3) When the demand for gas is low, by firing with coal gas 10 to 13% more coke is available for sale. (4) Since the ovens may be shifted one at a time and the whole plant is always in operation, division into blocks is unnecessary, making construction cheaper. Drawings are given showing the different modes of operation and a comparison is made between chamber oven plants and combined ovens. On the basis of a max. daily output of 3,530,000 cu. ft. the combined oven saves \$4.91 per oven per day.

W. L. BADGER.

Australian experience of Glover-West vertical retorts. J. MACKENZIE. *Gas World* 64, 37(1916).—M. gives a detailed description of experience in operation of these retorts. The advantages found are stated as (1) large saving in labor; (2) increased yield of gas; (3) great improvement in working conditions, but the coke is different, being harder and having all volatile matter removed, and this tar is much thinner and contains more light oil.

M. L. TROWBRIDGE.

Efficacy of Carpenters reversible condenser. T. O. MORLAND. *Gas World* 64, 38(1916).—A description of the app. is given. H_2O can be used on the condenser if desired, but cooling by this method was found to be unnecessary; the temp. of the atm., if the app. is not overworked, has been sufficient to produce satisfactory results. When in use any C_{10}H_8 which the gas may contain is lodged in the pipes through which it rises, and when the current is reversed the hot hydrocarbon vapors dissolve and carry with them to the tar tank any C_{10}H_8 adhering to the sides of the condenser. The current is reversed twice weekly. It is important that ample condensing surface be provided, 12 to 15 sq. ft. per 1000 cu. ft. of gas per day is recommended.

M. L. TROWBRIDGE.

Distillation of tar in gas works. A. P. BRUIGON. *J. Gas Lighting* 133, 34-5 (1916).—B. suggests some of the disadvantages of the old-fashioned intermittent tar still and describes a more efficient up-to-date plant. After the crude tar is preheated it flows continuously in a thin jet into a column still passing downward over coke or other filling material. The oils are vaporized by a jet of superheated steam introduced in an upward direction. The striking advantage of superheated steam is shown by an expt. in which equal quantities of 3 oils boiling at 200, 300 and 400° , resp., were distd. over at 100° and atm. pressure by quantities of steam proportional to 1:8:60; while with superheated steam at 200° these proportions became 1:1.6:2.4. The distn. is carried out by degrees so that the vapors are immediately sepd. from the remaining liquor. Inasmuch as no low-boiling vapors are present in the bottom part of the still the hot liquor leaving the column is nothing more than molten pitch. Soft pitch may be obtained with sufficient sepn. of the fractions for gas-works purposes.

Suggestions for a building and plant with cost estimate to handle annually 1500 metric tons of tar are given. R. H. SAWENS.

Changes in hydrocarbons at high temperatures, and formation of coal tar. J. P. WIBAUT. *Chem. Weekblad* 12, 954-66(1915).—A report of a lecture, mainly dealing with the literature of the above subject. J. T. FLOHL.

Process for the preparation of carbolic oil. F. RASCHIG. *Z. angew. Chem.* 28, I, 409-12(1915).—The German "middle oil" (fraction from 170-250°, d. 1.0-1.02) from tar distn. is relatively poor in phenol and the prepn. of a carbolic oil rich in phenol is an essential preliminary to the NaOH extn. R. accomplishes this by fractional distn. of the middle oil *in vacuo*, using a still of 5-20 cu. m. capacity (heated with steam under 6-8 atms. pressure) connected by a wide, slightly inclined still-head to the base of a column 14 m. high and 60 cm. diam. filled with R.'s patented rings, and provided with a reflux tube at the bottom leading back into the still. The column is surmounted by a dephlegmator leading to a worm condenser, from which a vertical exit pipe at least 12 m. long to overcome, when full, the atm. pressure, discharges the distillate into the open air under normal pressure, and it can thus be sampled from time to time as desired. The condensing H₂O passes first through the condenser, then through the dephlegmator, and the distn. conducted so that about 4 times as much vapor condenses in the latter as in the former. Under these conditions, with a column of the height specified, a fraction (solvent naphtha II) free from phenol is first obtained, and then, by a fairly sudden transition, carbolic oil passes over containing 30-40% of phenol. The phenol content finally falls to 20-25% and the distillate on cooling to about 15° deposits naphthalene; the distn. is stopped at this point, and the residue in the still is run into a cooling bath to crystallize. With the same plant a considerable carbolic oil fraction can be obtained from "light oil," and at the same time commercial C₆H₆ and toluene are obtained of better quality than by the usual methods, and quite free from phenol. F. W. SMITHER.

Thermal reactions in vapor phase of various coal tar oils and distillates. W. F. RITTMAN AND G. EGLOFF. *Met. Chem. Eng.* 14, 15-8(1916).—Several coal-tar oils and distillates, all of the class less valuable commercially, such as solvent naphtha, creosote oil, light dead oil, etc., were subjected to cracking by heating to temps. from 600 to 700° under pressures from 1 to 15 atms. The percentage recovery of benzene and toluene was somewhat larger than that when petroleum was similarly cracked. In general from 20 to 40% of the 200° cut from the original oil was recovered as benzene and toluene. Oils or fractions of oils boiling above 200° were not converted into the simple aromatics. R. believes interaromatic reactions take place in the following sequence: higher benzene homologs, lower benzene homologs, benzene, naphthalene, anthracene, etc. F. L. GROVER.

Coal tar and its products. ANON. *Eng. Mining J.* 101, 7-8.—A schematic presentation of the subject showing interrelationships and yields. F. L. GROVER.

Effect of aeration and "watering out" on sulfur content of coke. J. R. CAMPBELL. *Bull. Am. Inst. Mining Eng.* 1916, 177-80.—S is known to exist in coal as sulfides and sulfates and as so-called organic S. For most coking coals it is in the form of pyrite (FeS₂). Exposed to comparatively low temp. during coking about 42% is volatilized; the rest remains as pyrrhotite. In beehive practice the air oxidizes the S to SO₂, then to SO₃, which forms H₂SO₄ as it comes in contact with moisture; that remaining as FeS can not in any way be affected by aeration or draft on the oven. In the by-product oven the S is distd. as atomic S but apparently, it afterwards combines with the H of the coal gas and forms H₂S. Any organic S remains for the most part in the coke and would be unaffected by aeration except in event of total destruction of C with which it is combined. Sulfates present as CaSO₄ would be unaffected by aeration or

superaeration. When coke is quenched externally, the action of the H_2O on the FeS is as follows: $FeS + H_2O = FeO + H_2S$. The same holds true in quenching in the oven itself as in beehive practice. H_2S is evolved; also the steam is decomposed by the C. From experience it is concluded that only an infinitesimal percentage of S is given off during the quenching process. It is stated that the addition of HCl to the H_2O will greatly facilitate the removal of S.

M. L. T.

Chemical and geological distinction of coal from lignite (SACHS) 8.

22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

The effect of temperature on the formation of benzene, toluene, xylene, naphthalene and anthracene from petroleum at atmospheric pressure. G. EGLOFF AND T. J. TWOMBLY. *J. Phys. Chem.* 20, 121-50(1916).—The object of the authors was to det. the effect of temp. on the formation of C_6H_6 , C_7H_8 , C_8H_{10} , $C_{10}H_8$, $C_{14}H_{10}$ from petroleum with all factors kept constant. A thorough historical review of the work done upon the cracking of petroleum for aromatic hydrocarbons is given. The app. consisted of an elec. heated furnace, a condenser and a receiver. The oil was fed through the furnace at a definite rate, and after the run was completed, the cracked oil was tapped from the condenser and weighed, and the vol. of gas produced noted in the gasometer. In each expt. 574 g. were passed through the furnace at the rate of 246 g. per hr. The temps. employed ranged from 450 to 875°. The oil used was a gas-oil distillate made from Penn. crude petroleum, possessed a sp. gr. of 0.817, and when distd. yielded 2% up to 200°, 7.3% between 200 and 250°, 57.0% between 250 and 300°, 28% between 300 and 350°, and 5.5% residue. The cracked oil as it came from the condenser was found to contain appreciable amts. of C, which had to be removed by filtration. The oil was analyzed by distn. The fraction boiling below 170° was examd. for C_6H_6 , C_7H_8 , C_8H_{10} . The fraction boiling above 170° was redistd., and fractions between 170 and 230°, 230 and 270°, and 270° and tar were sepd. The $C_{10}H_8$ and $C_{14}H_{10}$ were obtained from these fractions by chilling in ice-salt mixt., and pressing and drying solid aromatics with filter paper. The sp. gr. of the distillate to 170° detd. the percentages of C_6H_6 , C_7H_8 and C_8H_{10} . The following effects were noted: The per cent. of cracked oil decreased with increase in temp. At 450°, 97.4% of recovered oil was obtained; at 500°, 84.9%; at 600°, 62.8%; at 700°, 26.7%; at 800°, 20.7%; at 875°, 9.4%. The gas formation increased with temp.; the sp. gr. of the cracked oil also increased with temp. At 450 to 600°, more C_7H_8 and C_8H_{10} than C_6H_6 were produced, and more C_7H_8 than C_8H_{10} . No naphthalene nor anthracene were found at these temps. At 650°, more C_7H_8 than C_6H_6 were obtained, but more C_6H_6 than C_8H_{10} . At 700 to 875°, more C_6H_6 than either C_7H_8 or C_8H_{10} were formed. Naphthalene formation began at 750°, anthracene at 800°. The max. of C_6H_6 formation in the cracked oil was 21.0% at 800°; the max. of C_7H_8 was 8.3% at 700°, and C_8H_{10} 7.2% at 700°. The largest % of naphthalene was 11.4% at 875°, and anthracene 2.5% at 875°. From 450 to 700° mixts. of aliphatic and aromatic hydrocarbons were obtained; above 700° no aliphatics were left in the cracked oil. On the basis of the oil used 4.6% of C_6H_6 were produced at 750°, 3.1% of C_7H_8 at 650°, 1.9% C_8H_{10} at 700°, 2.0% of naphthalene at 800°, and 0.3% anthracene at 800°. The aromatic formation is as follows: higher homologs form C_7H_8 and C_8H_{10} , which go to C_6H_6 , which is transformed to naphthalene, and then to anthracene.

O. E. BRANSKY.

Distillation of mineral oils and liquid hydrocarbons, fatty acids, and similar products. L. SINGAR. *Petroleum* 10, 605-8(1915).—The advantages of high vacuum

distn. are pointed out. Better lubricating oils, paraffin wax, and asphaltic products are obtained by this method, while the loss as fixed gas, the amt. of fuel, and the time of completing a distn. is considerably decreased. The products are homogeneous in compn., and require less chem. treatment for purification. O. E. BRANSKY.

The Hellige petroleum colorimeter, and transposition numbers for this and the Stammer and Wilson colorimeter. L. UBBELOHDE. *Petroleum* 10, 725-8(1915).—A new app. for which accuracy and ease of manipulation are claimed. A soln. of 0.06 g. of $K_2Cr_2O_7$ in 1 liter of H_2O is used as the standard color. By means of the formula $S = 3733.5/H$, in which S is the Stammer no. and H , the Hellige no., the 2 values are correlated. By means of a curve, the values of the Hellige, Stammer, and Wilson can be readily interchanged. O. E. BRANSKY.

The Uralsk province and its oil fields. F. A. HOLIDAY. *J. Roy. Soc. Arts* 64, 158-66(1916).—The Uralsk province, situated along the Caspian Sea and the Emba river, has an area of 27,250 sq. miles. Considerable oil has been found, and many wells are flowing. One gusher, struck at a depth of 732 ft., has produced to date over 140,000 tons. The oil is green, has a sp. gr. of 0.861, and yields 0.36% of gasoline, 23.66% kerosene and 74.92% residues. O. E. BRANSKY.

Cracking and distilling petroleum. W. M. BURTON. U. S., 1,167,884, Jan. 11. Petroleum having a b. p. above 260° is distd. at a temp. of $340-450^\circ$ under a pressure of 3 atm. or more until about 65% of the oil has been distd. The residue is withdrawn from the pressure still, and distd. under approx. atm. pressure. A product is obtained having a d. of 15° Bé. and a viscosity of about 130° Saybolt at a temp. of 38° .

Catalyst for cracking petroleum oils. O. D. LUCAS. U. S., 1,168,404, Jan. 18. A mixt. of oxides and oxalates of Fe and Ni, Cr or Co is heated to a sintering temp. with small amts. of C and Al, Mg or Ce to reduce the metallic compds. The metallic catalyst thus formed retains its efficiency in continued use for cracking oils, for a considerable time.

Paraffin emulsion. G. W. MILES. U. S., 1,168,534, Jan. 18. Paraffin is heated with soap and H_2O to form a viscous paste and this is subsequently thinned by adding H_2O .

Solidifying tar oils. L. BEREND. U. S., 1,167,373, Jan. 11. Mineral oil, tar oil, asphalt, waxes, resins, etc., in the form of liquid mixts., are emulsified with sulfite cellulose waste liquor and a solid mixt. suitable for use in fuel or road material is produced by the addition of a filler such as wood flour, coal or peat and sufficient CaO to combine with the H_2O present.

Alcohol; petrol. C. TUCKFIELD and W. G. DE F. GARLAND. Brit., 19,845, Sept. 16, 1914. Alc., naphtha, petrol, and other spirits are sepd. from solns., mixts., etc., by heating under pressure, preferably to $300-500^\circ F.$, and then decanting the sepd. upper layer of spirit. A suitable app. is specified.

23. CELLULOSE AND PAPER.

A. D. LITTLE.

Fiber length of cellulose. ERICH RICHTER. *Wochenbl. Papierfabr.* 1915; *Paper* 17, 17-9(1915).—Lengths of unbroken fibers of sulfite cellulose of American, German and Scandinavian origin varied from 0.081 to 0.118 in., the av. being 0.098 in. The proportion of fibers whose length was equal to the av. length of the unbroken fibers varied from 47 to 74% of the whole, the proportion being less in case of American

pulps, most of which are made by the quick-cook process and are blown from the digester. Lignin content of the pulps varied from 2.9 to 9.3%. V. NUNEZ.

Paper industry and substitute materials. U. HAASE. *Kunststoffe* 6, 10-1 (1916).—A brief review of the manufacture of pasteboard and crepe paper and the various uses that have been suggested for them, e. g., substitutes for cigar box wood, textile wares, etc. F. W. SMITHER.

A process for making paper without sulfite. ALBERT KEMP. *Paper Trade J.* 62, No. 1, 46-8 (1916).—The process consists in boiling wood under steam and water pressure in closed vessels, air being excluded. A pulp is produced by grinding, from which news, book and other grades can be made without any addition of sulfite. The process also renders rosin sizing unnecessary, as the rosin in the wood suffices for the purpose. E. J. KELLEY.

Tar size. EMIL HAUSER AND WERNER SCHMIDT. *Papier-Ztg.* 40, 1800 (1915).—A size for paper, prepd. from beechwood tar saponified by alkali, has been found to be an effective size for paper. Used alone, it is not retained by the pulp, but when mixed with a small percentage of rosin soap, excellent results are obtained. Pptn. is by alum or NaHSO_4 in the usual manner. The dark color of the size prevents its use in white paper. V. NUNEZ.

Adsorption of caustic soda by cellulose (LEIGHTON) 25.

Apparatus for cooking wood-pulp. L. B. DECKER. U. S., 1,167,800, Jan. 11.

Apparatus for bleaching paper pulp. F. G. TEN BROECK. U. S., 1,167,728, Jan. 11.

Flax-straw paper. F. H. COYNE. U. S., 1,168,285, Jan. 18. Flax straw is treated in a beater until reduced to paper pulp leaving the cortex in small unreduced fragments which are used in making paper, together with the reduced portions. The paper is especially intended for use with roofing compositions.

24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

Properties and uses of military explosives. LOGAN CRESAP. *Iron Age* 96, 752-3 (1915).—Nitroglycerin smokeless powder is styled in different countries ballistite, filite, solenite or cordite. In British m. d. cordite there is 65% nitrocellulose, 30% nitroglycerin and 5% vaseline, but other varieties of this class of smokeless powders contain as high as 58% of nitroglycerin. The U. S., France, Russia and Spain use nitrocellulose powders in all guns. Great Britain and Italy use nitroglycerin powders in practically all guns. The other powers use nitrocellulose powders for small arms and nitroglycerin powders for larger guns. Since the great war began some modification has taken place, owing to the consumption of U. S. powders which are practically all nitrocellulose. Ammonium picrate is used in shells in place of picric acid. In the U. S. this bursting charge is styled dunnite, in Italy pertite, in Spain picrinite, and in Sweden coronite. Trinitrotoluene when mixed with $\text{Pb}(\text{NO}_3)_2$ is styled macarite. Ammonal (NH_4NO_3 85, Al 10 and C 5%) has been used to a limited extent in Austria as a bursting charge for shell. Sometimes 15% of trinitrotoluene has been mixed with it. CHARLES E. MUNROE.

Primer for explosives. W. RUNGE. U. S., 1,168,746, Jan. 18. Pb azide is mixed with 5-30% its wt. of trinitrotoluene, with or without a very small amt. of gum

arabic as a binder. The mixt. gives a more effective detonation than a mixt. of Pb azide and a chlorate.

Acetylating nitrocellulose. L. CLEMENT and C. RIVIERE. U. S., 1,168,164, Jan. 11. A mixt. of Ac_2O with HOAc and H_2SO_4 or $\text{C}_6\text{H}_5\text{SO}_3\text{H}$ is used to react upon a lower nitro deriv. of cellulose which is insol. in organic acids, Ac_2O , HCl , HNO_3 , phenols, alk. hydroxides, alc.-ether and acetone, and the resulting acetylated product may then be hydrolyzed.

Picric acid. G. B. BRADSHAW. U. S., 1,168,266, Jan. 11. Phenol is sulfonated and the product is converted completely into *p*-phenolsulfonic acid by dilg. with H_2O to 30°Bé. and boiling with live steam or by heating with excess H_2SO_4 to 127° . The resulting soln. is nitrated with about 3.5 times its wt. of HNO_3 of 40°Bé. and heated to 90° to complete the nitration. A better yield of picric acid is obtained than in usual similar processes by reason of the complete conversion of the sulfonic acids into the *p*-acid.

Match splints. J. R. NOLAN. U. S., 1,168,901, Jan. 18. Wood match splints are coated with a finely powdered mixt. of alum and paraffin or H_3BO_3 and paraffin and then heated to fuse the paraffin and effect impregnation of the splints to render them readily combustible but non-glowing when extinguished.

Match splints. W. A. FAIRBURN. U. S., 1,168,869, Jan. 18. Wood match splints are rendered readily combustible but "non-glowing" when extinguished by impregnation with a mixt. formed of molten paraffin mixed with vaseline in which H_3BO_3 or other "anti-glowing material" has been incorporated. Cf. C. A. 9, 2815.

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Dyestuff situation in the United States at the close of 1915. THOMAS H. NORTON. *J. Ind. Eng. Chem.* 8, 166-72 (1916).—An address. E. J. C.

Quantitative estimation of alizarin and of certain other dyestuffs. EDMUND KNIGHT AND EVA HIBBERT. *J. Soc. Dyers Colourists* 31, 241-4 (1915).—The method is based upon titration of dyestuffs in alc. soln. with TiCl_3 . An excess of standard TiCl_3 soln. together with a 20% soln. of Rochelle salt is added to an alc. soln. of the dyestuff and boiled, the excess of TiCl_3 being detd. directly by titration with iron alum soln. The method is considered in connection with alizarin, anthrapurpurin, flavo-purpurin, alizarin black and gallocyanine. L. A. OLNEY.

The interaction between metallic copper and certain dyes of the thiazine, oxazine and azine series. J. R. HANNAY. *J. Soc. Dyers Colourists* 31, 244-52 (1915).—Solns. of methylene blue of different brands in 30% AcOH have a decided action on Cu while AcOH without the blue has no action. When Cu is boiled with such solns. of methylene blue and AcOH it loses weight rapidly and a greenish blue, semi-cryst. material is obtained which, when made up into a printing paste, had but little coloring power as compared with the org. dyestuff. The same was found to be true of Nile Blue A, Safranin FF, Methylene Violet R R A. Acridine Orange N O a dyestuff somewhat removed in constitution from the others also showed a solvent action on copper. On the other hand Rhodamine 6 G and Brilliant Green and Thioflavine T gave no indication whatever of action on Cu. No theory giving any reasonable explanation of the results has as yet been formulated. H. finds speck and flat prints which result when Methylene Blue is dissolved in copper vessels is entirely overcome when the soln. is made in porcelain. L. A. OLNEY.

Dye lakes and filled dyes. WILHELM OSTWALD. Grossbothen. *Kolloid-Z.* 17, 65-78(1915).—Instead of a dye lake in which the colloidal dye is pptd. by another colloid, usually alumina, using an excess of the alumina to dilute the color if that is desired, there are advantages in using a "filled dye" in which a second material, very finely ground and either cryst. or amorphous, is used to dilute the dye lake which contains only enough alumina for complete pptn. of the dye. Such a filled dye gives a brightness nearly inversely proportional to the log of the concn. of the dye if a white filler is used. As filling material ground heavy spar gives the deepest color for a given dye content but cannot be used with an oil binding agent because of its poor covering properties. The brightness of 0.25% methyl violet in various fillers and 4% lime as binding agent varies as follows (white light = 1000): Ground heavyspar 99, pptd. CaCO_3 121, ground gypsum 143, burned gypsum 158, heavyspar and kaolin 3:1 194, CaCO_3 pptd. light 206, lead white 213, BaSO_4 pptd. moist 216, kaolin 225, chalk 226, BaSO_4 pptd. dried 239, lithopone 322, zinc white 330, MgCO_3 349. The covering power is about $1/12$ as great with heavy spar as with MgCO_3 because of the greater size of the particles of the heavy spar. The effect of the filler on the brightness of the filled dye seems to depend mainly on the size of the particles of the filler—the smaller the particles the brighter is the filled dye, and the greater its covering power. Microphotographs show that the fillers show decreasing size of particle in the same order that they show increasing brightness. The color of the filled dye varies somewhat with the various fillers. An oil emulsion known as Tempera added to a lime binding agent increases the depth of color considerably.

H. I. MATTIL.

The black dyeing of furs with hints on other colors. "Cosmos." *Leather Manufac.* 27, 1, 13-5(1916).—To prevent injury to the leather dyeing is done at low temp. Many furs have a fine wooly coat next the skin, and a number of longer hairs. The latter are harder to dye and require softening. For best results artificial heat should not be used in drying. Recipes are given for the application of a number of dyes upon leather.

J. S. ROGERS.

Weighting of silk as a chemical reaction. F. FICHTER. *Naturfors. Ges. Basel*, June 16, 1915; *J. Soc. Chem. Ind.* 34, 1008.—The weighting of silk by means of SnCl_4 is due to the formation and progressive hydrolysis of an addition compd. of the Sn salt with the silk fibroin (cf. *C. A.* 8, 3630). In the subsequent treatment with phosphate, the silk fiber plays no part, the sole reaction being between the stannic acid and H_3PO_4 or Na_2HPO_4 .

L. W. RIGGS.

Adsorption of caustic soda by cellulose. ALAN LEIGHTON. *J. Phys. Chem.* 20, 32-50(1916).—Most, and perhaps all, of the adhering liquid may be removed from cotton by centrifuging for an hour at 4000 r. p. m. An analysis of the cotton gives the amt. of NaOH adsorbed, subject to a correction for any failure to get the cotton dry. Data obtained in this way gave a smooth adsorption curve. There is no evidence of the formation of a compd. when cotton is treated with NaOH for concns. up to 500 g. NaOH per l. Mercerization of cotton is not due to the formation of any compd. of cellulose and NaOH. Until the amt. of adsorbed NaOH is 0.34 g. per g. of cotton there is apparently no displacement of H_2O from the cotton, but there is a decrease in the amt. of H_2O adsorbed for amts. of NaOH higher than this. A standard and reproducible cellulose may be obtained by heating absorbent cotton with 1% NaOH for 18 hrs. on the water bath.

E. B. MILLARD.

β -Chloro derivatives of anthraquinone. FARBW. v. M. L. & B. Ger., 284,976. Nov. 19, 1913. Instead of 1-anthraquinonesulfonic acid, which is recommended in 267,544 (*C. A.* 8, 1018), anthraquinone- β -sulfonyl chloride is heated with SOCl_2 to a high temp. (220°).

N-Anthraquinonylisatins. BAYER & Co. Ger., 285,771, Apr. 7, 1914. Addition to 236,407 (C. A. 6, 1230). The parent process is modified by discontinuing the action of the halogenated anthraquinones or their derivs. on isatin, its homologs or analogs, before the formation of the vat-dyeing anthraquinone acridones results, or by removing the anthraquinone acridones from the reaction mixt. by suitable methods. Cf. C. A. 9, 2598.

Octochloro- and decachloroanthracene. FARBW. v. M. L. & B. Ger., 284,790, Dec. 24, 1913. These products are obtained by chlorinating anthracene or 9,10-dichloroanthracene in the presence of I, in CCl_4 . The reaction products are sepd. according to their different soly.

Compounds of basic dyes of the acridine and safranin series. BAYER & Co. Ger., 285,500, Feb. 7, 1915. These products are obtained by converting the dyes of this series, or their salts, according to the usual salt-forming methods, into their gallocarboxylic acid salts.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

Alizarin red (madder) and geranium lacquers. ANON. *Farben-Ztg.* 21, 230-2 (1915).—A general descriptive article. E. W. BOUGHTON.

A case of fatal poisoning due to spraying in a varnish department. R. P. ALPAUGH. *Ohio Pub. Health J.* 6, 512-4 (1915).—The symptoms present in a case of supposed naphtha poisoning are described. The physiological standards of endurance of benzine, benzole, and turpentine, which are used either separately or together in this kind of work, have been detd. *Benzine* (naphtha, gasoline, pet.-ether) 0.02 g. per l. of air will cause local symptoms, while 0.05 g. per l. of air is poisonous. *Benzole* 0.015 g. per l. of air is poisonous, while 0.042 g. per l. will kill dogs in 20 min. *Turpentine* 0.003 g. per l. of air cause local symptoms, while 0.006 g. per l. poisons a healthy man in from 1 to 4 hrs. J. GAUB.

Paint. S. LOWY. U. S., 1,168,730, Jan. 18. A mixt. of shellac 5 lbs., NaOH 4 oz., borax 6 oz., ZnSO_4 2 drams and H_2O 10 gals. is added to Pb paint in equal proportions to decrease its cost.

Lead chromate. A. S. RAMAGE. U. S., 1,168,417, Jan. 18. Pb or galena is dissolved in HNO_3 or HOAc, the Pb is pptd. as PbSO_4 by adding H_2SO_4 and the ppt. is washed and digested with $\text{Na}_2\text{Cr}_2\text{O}_7$ and NaOH. The acid soln. formed on pptn. with H_2SO_4 is used to dissolve fresh portions of Pb or galena.

Lead sulfate. A. S. RAMAGE. U. S., 1,168,418, Jan. 18. Galena is roasted with limited contact with air during the earlier and freer access of air during the later stages of the roasting, to produce a mixt. of oxide, sulfate and sulfide. The roasted mixt. is treated with HNO_3 and the nitrous fumes from this operation are mixed with the sulfurous gases from the roasting and the mixed H_2SO_4 and nitrosulfuric acid used for the conversion of the roasted mixt. into PbSO_4 , the HNO_3 thus produced being used in continuing the process with fresh portions of ore.

Paint- and varnish-remover. C. ELLIS. U. S., 1,167,641, Jan. 11. NaOAc or other acetate is dissolved in a mixt. of alc. and C_6H_6 or other organic solvents and heated with HCl or H_2SO_4 to effect esterification. Wax is added as a thickener. Cf. C. A. 9, 2601.

Paint- and varnish-remover. C. ELLIS. U. S., 1,167,640, Jan. 11. *o*-Anisidine

10 parts is mixed with naphthenic acid 15, benzal chloride 25, aniline 5, monochlorocresol 10, benzyl alc. 40, EtOH 10, Montan wax 4, paraffin 3 and soap 3 parts.

Paint- and varnish-remover. J. M. WILSON and C. V. BACON. U. S., 1,167,462, Jan. 11. Palm wax or candelilla wax is rendered effective as a thickener in paint-removers, in much less than the usual amts. necessary, by the colloiding action of H_3PO_4 or H_2SO_4 . A paint remover of this type may be made from C_4H_8 46, "methyl acetone" 46, concd. H_3PO_4 6 and palm wax or candelilla wax 2 parts. The use of H_3PO_4 gives the mixt. a very energetic action on linseed oil lead paints. In making the mixt. the wax is added last after heating the other ingredients together.

Paint- and varnish-remover. C. V. BACON and J. M. WILSON. U. S., 1,167,469, Jan. 11. A paint remover is made similar to that of the preceding pat. except that concd. formic acid or glacial HOAc is used as wax-colloiding agent. A mixt. containing HOAc is very effective in removing films of linseed oil-lead paint.

Wood filler, stain and polish. G. A. DENNIS. U. S., 1,168,485, Jan. 18. A mixt. of talc 90 and Mn borate, sulfate, oxide or oxalate 10 parts is mixed with linseed oil and the mixt. is applied to wood as a smoothing, filling and staining material.

Phenol-formaldehyde artificial resin. B. B. GOLDSMITH. U. S., 1,168,626, Jan. 18. PhOH and anhydroformaldehydeaniline are heated together in the relative mol. proportions of 3:1, the aniline liberated is sep'd. from the reaction products and the heating is continued until a resinous product is obtained which is sol. in acetone and may be molded or used in solvents to form a varnish.

27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

Molecular weight determination of some vegetable oils. H. J. BACKER. Amsterdam. *Chem. Weekblad* 12, 1034-40(1915).—In addition to the ordinary consts. used for the identification of oils, the mol. wt., detd. by f. p. lowering in C_6H_6 , is proposed. Mol. wt. detns. were made on a number of oils, using 0.5, 1.0 and 2.0 g. oil to 15 cc. C_6H_6 , and it was found that Raoult's law does not hold at these concns. The values obtained run parallel to the sapon. no., which also is proportional to the mol. wt. of the saponifiable material. The f. p. detns. takes more time than the sapon. detns., and results are not so accurate, but the method should be of value in certain work.

GEORGE W. MOREY.

The hydrogenation of oils. L. HAMBURGER. *Chem. Weekblad* 13, 2-13(1916).—For the reduction of oils with H under a pressure of 9 atms. an apparatus was constructed resembling the one described by Stuckert and Enderli (cf. *C. A.* 7, 3254). The influence of temp., pressure, divisibility of the catalyst, and kind of oil (impurities therein) on the hydrogenation process was investigated. The hydrogenation of all pure oils with finely divided Ni, as a catalyst proceeds without difficulty; the same holds true for fatty acids obtained from very impure oils by distn. with steam *in vacuo*. The Ni catalyst was obtained by the reduction at 260-300° of Ni oxide, which had been previously pptd. on pumice stone. It appears that W, Mo, Th, U, Zr, Ti, V and Mn cannot be used as catalysts in the hydrogenation of oils. H. states that the claims by Ellis (U. S. pat. 1,026,156 (cf. *C. A.* 6, 2014)) could not be confirmed, not even when a H pressure of 200 atms. was applied.

J. T. FLOHL.

The use and valuation of solid lubricating fats in chemical factories. H. WINKELMANN. *Chem. App.* 2, 295-8(1915).—General remarks on the compn. and appearance of these lubricants, with simple methods for rough detn. of H_2O , weighting, consistence, melting and ignition points and resinifying p.

J. H. MOORE.

Optical dispersion of Chinese wood oil as an index of purity. E. E. WARR. *J. Ind. Eng. Chem.* 8, 126-8(1916).—A new method based on the observations of Brier (*C. A.* 9, 2459) is proposed, the necessary app. being the ordinary spectrometer with an autocollimating eyepiece. A cut of app. is given. A brass electrode arc lamp was used as the source of light. Compared to other fatty oils Chinese wood oil has an abnormally wide dispersion. The angle through which the table of the spectrometer must be rotated to focus properly the slit image upon the slit itself is the angle from which, knowing the angle of the prism, the n for any particular wave length may be calcd. By using a source emitting light of different wave lengths the relative dispersion for any two can be calcd. From this value, expressed in angular degrees or in vernier units, adulteration in Chinese wood oil can be estd. with remarkable accuracy. In W.'s results the greatest error was 0.5%, the oil containing 5% of adulterant. Expressed in vernier units, pure Chinese wood oil gave values of 267-269, while other oils, such as soy-bean, linseed and rape, gave values of 127-143. Tables, curves and formulas containing the necessary data are given. E. W. BOUGHTON.

The differentiation between fats of vegetable and of animal origin. F. H. VAN LÉENT. *Watergraafsmeer. Chem. Weekblad* 12, 86-92(1915).—A general article. containing little new material. The chief criterion for the differentiation, and for the estn. of the approx. amt. of vegetable and of animal fat in mixts., lies in the detn. of the m. p. of the sepd. phytosteryl and cholesteryl acetate crystals. The method recommended for obtaining these crystals is the extn. of the fat with EtOH, sapon. of the dissolved fat, extn. with Et₂O, and subsequent conversion to the acetate. Before detn. of the m. p. the product should be 4 times recrystd. The m. p. of cholesteryl acetate is, in general, from 113.6° (from beef fat) to 114.1° (from lard), though fish fat yields an acetate m. at 116.4°; phytosteryl acetate is of more variable m. p., although in general it melts about 129° (cocoa butter) to 132° (soy bean oil). Other factors are discussed. GEORGE W. MOREY.

Acid and ester values. (New method for the determination of acid and ester values of fats, fixed and essential oils, and waxes.) H. F. SLACK. *Chemist Druggist* 87, 673-4(1915).—About 5 g. sample is weighed into a 120 cc. CO₂ flask, warmed to 80°, neutralized to phenolphthalein with 0.1 *N* alc. KOH, 20 cc. of approx. *N* KOH dissolved in benzyl alc. is added and the whole is boiled under a reflux air condenser over a free flame for 5 min. It is then cooled to 100°, and the excess alkali titrated with *N* HCl after the addition of sufficient neutral alc. The advantages of the use of benzyl alc. are (1) it has better solvent action on fats and oils than EtOH, which facilitates the action of the alkali and (2) its high b. p. (200°) hastens the saponification, which is complete in 5 min. instead of the 1 hr. required by the old method. For smaller samples 0.5 *N* KOH in benzyl alc. can be used. The titration of the excess of alkali should be rapid since the color of the phenolphthalein quickly returns upon standing. Blanks should be run since benzyl alc. has small acid (0.41) and ester (8.85) values. S. also proposes to modify the Koettstorfer method by (1) limiting the amt. of neutral alc. in the acid value detn., (2) titrating the free acids with alc. KOH instead of aq. KOH, (3) using *N* alc. KOH for the saponification, and (4) const. agitation to break up the fat globules during saponification. By these means the time required for the saponification is reduced from 1 hr. to 30 min. C. O. EWING.

Unification of methods of fat analysis. C. N. NIEGHMANN. *Farben-Ztg.* 21, 207-9(1915).—Commenting on the report of leather chemists on the unification of methods of fat analysis (cf. *C. A.* 9, 1850), N. concludes that for the detn. of acid no. (1) 5 g. of sample should be taken or 10 g. of materials having low acid nos.; (2) 0.2 *N* aq. KOH soln. should be used for the titration; (3) if phenolphthalein is used as indicator, at least 2 cc. of a 1% soln. should be used. E. W. BOUGHTON.

Fat analysis. F. H. SMITH. *Chem. News* 112, 319-20(1915).—S. sought to combine in one operation detns. for sapon. no., sol. and insol. fatty acids and mean mol. wt. as follows: 5 g. of fat are weighed into a 250 cc. Erlenmeyer. To this 50 cc. of 0.5 N alc. KOH are added and the soln. heated under a reflux condenser on a water bath until saponified. The excess alkali is titrated with 0.5 N HCl and the sapon. no. calcd. The alc. is next evapd. and the residue dissolved in 100 cc. H₂O and enough HCl added to make 1 cc. excess over that required by the blank for the sapon. no. When the fatty acids are sepd. and cooled the acid soln. is decanted into a measuring flask of 1 l. The acids are allowed to solidify and are washed with H₂O. This is done 5 times, and the insol. acids are kept in the original flask where they are freed from alc. and dried to const. wt.; then they may be titrated. Two 100 cc. portions taken from the flask contg. the washings are titrated with 0.1 N KOH. The readings are multiplied by 10 and 5 is deducted for the excess of acid added to separate the fatty acids. The result is expressed as mg. KOH for 1 g. of sol. fatty acids. E. SCHERUBEL.

Three new vegetable waxes from Madagascar. A. HERBERT AND F. HEIM. *Bull. Office Colonial* 8, 86, 96-101; through *J. Soc. Chem. Ind.* 34, 1061(1915).—The plants from which waxes are obtained are *Cynanchum messeri*, *Euphorbia xylphyloides* and *E. stenoclada*. The best method of extn. consists in pounding the dried cut pieces on a cloth and then throwing them into boiling H₂O and removing the scum. A quicker method is to put the branches into boiling H₂O and then skim off the wax. The largest yield is from the 1st plant, 7 oz. being obtained from 6 small plants. The m. p. of each is 88° which is higher than that of any other wax. These waxes contained but little free acid; among the alcs. were cerylic and melissic. Etriacontane, C₄₁H₈₄, was also present. The const. for the waxes in the order given were: acid value 17.7, 28, 19.3; sapon. no. 159.6, 142.8 and 140; I no. 3.2, 5.3 and 5.9. The % of hydrocarbons were, resp., 11, 14 and 15. E. SCHERUBEL.

The history and knowledge of beeswax. HANNS FISCHER. Bremen. *Z. offent. Chem.* 21, 177-80(1915).—A continuation of a former article on the history of beeswax (*C. A.* 9, 867). The fact that after melting together European and Indian beeswax over water the calcd. const. are not obtained, is due to the changes in compn. brought about by the melting. The observed increase in I no. on heating shows that those constituents of the wax which absorb I are found among the non-volatile neutral ingredients. The acids and saponifiable matter of Indian wax are more easily changed by heating than those of European wax. The low acid no. of Ghedda wax seems to F. to be due to climatic conditions (temp. of 35° to 50°) and not to any physiological peculiarity of the Indian bees. *Melipona* and *Trigona* waxes often give normal acid numbers, so it seems that the rubber juice, which these insects mix with their wax, protects the wax from any great decompn. H. E. WOODWARD.

The practical value of the commercial analysis of beeswax. HANNS FISCHER. *Z. offent. Chem.* 21, 145-9(1915); cf. *C. A.* 9, 2157.—F. arrives at the conclusion that it is misleading to consider a strongly positive stearic acid reaction occasioned by palmitic acid as doubtful when the wax appears to be free from objection otherwise. The constant known as normal number is further defined. The test for neutral matter is not accurate. The recent methods of commercial analysis do not have the value of an exact detn. of purity, and do not show whether the material is free from objection.

H. E. WOODWARD.

New method for the determination of fatty acids in soap. H. F. SLACK. *Pharm. J.* 95, 696-7(1915).—Dissolve 5 g. of shredded soap in about 10 cc. of glycerol with heat. Slowly add 4 cc. of dil. HCl (1 in 4). Withdraw the liberated fatty acids into a 5 cc. graduated pipet, by the aid of hot H₂O if necessary. Suspend the pipet, with upper end closed, in H₂O at 50-55° and read the vol. of the fatty acids. To find %.

the sp. gr. must be detd. at the same temp. It does not vary much with the ordinary soaps. In using glycerol, the soap dissolves without froth, and the fatty acid layer is perfectly clear.

S. WALDBOTT.

Beechnut oil for the preparation of soap. FREUND. *Pharm. Zentralhalle* 56, 463-4(1915).—After the removal of the cold-pressed edible oil of the nut of the beech, *Fagus sylvatica*, the less valuable hot pressed oil can be used for the manuf. of soap.

C. O. EWING.

Distillation of mineral oils, liquid hydrocarbons, fatty acids and similar products (SINGER) 22. Determination of the origin of hydrogenated fats (PRESCHER) 12.

29. LEATHER AND GLUE.

LLOYD BALDERSTON.

Artificial tannins. R. LAUFFMANN. *Kunststoffe* 6, 1-4(1916).—A review and discussion of the patents for "synthetic" or "artificial tannins."

F. W. S.

Artificial tannin derived from gallic and arsenious acids. ANON. *Conceria* 22, 147(1914).—On boiling a soln. of gallic and arsenious acids Schiff obtained a product which, like tannin, pptd. gelatin. This compd. was termed digallic acid. Subsequent expts. failed, however, to give uniform results and the product decompd. with reformation of gallic acid which had no tanning action. It is probable that the product was a definite compd. of gallic and arsenious acids of slight stability.

H. S. PAINE.

Analysis of one-bath chrome liquors; basicity. ERNEST LITTLE. *J. Am. Leather Chem. Assoc.* 11, 61-6(1916).—The methods given are essentially the same as those of the Leather Industries Laboratory Book (H. R. Procter, *C. A.* 9, 1258; cf. Balderston, *C. A.* 9, 534). Directions are given for bringing the ratio of acid to basic radical in the chromium compound to a certain stated value assumed to be the best for successful tannage.

L. B.

Basicity of one-bath chrome solutions. FRANK N. HARRAP AND HARRY HAYES. *Collegium (London)* 1915, 305-12; *J. Am. Leather Chem. Assoc.* 11, 66-74(1916).—Cr is estd. as usual (see preceding abstract). Six methods for detn. of acid are discussed, Procter-McCandlish, Körner, Alden, Stiasny (*C. A.* 1, 1915), Bateson, and Kopecky. No definite preference is stated. It is known that in using methods involving the addition of an excess of alkali, results depend on the amt. of excess, which must therefore be closely controlled. It is assumed that differences are due to adsorption of excess alkali by the pptd. Cr(OH).
L. B.

Water penetration apparatus for leather. C. T. GAYLEY. *J. Am. Leather Chem. Assoc.* 11, 36-40(1916).—The piece of leather to be tested is subjected to the pressure of a column of water 24 in. high and 2 in. in diameter. A copper disk touches the lower side of the leather, and when the water has penetrated to the copper, an electric circuit is completed, ringing a bell and stopping a clock. Illustrations, with dimensions and directions for construction are given.
L. B.

Contribution to the knowledge of chestnut extract. L. POLLAK. *Collegium* 1915, 435-40.—For the estn. of "lignin" in wood P. uses the method of Cross, Bevans and Briggs (*C. A.* 1, 2942) and extends it to exts. by drying them 2 hr. at 100° after 3 times evapg. to dryness with sand on a water bath to drive off aldehydes, which would absorb phloroglucinol and so alter the phloroglucinol absorption value on which the method depends. P. finds this value for chestnut ext. to be about half that of the wood, while the extd. wood has as high a figure as the new. He concludes that during extn., especially at high temps. and pressures, a gradual breaking down of the wood-

substance takes place, more phloroglucinol-absorbing substance being formed, and that higher non-tannin content of such exts. is not due to breaking down of tannin, but that portions of the wood otherwise insol. are broken down by prolonged heat and pressure. Figures are given for many samples of wood and ext. L. B.

Degreasing of hides by a wet process. ANON. *Conceria* 22, 337(1914).—The series of non-inflammable products obtained by the substitution of Cl in the paraffin and olefin hydrocarbons may find an extensive application in the removal of fat from various hides. Tetrachloroethane is the most frequently used of these compds., but pentachloroethane and di-, tri-, and tetrachloroethylene may also be employed. The solvent is mixed with H_2O at $35-40^\circ$ and the green hides are worked in the mixt. until the fat forms a colloidal soln. which separates on cooling; the solvent may then be recovered by drawing off and filtering. In one instance 10 dozen ram skins were treated with 20 kilos of tetrachloroethane and 80 l. of water at 40° . After 2 hrs. the fat was practically eliminated and the hides were removed; liquid fat collected at the surface of separation of the H_2O and tetrachloroethane on cooling. The solvent was then drawn off and the last traces of suspended fat were removed by passing through a filter press. The hides were then washed with H_2O and another portion of solvent; the fat which was removed was recovered in the usual manner. The above process should be conducted in the dark to as great an extent as possible, inasmuch as light has a decomposing action on the Cl substitution products used in this method of degreasing. H. S. PAINE.

Theory of dehairing. ANON. *Conceria* 23, 496(1915).—Dehairing may be accomplished through the chem. influence of alk. upon the substance of the hide or through the influence of NH_3 which is developed by putrefaction. There is a difference in the H_2O content of hides which have been subjected to these processes. Hides which have been subjected to warm putrefaction have the smaller H_2O content. The reason for this phenomenon may be found in the van't Hoff-Arrhenius theory. In view of the relatively slight electrolytic dissociation of NH_4OH the difference between the osmotic pressure at the interior and exterior of the hide is small and there is consequently little flow of liquid. In the case of dehairing by liming the $Ca(OH)_2$ is a relatively strong base; the substance of the hide is readily permeable by $Ca(OH)_2$ in view of the degree of dissociation of the latter. The hide becomes greatly swollen as a result of the penetration of $Ca(OH)_2$. If the lime liquor becomes putrid with time (and hence enriched in its content of NH_4 salts and combinations of organic bases) the electrolytic dissociation of the $Ca(OH)_2$ diminishes and the osmotic pressure is consequently decreased; the swelling action of a lime liquor is, therefore, diminished by putrefaction. When Na_2S is used in connection with $Ca(OH)_2$ the formation of $NaOH$ must be taken into account in connection with the principles stated above. H. S. PAINE.

The black dyeing of furs ("Cosmos") 25.

Tanning. J. G. STODOLA. U. S., 1,167,951, Jan. 11. Hides are pickled in a dil. soln. of $NaCl$ and H_2SO_4 , treated with a Cr tanning soln. and then treated with a soln. of basic Fe and Cr salts such as basic sulfates, allowed to drain after removal from the soln., and washed with lukewarm H_2O , after treatment with an alk. soln. to fix the Fe in the leather.

Adhesive. E. WIGAR. U. S., 1,168,137, Jan. 11. Gelatin, 600 g., is digested in a soln. of 3% H_2O_2 , 1000 g., containing 10% $HOAc$ and 8% $ZnCl_2$ and the product is filtered after standing for several days. A clear colorless product is obtained suitable for prep. microscopic specimens or uniting glass.

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CHEMICAL ABSTRACTS

Vol. 10.

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No. 7

I. APPARATUS.

L. C. JONES.

Simple apparatus for the accurate and easy determination of surface tension, with a metal thermoregulator for the quick adjustment of temperature. WILLIAM D. HARKINS AND F. E. BROWN. *J. Am. Chem. Soc.* 38, 246-52(1916).—The glass or metal tip from which the drop is suspended in this modification of the drop wt. method is ground as nearly as possible in a perfect circle, and the edges of the tip are sharp. Above the tip the glass capillary is ground to fit into a Monel-metal stopper, which in turn fits the weighing bottle into which the drops are caused to fall. This glass capillary tube is bent into an inverted U, and the other limb of the tube passes down into a second weighing bottle which contains the liquid whose surface tension is to be detd. The whole app. is contained in a metal box with a water-tight cover and fitted with a simple leveling app. The rate of formation of the drop is controlled by an aspirator consisting of a buret-shaped tube with a capillary tip filled with Hg. The thermoregulator is of Ni-plated steel filled with Hg, thermal lag being thus largely eliminated. It is fitted with a threaded metal head which allows the rapid (coarse) adjustment of the temp. at which the regulator is to operate. The finer adjustment is then made with a wire attached to a threaded head and fitting into a narrow glass throat in the movable head. This glass head is ground into the metal parts and makes it possible to see the wire during adjustment. E. B. MILLARD.

A new form of gas buret. HAMMERMAN. Ölsnitz. *Chem. Ztg.* 40, 84(1916).—The app. is for lecture purposes. It consists of a 3-neck Wouff bottle with tubulure at the bottom. One neck carries a thermometer, the middle neck a 3-way cock connected with a rubber bulb, the other neck a Y U-tube, the outer vertical arms of which carry a measuring buret and a leveling tube, and the stem reaching below the surface of H₂O in the bottle. Directions for operating are given. J. H. MOORE.

A new "hot air" Teclu burner. PAUL VERBEEK. *Chem. Ztg.* 39, 948(1915).—The app. has 2 concentric tubes, the inner, gas tube, being slightly longer than the outer. The air drawn in by the gas passes downward between the tubes and is thus preheated by radiation from the flame and by the hot upper ends of the tubes. Five cuts show the construction. J. H. MOORE.

Simple sodium lamp for polariscope. G. K. FORESMORE. *J. Ind. Eng. Chem.* 8, 165(1916).—The app. consists of a piece of asbestos board 4 x 4 x 1/8 in. with a slit 3 x 1/4 in., 1 in. from the edge. This is supported about 1/4 in. above a wing-top flame which is directly under the slit and parallel to it. The edges of the slit are moistened with a satd. soln. of NaCl. A broad double flame is formed, easily located with the instrument. H. L. OLIN.

New Röntgen tube for spectroscopic purposes. M. SIEGBAHN. *Verh. deut. physik. Ges.* 17, 469-70(1915).—A tube of porcelain with a metal chamber having a conical end with arms turned into it to increase the cooling by radiation. The anticathode is cemented directly to this metal end. E. B. MILLARD.

An apparatus for mixing powdered substances. J. HUDIG. *Chem. Weekblad* 12, 984-8(1916).—The substances to be mixed enter a vertical tube through a funnel and

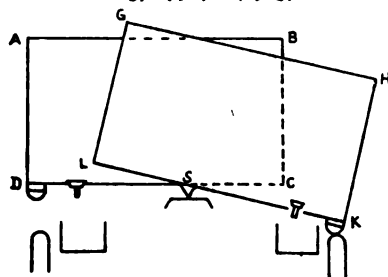
fall into a tray which divides the falling mass into 4 portions. The trays are removed and replaced by empty ones and the filled trays are now successively emptied into the funnel so that the division is repeated. Experiments with white and black oats, kainite and $(\text{NH}_4)_2\text{SO}_4$, powdered Na_2SO_4 and crystd. CuSO_4 showed that the mixing is sufficiently complete after 4 manipulations. The app. is especially recommended for sampling and in the case where thorough mixing of soil with fertilizer is needed for experimental work.

J. T. FLOHL.

Aluminium as construction material in the chemical industry. OTTO BECHSTEIN. *Chem. App.* 3, 17-9(1916).—Since the introduction of autogenous and elec. welding it is possible to construct Al app. of large dimensions and of any form for a large variety of purposes, a partial list of which is given. Its resisting power to acids, especially weak org. acids, makes it greatly superior to Fe, Cu or brass, not only because its salts are non-toxic but also because the goods are not discolored.

J. H. MOORE.

The Cochius automatic weighing machine for liquids. W. J. PENARD. *Arch. Suikerind.* 23, 699-702(1915).—Two rectangular tanks, ABCD and GHKL, of equal



size and wt., are mounted side by side at an angle to each other. The system revolves about S. A spout is moved by a system of levers operated by the tanks themselves, to fill the tanks alternately; and they are emptied by a valve in the bottom which is opened by striking a stop as the tanks trip. Suitable buffers are placed so that the tank which is filling is held perfectly horizontal, but the springs are so arranged that at the moment of balance there is no support from the springs.

Advantages claimed are simplicity, reliability, uninterrupted flow of juice, and no inaccuracy from solids depositing in the tanks.

W. L. BADGER.

The Cochius automatic weighing machine. C. J. TÖNJES. *Arch. Suikerind.* 23, 1056-8(1915); cf. preceding abstract.—A discussion to show that if one compartment contains any ppt., the weighing will be false. W. J. PENARD. *Ibid* 1116-7.—The presence of ppt. does not cause any error. J. SPAICH. *Ibid* 1217-19.—Another line of reasoning to show that the presence of ppt. does not affect the accuracy.

W. L. BADGER.

Mills for grinding straw, dried potatoes, refuse, etc. J. E. BRAUER-TUCHORZ. Hanover. *Chem. App.* 3, 15-7(1916).—Descriptions, with 3 cuts. J. H. MOORE.

New methods for washing and distilling liquids. C. H. BORRMANN. *Z. angew. Chem.* 28, I, 377-80, 381-8(1915).—B. reviews some recent installations for the washing and continuous distn. of liquids. Descriptions and illustrations are given of installations used for washing paraffin oil produced from brown coal tar, continuous production of nitrobenzene, and continuous distn. of alc., Br, petroleum, coal and pine tars and fatty acids.

H. R. GUNDLACH.

Apparatus for the determination of the surface tension at the interface between two liquids (HARKINS) 2. Carbon helix resistance furnace and a temperature recording apparatus (JANECKE) 4.

Column apparatus for distilling alcohol.

Hydrogen sulfide generator. R. M. F. tube II (having sr

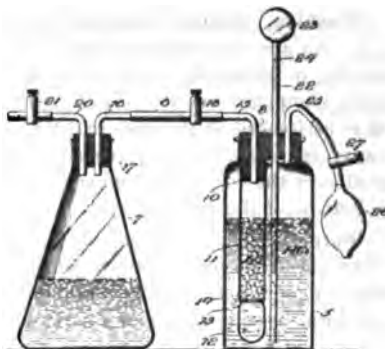
S., 1,169,122, Jan. 25.

70,953, Feb. 8. The

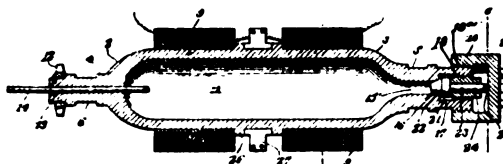
the bottle 5 with acid

as indicated. H_2S generated is passed into a pptn. flask 7 containing a soln. to be reacted upon and when the air has been displaced the valve 21 is closed; back pressure in the generator then forces the acid below the level of the solid sulfide in the tube 11 and stops the generation of H_2S . The bulb 26 may be used to force air into the generator and start the operation at a higher pressure. The tube 22 serves as a pressure indicator.

Retort for effecting synthetic reactions under high pressure. J. R. WATSON. U. S., 1,169,893, Feb. 1. The retort described is used for the synthetic production of phenol, α -naphthol, toluene, pyrocatechol, etc., or for



reactions with alkalis and HCl , in which high pressures are used. The retort is formed with a seamless flask 1 of drawn metal rotatably mounted on journals at the points 5 and 6 and carrying elec. resistance heaters 9 insulated from the retort



itself. The temp. is controlled by a thermostat 14 and a safety plug 24 limits the max. pressure.

Heating furnace. H. HILLEBRANDT, JR. Ger., 285,372, May 14, 1912. Addition to 257,716. The furnace is provided with a cooling device, and is used for heating and cooling the charge in a gas atm. with exclusion of air. Cf. C. A. 9, 398.

Filters. F. P. CANDY. Brit., 21,120, Oct. 17, 1914. Downwardly acting mechanical filters wherein the filter bed is divided into a number of sep. compartments and a filtering plant comprising a number of sep. filters. Non-return valves are provided on the pipes serving for the exit of the filtrate, one or a few of such valves being opened or by-passed during the washing operation so as to limit the supply of wash-water to one or a small proportion only of the compartments or filters, resp. The valves may be opened by hand or mechanically so that the wash-water is supplied to each filtering element in succession.

Magnetic separators. S. BRÜCK. Brit., 20,551, Oct. 5, 1914. Addition to 11,898, 1911. (C. A. 6, 3087.) In a magnetic separator in which fine-grained material passes through the magnetic field under the action of some driving force other than gravity alone, as described in the parent specification, the magnet surrounding the container is formed with inwardly projecting poles parallel to the vertical axis of the vessel. Also, the movement of the material along the magnetic field is assisted by periodically interrupting the energizing current and simultaneously weakening the residual magnetism.

Magnetic separators. S. BRÜCK. Brit., 20,552, Oct. 5, 1914. The containing vessel, instead of being provided with a single magnetic field as described in the parent specification, has several magnetic fields arranged helically so as to utilize the entire external surface of the containing vessel. Cf. preceding patent.

Electromagnetic separator with zones of different magnetic strength. A. F. JOBKE. Ger., 285,826, Nov. 26, 1913. Addition to 278,248 (C. A. 9, 982). The separator specified in the principal patent is modified in that a difference in magnetism is effected by a cross-sectional alteration of the several poles.

Washing, dyeing, bleaching, tanning. J. HAYWOOD. Brit., 21,161, Oct. 19, 1914. An app. for washing clothes, textiles, crockery, and other articles, for dyeing, scouring, or bleaching, for tanning, or for otherwise treating articles with hot or cold liquids, comprizes an outer, liquid-tight vessel, an inner vessel which contains the articles and is perforated at the ends and bottom, a propeller situated between one end of the inner vessel and the outer vessel, baffle-plates attached to the outer vessel to deflect liquid over the edge of the inner vessel, and one or more perforated steampipes below the bottom of the inner vessel.

Burners. H. N. DAVIS and W. R. TWIGG. Brit., 20,538, Oct. 5, 1914. A Bunsen or like burner having a number of outlet passages with independent walls is provided with 2 or more plates which subdivide the passages and bridge the intervening gaps so as to form heating-chambers for the air supplied to the flame.

2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS and E. B. MILLARD.

Arthur Williams Wright. C. S. H. *Science* 43, 270-2(1916).—An obituary.
E. J. C.

Ernst Ludwig. FRITSCH. *Arch. Chem. Mikros.* 8, 148-51(1915).—An obituary.
E. J. C.

Advances in the field of chemistry during 1915. HELEN R. HOSMER. *Chem. Eng.* 23, 45-8(1916).
E. J. C.

Researches at the physikalisch-technischen Reichsanstalt (1914). KARL SCHREL. *Naturwissenschaften* 3, 533-6(1915); see C. A. 10, 546-50.
C. G. F.

Twenty-third annual report of committee on atomic weights. Determinations published during 1915. G. P. BAXTER. *J. Am. Chem. Soc.* 38, 489-96(1916).—Bibliography and discussion of new detns. The new values for those elements whose at. wts. have been changed 0.1 unit or more are Sn 118.7, Pb 207.20, Ra 226.0, U 238.2, Yb 173.5 (old value 172.0), Pr 140.9, Yt 88.7, Lu 175.0 (old value 174.0). E. B. M.

Atomic weight of cadmium. W. OECHSNER DE CONINCK AND GERARD. *Compt. rend.* 161, 676-7(1915).—The metal was dissolved in H_2SO_4 and pptd. (together with Cu and a little Zn) with H_2S ; this ppt. was dissolved in concd. HCl, evapd. to expel excess acid, then treated with a large excess of a concd. soln. of $(NH_4)_2CO_3$, by which Cd alone was pptd. The $CdCO_3$ was washed, dried and weighed. From the loss of wt. when this carbonate was ignited first to CdO, then reduced in a stream of H to the metal, the at. wt. was calcd. As a mean of 5 detns. on about 0.6 g. samples of carbonate, the value 112.32 is given for the at. wt. of Cd, with the extreme values of 112.28 and 112.37. No details of manipulation, corrections applied, etc., are given.

E. B. MILLARD.

Inclusions in the silver voltameter deposits. G. W. VINAL AND WM. M. BOVARD. *J. Am. Chem. Soc.* 38, 496-515(1916); cf. C. A. 8, 1391, 3154.—The same instruments were used as in the previous work at the Bur. Standards and at Princeton (C. A. 9, 412, 1582), and the $AgNO_3$ was prepd. by either of the methods previously described. Deposits were heated to slightly above 600° , both with a flame and in an elec. furnace. Losses in wt. were found which indicated inclusions averaging 0.0040% for pure electrolytes, and higher for impure electrolytes. Heating to 625° for 30 min. caused more alloying than heating to 675° for a short time. After the Ag was removed a brown or black stain was left which could not be removed by scrubbing without considerable abrasion of the Pt surface, and which disappeared completely on being heated to bright

redness without lessening the capacity of the stain to make trouble. The most accurate value for the abs. electrochem. equiv. of Ag is that recommended as the international standard, 1.11800 mg., making the value of the faraday 96494. A rounded value 96500 is recommended. Inclusions on polished Pt surfaces and matte surfaces were the same within exptl. errors. Inclusions between the cup and the deposit were a negligible part of the whole. Strong heating of the cups does not lessen the "vol. effect" when this is present. No evidence was found of the existence of a heavy anode ion.

E. B. MILLARD.

Atomic structure. V. Periodic system and the properties of the elements. WILLIAM D. HARKINS AND R. E. HALL. *J. Am. Chem. Soc.* 38, 169-221 (1916); cf. *C. A.* 9, 2335.—A periodic table is presented which shows graphically the relations between the main and sub-groups of the elements; periodic tables which have been designed formerly do not show this. The elements are arranged in the order of their atomic numbers, and no blanks are left for unknown elements which do not correspond to the at. numbers detd. by Mosley. This table also plots the elements according to their at. wts., so that isotopic forms of an element may be shown graphically on the table, and the α and β decompns. of radioactive elements may also be depicted. Both the zero and 8th groups fall naturally into the system, which is best represented as a helix in space, but may also be shown as a spiral in a plane. The elements are divided into cycles, contg., resp., 4^2 , 6^2 , and 8^2 elements, with the latter part of the 3rd cycle missing, and the cycles are divided into periods, with 2×2^2 in the first two periods, 2×3^2 in the 2nd two periods and 2×4^2 in the 3rd two periods. These relations are undoubtedly a numerical expression of a function connected in some way with the system, according to which the atoms of the elements have been built up. Whenever the valence drops in passing along the continuous line connecting the elements in the order of their at. numbers, it always drops 7, either from 7 to 0 or from 8 to 1, and in the latter case there is evidenced a certain sluggishness in the drop (*e. g.*, in the valences of Cu, Ag and Au higher than unity). Whenever the group numbers in any one division differ considerably, the elements in the sub-groups are quite different chemically from the members of the main group, although they are in general alike in valence. As the group numbers in the division approach each other in magnitude the elements of the sub-group become much more like those of the main group. On the outer cylinder the main groups become less positive as the group number increases, while the corresponding sub-groups become more positive. The rare earths are put in the 3rd group, since if they are distributed around the table there are not enough known and undiscovered elements together to go around, and since the valence of the rare earths is 3 and the chem. characteristics are very similar to those of yttrium which is always classified with the rare earths. The rare earths therefore form a group similar to the 8th group elements and fill the same sort of a place in the system, that is, these are the only elements for which the at. number rises in steps of one while the valence remains const. Main group elements in the table lie on a primary loop of the helix; sub-group elements, including the 8th group, lie on secondary or inner loops; while the rare earths lie on a tertiary loop which connects Ce with Ta. A number of figures are used to show the relationship between the at. numbers and the following properties of the elements: at. vol., m. p., compressibility, coeff. of expansion, cohesion, atomic frequency, and magnetic susceptibility. An important relationship found is that the distances to which the centers of the monoatomic atoms of the He or zero group elements approach during collision is proportional to the 5th root of the at. number, and presumably to the 5th root of the number of electrons in the atoms external to the nucleus. Data are given which seem to support the idea that the large variations in what may be called the cohesional properties of the elements in a single period of the periodic table seem to be

of the asymptotic formula, (5) application of the Lorentz-Wien theory of impacts, and (6) a comparison with exptl. results.

E. B. MILLARD.

Influence of gases on the emission of electrons and ions from hot metals. O. W. RICHARDSON. *Proc. Roy. Soc. London (A)* 91, 524-35(1915); cf. *C. A.* 9, 2620. —The variations of the consts. A and b in the equation for the satn. current density i of the electron current from hot bodies, $i = AT^{1/2}e^{-b/T}$ where T is the abs. temp., are discussed, making use of the data of Langmuir (*C. A.* 9, 985, 1264, 1562). A theoretical discussion of the effect of gases, especially impurities in the gases, is given from a different standpoint from that of Wilson (1908). There is evidence that the linear relation between the consts. A and b in the emission temp. formula holds for positive ions as well as for electrons. If the change in the emission const. for Pt which is caused by H is an effect of positive H ions present in the surface layer, it is equally likely that the contrary effect with W in various gases is due to negative ions, originating from the gas, which are in a similar condition to the positive ions in the case of Pt. At least it seems improbable that the effects are not attributable to a similar cause acting in opposite senses in the case of the 2 metals.

E. B. MILLARD.

Law of fall of a drop of oil in air and the charge of the electron. A. SCHIDLÖF AND J. MURZYNOWSKA. *Arch. sci. phys. nat.* 40, 486-504(1915); cf. *C. A.* 10, 550. —The exptl. method was given in the first paper. In the present paper many of the exptl. details and methods of calcn. are discussed. The value of e is 4.738×10^{-10} e. s. u., and the value of Avogadro's N is 6.11×10^{23} . No charges were found which were not whole multiples of the electronic charge.

E. B. MILLARD.

The value of the electronic charge calculated from the Brownian movements. A. TARGONSKI. *Inst. of Physics, Geneva. Compt. rend.* 161, 778-81(1916). —There are two methods of deducing the magnitude of the elementary elec. charge: (1) by observing the motion of very small particles in an elec. field (Millikan); (2) by observing the Brownian movements. The elec. field method gives very consistent results with particles formed at low temp. but very low results with particles produced in a metallic arc. T. therefore concludes that the arc gives particles of irregular shape or abnormal density. The results obtained with the Brownian movements are independent of the shape and density of the particles. With this method all observers agree fairly well, but the results have been uniformly lower than those obtained by the elec. field method with oil drops, etc., though far higher than those obtained with particles from the arc. T. now finds, from results by himself and Fletcher, that the Brownian movement result approaches nearer to Millikan's ($e = 4.77 \times 10^{-10}$) as the ratio of the mean free path of the gas becomes larger relatively to the diameter of the particles. It would therefore seem that the theory of the Brownian movement does not apply rigorously unless the radius of the particles is small compared to the mean free path of the surrounding gas.

W. P. WHITE.

Theory of the calculation of the rise and fall experiments on particles with Brownian movement. D. KONSTANTINOWSKY. *Physik. Z.* 16, 369-72(1915); cf. *C. A.* 9, 2182. —Theoretical. Further discussion of the question of charges smaller than the electron. (Cf. Schrödinger, *C. A.* 10, 299; Ehrenhaft, *C. A.* 9, 411, 1000 and following abstr.) A simpler method of calcn. for the rise and fall expts. is given. There is no doubt that such charges exist, nor that they are in cases as small as $1/100$ of the electronic charge.

E. B. MILLARD.

Properties of small droplets of pure mercury. A. SCHIDLÖF. *Physik. Z.* 16, 372-5(1915). —Reply to Ehrenhaft (*C. A.* 10, 408) on the same subject. The application of formulas by E. is wholly unjustified.

E. B. MILLARD.

Quantum hypothesis for molecules with several degrees of freedom. MAX PLANCK. *Verh. deut. physik. Ges.* 17, 407-18, 438-51(1915).—Mathematical.

E. B. MILLARD.

Electron theory of metals and Nernst's formula. K. F. HERZFELD. *Pola. Physik. Z.* 16, 324-62(1915).—It is postulated that atoms, ions and free electrons are all present in the metal and that each is in equil. with the atoms, etc., of any other medium (e. g., water) making contact with the metal. Nernst's formula for the relation of potential difference to concn. can therefore be brought into the calcns. The chief conclusions of the mathematical treatment are that the number of free electrons in the metal is small and that the entropy constant differs from what the quantum hypothesis indicates.

W. P. WHITE.

Capillarity theory of crystal structure. P. EHRENFEST. *Ann. Physik* 48, 360-8 (1915).—A mathematical paper.

H. JERMAIN CREIGHTON.

The production of motion by the molecular directing force in liquid crystals. O. LEHMANN. Karlsruhe. *Ann. Physik* 48, 177-92(1915).—L. opposes the supposition that the mols. of liquid crystals are identical with those of isotropic fusions. When liquid crystals flow together, currents and motions are produced until the mol. directing force has the same value at all points, and thereby the surface energy becomes a minimum. This behavior is illustrated with crystals of ammonium oleate hydrate. A crystal drop of *p*-azoxyphenetole exhibits a rotatory motion on the addition of colophonium, when a temp. difference exists between the upper and under sides of the drop. This motion is referred to a change in surface tension resulting from the increase in temp. As the source of energy the surface energy comes into consideration, and as its source the chem. energy. It has not been possible to develop a rigid mathematical theory, on account of the complicated nature of the phenomena. H. J. CREIGHTON.

The structure of slimy crystalline liquids. O. LEHMANN. Karlsruhe. *Ann. Physik* 48, 725-69(1915).—Slimy cryst. liquids consist of chains of mols. so arranged with respect to one another that they behave like optical uniaxial straight threads. The influence of the mol. directing force is momentary. H. JERMAIN CREIGHTON.

The density of argon. H. SCHULTZE. Charlottenburg. *Ann. Physik* 48, 269-72(1915).—For the purest samples of A, the value 0.00178376 has been obtained for the d. at 760 mm. and 0°. The at. wt. of the element is, therefore, 39.945.

H. JERMAIN CREIGHTON.

Equation of state for gases and liquids. F. H. MACDOUGALL. *J. Am. Chem. Soc.* 38, 528-55(1916).—A mathematical discussion of the Dieterici equation of state $p = RTe^{-a/RT}/(v - b)$ and an indication of its accuracy. Methods are developed for calcg. *a* and *b* above, at, and below the crit. temp.; formulas are derived for calcg. the pressure of satd. vapor from the d. of liquid and vapor, and for calcg. the latent heat of vaporization from these quantities. Finally, the calcns. are applied to a study of iso-C₆H₁₂, H, and CO₂. The d. of a substance at abs. zero was calcd. as 4 times its crit. d.

E. B. MILLARD.

Properties of mixed liquids. I. Sulfuric acid-water mixtures. J. L. R. MORGAN AND C. E. DAVIS. *J. Am. Chem. Soc.* 38, 555-68(1916).—More than 100 detns. of the surface tension of 48 concns. of H₂SO₄ in H₂O at various temps. have been made by the drop wt. method, and formulas provided by which the surface tension and sp. cohesion can be calcd. at any concn. and for temps. between 0 and 50°. Both addition of H₂O to H₂SO₄ and of H₂SO₄ to H₂O increase the surface tension, so that different concns. of H₂SO₄ may have the same surface tension at the same temp. Addition of SO₂ to H₂SO₄ also increases the surface tension. The property-concn. curve indicates the existence of a hydrate H₂SO₄.H₂O at about 85% acid. From the Denison law that a

max. deviation from the mixt. law indicates a compd., hydrates with 1, 2, 3, and 12 mols. of H_2O per mol. of H_2SO_4 and 3, 4, or 5 mols. of H_2SO_4 per mol. of H_2O may be found from some property or other.

E. B. MILLARD.

Preliminary report on the diffusion of solids. C. E. VAN ORSTRAND AND F. P. DEWEY. U. S. Geol. Survey, *Prof. Paper* 95-G, 83-96(1915).—The coefficients of diffusion of Au into Pb at 100, 150 and 197° were found to agree closely with the values previously obtained by Roberts-Austen. Pressure appeared to increase the values for the coefficients. The theoretical values are deduced mathematically, and close agreement between observation and theory found. If minerals in the earth are capable of diffusing into each other under pressure, the argument for isostatic adjustment is greatly strengthened.

E. T. WHERRY.

Surface tension. I. Drop weight method for determining surface tension. W. D. HARKINS AND E. C. HUMPHREY. *J. Am. Chem. Soc.* 38, 228-36(1916).—Discussion of a modified method (cf. part II below); a liquid-liquid interface has been substituted for the usual liquid-air interface. The corrections calcd. by Lohnstein (*C. A.* 8, 1041) were not sufficiently accurate, so a new correction curve has been prepd. Values of the drop weight correction have also been calcd. (from Morgan's results). The curve showing these data does not fall on the correction curve of H. and H., though the discrepancies are not great. An attempt to find the cause of this discrepancy is in progress. If a function of r/a , where r is the radius of the tip and a is the square root of the capillary const., such as was calcd. by Lohnstein, be plotted against r/a from his calcs., the curve obtained coincides exactly with the exptl. values detd. from a number of different liquids, but the exptl. detd. values gave the smoother curve. Corrections for the drop weight are most accurately detd. for values of r/a in the neighborhood of 0.9. **II. Apparatus for the determination of the surface tension at the interface between two liquids.** *Ibid* 236-41.—The app. consists of a pipet of about 10 cc. capacity, the stem of which is graduated above and below the bulb. This pipet is one arm of a U-tube; the other arm is a capillary tube which is bent over at the top and which terminates in the dropping tip. A glass stopper is sealed above the end of the dropping tip, and closes the top of the beaker in which the lighter liquid is placed. When it is desired to save material in the lighter liquid a small vessel is used inside the beaker. Suction is used to force the drops over into the lighter liquid, which comes well above the dropping tip. Care is taken that the drop forms very slowly just before its fall, in order to have the drop free from currents and other motion. Details are also given of an app. for detg. the capillary rise with liquid-liquid interface. **III.** *Ibid* 242-6.—Detns. have been made by the capillary tube method of the interfacial tension between H_2O and C_6H_6 at several temps., between H_2O and Et_4CO_3 , xylene, $(CH_3)_3NC_4H_9$, toluene and hexane, resp., and between C_6H_6 and aq. solns. of NaCl, HCl, H_2SO_4 , HOAc, HCOOH and C_2H_5COOH , resp., at several concns. The organic acids lowered the interfacial tension between C_6H_6 and the solns.; HCl and H_2SO_4 produced almost no effect. NaCl increased it and bases lowered it slightly.

E. B. M.

The surface tension at the interface between two liquids. WILLIAM D. HARKINS AND E. C. HUMPHREY. *Proc. Nat. Acad. Sci.* 1, 585-90(1915); see preceding abstract.

E. B. M.

Surface tension of freshly formed surfaces of pure water and of salt solutions. G. MEYER AND H. STOCKER. *Z. Elektrochem.* 21, 5-11(1916).—A fresh, continually renewed surface may be formed by a stream flowing out of an elliptical opening which is vibrating around a cylindrical equil. position in such a way that the surface of the stream is symmetrical with respect to 2 planes passed through the axis of the stream and the long and short axes of the elliptical opening. The equation of von Bohr ex-

pressing the surface tension as a function of the d , velocity, wave length, vibration amplitude and mean radius of the stream, the viscosity of the liquid and the d of air was used. Expts. were made with 11 chlorides, 12 sulfates, and 10 other salts. The surface tension of fresh surfaces is roughly 0.5 dyne/cm. smaller than that of older surfaces, both for H_2O and the solns. Addition of salts to H_2O always increases the surface tension of the freshly formed surfaces.

E. B. MILLARD.

Determination of the composition of the vapors of calomel, the ammonium halides and phosphorus pentachloride from measurements of vapor pressure and density. ALEXANDER SMITH. *Z. Elektrochem.* 22, 33-7(1916).—Vapor pressures were measured using the 3 forms of app. described by Smith and Menzies (*J. Am. Chem. Soc.* 32, 897, 1413, 1541(1910); cf. *C. A.* 4, 2595; 5, 232, 612). The "static isoteniscope" was used to measure the pressure of Hg, of $HgCl$, and of mixts. of these 2 substances. There is no appreciable quantity of $HgCl$ in the vapor from calomel, practically all of it being Hg and $HgCl_2$. The vapor pressures of NH_4Cl , NH_4Br , NH_4I , NMe_4Cl , NMe_4I and PH_4I were detd. in previous expts. (cf. S. and Calvert, *C. A.* 8, 3139; S. and Lombard, *C. A.* 9, 748, 2614), and the d was then detd. for each vapor at several temps. This was done by weighing a small quantity of the solid salt into a small bulb, then sealing it on to a capillary which led to a much larger bulb, evacuating the 2 bulbs, heating in a bath of fused $NaNO_3$ and KNO_3 at the desired temp., and detg. the amt. of vapor driven into the larger bulb. The vapor d of NH_4Cl increased with the temp., since the pressure of satd. vapor increases rapidly. The degree of dissociation is nearly const., and lies between 66.8% at 280° and 62.8% at 330° . The mean (calcd.) value for the heat of vaporization was 32.9 kg. cal., and the heat of dissociation was $-12800 - 0.00967 T^2$ g. cal. per mol. The degree of dissociation of NH_4Br is a max., 39%, at 320° and falls off regularly to 8 or 10% at 388° . Above 320° the heat of dissociation of NH_4Br is therefore positive. The NH_4I reaction seems to be partly one of the dissociation of polymerized NH_4I to simple mols. below 340° , for the values of the d of the vapor are greater than correspond to no dissociation at all. At 300° at least 24% of NH_4I is associated (assuming the associated mol. to be $(NH_4I)_2$), and at least 17% is dissociated. A value of the heat of vaporization was calcd. as 18.0 kg. cal./mol. at 300° , and 24.2 kg. cal./mol. at 380° . The value 44.5 given by Johnson was calcd. on the erroneous assumption of 100% dissociation. Less exact detns. of the vapor d of PCl_5 showed an almost const. degree of dissociation of about 5%. The degree of dissociation is strongly influenced by slight changes in the d of the vapor. The heat of vaporization is for all temps. between 90 and 160° 15.5 ± 0.3 kg. cal./mol. Some errors in a paper of Holland (*C. A.* 6, 3215) are pointed out. See following abstract.

E. B. MILLARD.

Dissociation of gaseous acetic acid and phosphorus pentachloride. Correction. W. NERNST. *Z. Elektrochem.* 22, 37-8(1916); cf. *C. A.* 6, 3215 and preceding abstract.—N. has corrected the numerical errors in the paper of Holland (deceased). New values for the degree of dissociation and vapor d are given for temps. between 413 and 485° for $HOAc$ and between 462 and 623° for PCl_5 .

E. B. MILLARD.

The theory of peptization. W. D. BANCROFT. *J. Phys. Chem.* 20, 85-117(1916).—Accepting Freundlich's generalization, that all adsorption is accompanied by a lowering of the surface tension of the adsorbing phase, a theory of peptization follows, in that any substance which is adsorbed by a second will lower the surface tension of the second substance, and will therefore tend to disintegrate it, or to peptize it. If every adsorbed substance tends to peptize the adsorbing substance one may expect to get peptization by a solvent, by a dissolved nonelectrolyte, by an ion, by a salt, by a colloid. Adsorption decreases in general with rising temp., but so also does the cohesion of the adsorbing substance; there may, therefore, be peptization by a solvent at high

temp. when it does not occur at lower temp. Instances of this are glass and water, vulcanized rubber and organic solvents, gelatin and water. Instances of peptization by a dissolved nonelectrolyte are sugar or glycerol and hydroxides in water, ether and pyroxylin in alcohol; of ion peptization in water are AgBr and KBr, SiO_2 or $\text{Cr}(\text{OH})_3$ and KOH; Al_2O_3 and acids; Cr_2O_3 and CrCl_3 . No cases of peptization by a sol. undissociated salt have been studied. If impure Hg is shaken with water there is peptization by an oxide film. Instances of peptization by a colloid in water are AgBr and gelatin, alkaline Cr_2O_3 and hydrous ferric oxide, gold and stannic oxide. There is no necessary connection between amount of adsorption and ease of peptization. A coarse-grained, porous ppt. may be peptized more readily than the same mass in a more dense form. Von Weimarn's theory of peptization is inadequate. H. I. MATTILL.

Colloidal solid solutions. D. MCINTOSH AND R. EDSON. *J. Am. Chem. Soc.* 38, 613-5(1916).—Aq. salt solns. were placed in Cu tubes and plunged into CO_2 -ether mixts.; the frozen block was removed by dipping the Cu tube in H_2O for a moment. The frozen material resembled ice, but was more opaque and not so hard. It was perfectly homogeneous and showed no evidence of the formation of crystals of ice or salt. These solns. conduct electricity at low temps.; a 20% soln. of KI at -80° showed the color of I at the anode instantly when 110 v. was applied. Since the solns. melt sharply at the f. p. of the soln., their use is suggested as a means of maintaining const. temps. in Dewar tubes for short periods. Cond. expts. have been made on 10, 20 and 30% KI at temps. from -10 to -35° , and the cond. was found to increase most rapidly at -21° (the cryohydric temp. for KI soln.) so that it appeared some sepn. into salt had taken place. Further expts. were made with N , 0.5 N and 0.25 N HCl from -10 to -75° without finding here an abnormal increase at any one temp. E. B. M.

Effect of freezing on certain inorganic hydrogels. H. W. FOOTE AND BLAIR SAXTON. *J. Am. Chem. Soc.* 38, 588-609(1916).—The method used consists in freezing the ppt., of known total H_2O content, in a dilatometer and measuring the expansion caused by the freezing of the uncombined H_2O . From this expansion the amt. of H_2O frozen can be calcd., and the "combined" H_2O detd. by difference. A dilatometer of the usual form was calibrated with Hg and filled with ligroin when changes in vol. were observed. The temp. of the dilatometer was lowered gradually to about -20° , then rapidly to -30° . Preliminary detns. were made with sand and H_2O , lamp black and H_2O , and $\text{Ca}(\text{OH})_2$ and H_2O . Expts. were then made on $\text{Al}(\text{OH})_3$, silica and $\text{Fe}(\text{OH})_3$ gels of various concns. Freezing $\text{Al}(\text{OH})_3$ appears to increase the free H_2O at the expense of the capillary H_2O ; the capillary H_2O is decreased also by repeated freezing. The total free and capillary H_2O increased with long standing of the gel (8 months), but the data do not show whether this extra freezable H_2O comes from that which was actually combined with the Al_2O_3 or whether it was capillary H_2O of too low a f. p. to appear earlier. In SiO_2 gels the behavior of H_2O is quite different, showing little change on repeated freezings. The apparent capillary H_2O (*i. e.*, H_2O freezing below -6°) amounted to over 0.7 g. per g. of SiO_2 . Capillary H_2O in $\text{Fe}(\text{OH})_3$ is held more firmly, or is in smaller capillaries, than in either of the other gels. The work is being continued. E. B. MILLARD.

Double refraction of vanadium pentoxide sols. H. FREUNDLICH. *Z. Elektrochem.* 22, 27-33(1916).— NH_4VO_3 may be changed into V_2O_5 by addition of HCl or gentle ignition, and the resulting oxide may be peptized after washing out. The sol is red-brown, almost completely clear in transmitted light and, if not too concd., little more viscous than H_2O . It is a negative hydrophobic sol, easily coagulated by electrolytes, and if pptd. by weakly coagulating electrolytes (KCl), is easily peptized again. When stirred with a glass rod and viewed in reflected light the sol is filled with yellowish

glittering streaks as if there were fine crystals suspended in it. In transmitted light the sol remains clear but there are dark streaks in it. If it is brought between crossed nicols the field remains dark so long as the sol is not disturbed. If it is stirred the field becomes bright at once. Many of the V_2O_5 preps. were so sensitive that one had only to shake the vessel gently between the nicols to illuminate the field. These properties suggest an elongated shape to the particles of V_2O_5 . Some of the preps. could not be examd. under the ultramicroscope; the smallest of the particles appeared to glitter and moved about so rapidly and irregularly that they could not be followed. If the sol was pptd. with KCl, washed, and reprecipitated several times the particles became larger. In a sol which had been 3 times precipitated the particles appeared about 10 times as long as broad and were in rapid Brownian movement. Attempts to ppt. a cryst. solid from the sol were without success; a bulky spongy flock was formed, and a somewhat more concd. sol set to a jelly. The following picture of the sol is suggested to explain its optical behavior: if the sol is not in motion the usual Brownian movement is observed and on account of its unordered character no double refraction is to be expected. If, however, some directed motion is set up, the particles rub against each other, their longest axes are set in the line of the motion, and the sol loses its isotropic nature and becomes double-refracting. A section cut from the sol may be considered as having a space lattice somewhat similar to a plate from an optically mono-axial crystal, the long axis of the sol particles coinciding in direction with the optical axis. If plane-polarized light is allowed to fall on the sol while it is in a streaming motion and the liquid is viewed between crossed nicols the field will remain dark when the elec. vector of the polarized light is parallel or perpendicular to the optical axis. But if the elec. vector is at an angle of 45° a component of the vector passes through the sol (considered as a crystal) to the nicol, and the field becomes bright; the same would be true for any other angle. This was found to be true for V_2O_5 sols. The question is discussed as to what can be considered an amorphous condition in the light of these expts.

E. B. MILLARD.

Double refraction of vanadium pentoxide sols. H. DIESSELHORST AND H. FREUNDLICH. *Physik. Z.* 16, 419-25(1915); cf. preceding abstract.—If V_2O_5 sol is allowed to flow between crossed nicols in convergent light parallel to the line connecting the nicols, an image of a crossed-axis with concentric rings is obtained. By the use of a quarter-wave mica plate it was shown that the V_2O_5 sol when flowing between the prisms behaved like a mono-axial crystal. If the V_2O_5 sol is allowed to flow through a prismatic tube with a triangular cross section and this is used as a prism to decompose spectrum lines, the red H line is decomposed into 2 oppositely polarized lines when a concd. V_2O_5 sol is used. This extraordinary radiation is strongly refracted, corresponding to a positive double refraction, *i. e.*, its elec. vector vibrates parallel to the direction of flow of the sol and therefore to the long axis of the particles. If a dil. sol is used there is only a broadening of the line. It was previously shown that the extraordinary radiation was more strongly absorbed by the V_2O_5 sol than the ordinary; this is in harmony with the rule of Babinet, according to which in colored doubly refracting media those rays are most strongly absorbed which are most slowly propagated and therefore most strongly refracted. Some of these phenomena may also be observed with old $Fe(OH)_3$ sols, but the action is much fainter. The similarity between the swarming in an anisotropic melt and the V_2O_5 particles has already been mentioned, and it was to be expected that mechanical directing of the axes (stirring) would have the same effect, as has been shown for *p*-azoxyanisole and *p*-azoxyphenetole. It is possible that in anisotropic melts there are very viscous glassy mol. aggregates, in which the atoms are not at the points of a space lattice. An amorphous solid is also possibly not isotropic.

E. B. MILLARD.

Willard Gibbs' adsorption coefficient. A. W. PORTER. *Trans. Faraday Soc.* 11, 51-2(1915).—A mathematical proof (in outline) of Gibbs' adsorption theorem, which is extended to strong solutions. E. B. MILLARD.

Nonideal solutions. The activity of a difficultly soluble component. E. K. STRACHAN. *J. Am. Chem. Soc.* 38, 626-32(1916).—The simplest case of a nonideal soln. consists of a solid of only moderate soly. dissolved in a normal liquid forming a mixt. in which the number of mol. species is equal to the number of components. Calcns. are based on solns. of I in CCl_4 , CS_2 , and CHBr_3 . The partial pressure of the moderately sol. component has been calcd. by combining the soly. data with those for the sublimation pressure, and reducing the vapor pressures to a single temp. by means of the Clausius equation. The partial soly. of a difficultly sol. component of a truly nonideal soln. can be expressed by the relation $p = (N/N_s)p_0 + C(N_s - N)N$, in which p is the partial pressure of the solute when its mol. fraction is N , p_0 is the vapor pressure of the max. solute and N_s its mol. fraction in a satd. soln. C is a const. approx. inversely proportional to the square of the soly. E. B. MILLARD.

Theory of acidimetric indicators. R. WEGSCHEIDER. Univ. Vienna. *Z. physik. Chem.* 90, 641-80(1915).—A theory for the color transformation of indicators has been developed, on the ground that the undissociated compds. and similarly constituted ions are similarly colored, and that the color transformation depends upon a change in constitution. Formulas are given for the content of the soln. with respect to free acid or free base for definite concns. of H ions and indicator, for the H-ion content at the point of neutralization for strong acids and bases, and for the indicator concn. By means of these formulas, the exact point of neutralization may be obtained in titration. Some unicolored indicators behave as ideal indicators (those in which the one form appears only in an ionized, the other only in an un-ionized form), others as non-ideal. With ideal indicators, the sensitiveness increases continuously with the indicator concn. while, on the other hand, with non-ideal indicators a max. sensitiveness is associated with a definite concn. of indicator. The dissociation const. and the apparent dissociation const. of the colored form serve for the calcn. of all phenomena. Both these consts. can be ascertained. Better results are obtained by using an indicator acid that is colored in alk. soln. or an indicator base that is colored in acid soln. than by using an indicator acid that is colored in acid soln. or an indicator base that is colored in alk. soln. Two-colored indicators can behave differently. Their behavior may be ascertained from the apparent dissociation const. Ideal and non-ideal two-colored indicators behave alike. The collective equil. consts. of a non-ideal indicator (dissoc. consts. of both forms and transformation const.) can only be detd. by the usual chem. and optical methods, when spectral regions can be found in which only one form is absorbed. The proof that this condition is fulfilled is difficult to ascertain in the case of two-colored indicators. H. JERMAIN CREIGHTON.

Partition coefficients of hydrogen peroxide between water and certain organic solvents. J. H. WALTON AND H. A. LEWIS. *J. Am. Chem. Soc.* 38, 633-8(1916).—About 15 cc. of H_2O and the same amt. of the organic liquid were placed in glass-stoppered bottles with the desired amt. of H_2O_2 and rotated in a thermostat for about an hour. Then samples were withdrawn and analyzed either by titration with KMnO_4 or, in cases in which this substance oxidized the organic liquid, gasometrically by means of MnO_2 catalyzer. Expts. were made at 25° with the following liquids: EtOAc , $\text{iso-C}_4\text{H}_9\text{OH}$, amyl acetate, acetophenone, Et_2O , aniline, phenol and quinoline. When a soln. of H_2O_2 is shaken with the last-named substance more than half of the H_2O_2 is removed. Organic solvents which dissolve H_2O will also dissolve H_2O_2 . H_2O_2 does not undergo association in the solvents studied. The quinoline soln. is not a simple

one, but probably consists of a compd. of the solvent and H_2O_2 in equil. with H_2O .
E. B. MILLARD.

Studies of the vapor pressure of solutions. Lowering of the vapor pressure of water produced by dissolved potassium chloride. B. F. LOVELACE, J. C. W. FRAZER AND E. MILLER. *J. Am. Chem. Soc.* 38, 515-28(1916); cf. *C. A.* 9, 403.—The original app. has been changed to include a new thermostat const. to 0.001° for periods of 12 hrs., a device for stirring the soln. and solvent in the vacuum, and a more sensitive McLeod gage. Actual observations were made only after the air pressure in the McLeod gage was less than 0.0001 mm.; under these conditions the vapor pressure lowering was const. to 0.001 mm. for days. Solns. of KCl of 9 concns. between 0.2 and 2.0 M at 20° were studied. Changes of concn. of the solns. during the removal of dissolved air and the measurement of the vapor tensions were negligible. The mol. lowering of the vapor tension was the same for all concns. investigated (cf. Tower and Germann, *C. A.* 9, 403). The reason for this cannot be detd. until the rigid applicability of Raoult's law has been tested for some nonelectrolyte over the same concn. This is to be done as soon as possible.
E. B. MILLARD.

Difficulties in van Laar's theory of the vapor pressure of binary mixtures. R. T. LATTY. *Trans. Faraday Soc.* 11, 118-20(1915).—Mathematical formulas are derived for the condition under which the P/x graph will pass through a max. or a minimum and for conditions of partial miscibility at one temp. and complete miscibility at another temp. From calcns. on the vapor pressure curve of MeEtCO and H_2O it is shown that the formula is not only inconsistent with the observed effects of temp., but that it does not agree with exptl. facts when comparison is made at const. temp. R. B. M.

Viscosity coefficients of mixtures of helium and hydrogen. A. GILLER. *Ann. Physik* 48, 799-837(1915).—New detns. have been made of the viscosity coeffs. of air, He and H. Viscosity coeffs. of mixts. of He and H have been detd. at 0° , 15° and 100° . Between 0° and 100° the change of the viscosity coeffs. with temp. can be expressed by Sutherland's law for the mixts. investigated. The change of the viscosity coeffs. with the compn. of the mixts. can be expressed by Puluij's formula. H. J. C.

Study of binary mixtures. I. Densities and viscosities of mixtures containing phenol. ARTHUR BRAMLEY. *J. Chem. Soc.* 109, 10-45(1916).—Mixts. of $\text{C}_6\text{H}_5\text{OH}$ with C_6H_6 , $\text{C}_6\text{H}_5\text{Cl}$, $\text{C}_6\text{H}_5\text{NO}_2$, $\text{C}_6\text{H}_5\text{NH}_2$, $\text{C}_6\text{H}_5\text{N}(\text{CH}_3)_2$, *p*-toluidine, $(\text{C}_6\text{H}_5)_2\text{NH}$, $\text{C}(\text{C}_6\text{H}_5)_2\text{NH}$, $\text{C}_6\text{H}_5\text{N}$, phenetole and acetone and of $\text{C}_6\text{H}_5\text{NH}_2$ with phenetole at various concns. were studied at several temps. Viscosities were detd. in 3 pairs of Ostwald viscosimeters, and d 's in 10 cc. pycnometers. Mixts. contg. $\text{C}_6\text{H}_5\text{OH}$ have lower viscosities than correspond to the mixt. rule when the 2nd liquid is "indifferent," and when a compd. is formed in the mixt. the viscosity is generally higher than that demanded by the mixture rule. Deviations are due to the acidic nature of phenol. Phenetole and aniline give mixts. whose viscosity curves are convex toward the compn. axis; the phenol mixts. are concave toward this axis. The position of the max. point on the viscosity curves generally varies with the temp., and therefore gives little indication of the compn. of any compd. which might be present. The conclusions are not in harmony with those of Denison (*C. A.* 7, 925). Peculiarities in the curves may be due to the unequal thermal dissociation of phenol and the compds. formed with changing temp.
E. B. MILLARD.

Equilibrium between mucic acid and its lactones. W. A. TAYLOR AND S. F. ACRRE. *J. Phys. Chem.* 20, 118-20(1916).—This equil. was detd. in connection with the larger problem of the mechanism of the reactions involved in the oxidation and reduction of sugars and their derivs. Mucic acid solns. containing an excess of solid mucic acid were prepd. at room temp., at 30° and at 100° , then placed in a const.

temp. bath at 25°. The acid was detd. by titration with 0.1 *N* alkali at 0°, the lactone by adding an excess of standard alkali, boiling a few min. and titrating the excess with 0.1 *N* HCL. Equil. is established in from 1440 to 2880 hrs. (the longer time was required for the soln. prepd. at 100° which showed supersaturation) and at equil. there are about twice as many lactone as carboxyl groups in the soln. Further investigation will be instituted to det. whether the lactone is the mono- or dilactone and to learn whether acids catalyze these changes by the H ion, the nonionized molecule, or both.

H. I. MATTILL.

The kinetic interpretation of osmotic pressure. P. EHRENFEST. *Ann. Physik* 48, 369-74(1915); cf. *C. A.* 9, 1866.—A mathematical paper. H. J. C.

Entropy constant of diatomic gases. MAX PLANCK. *Verh. deut. physik. Ges.* 17, 418-9(1915).—Mathematical. An expression has been derived which is exactly the same as that of Tetrode (*C. A.* 9, 2020), though derived in an independent manner. This agreement is support for the Nernst heat theorem. E. B. MILLARD.

Heat of neutralization and the quantum theory. A. HEYDWEILLER. *Ann. Physik* 48, 681-92(1915).—From considerations of Planck's equation for the energy of a system composed of a definite number of linear oscillators with a definite frequency at a definite temp. it was shown that the heat evolution of a chem. reaction at ordinary temp., in which only one electron in the mol. is altered in its method of linking and its vibration frequency, is proportional to this change of the properties of the electron. The proportionality const., if the heat is expressed in ergs per mol., is $Nh/2$, where N is Avogadro's number and h is the h of Planck's theory. The exptl. material consisted of detns. of d., n , and elec. cond. of the hydroxides of Li, Na, K and Rb in H₂O at 6 or 8 concns. This material is mathematically discussed in a form not suited to brief review. The calcd. results agree with the exptl. in order of magnitude, but do not constitute a confirmation of the theory. There is, however, nothing to indicate a refutation of the theory. E. B. MILLARD.

Heat conductivity of neon. E. BANNAWITZ. *Ann. Physik* 48, 577-92(1915).—A wire was stretched along the axis of a cylindrical glass tube contg. the gas and immersed in a water bath, and the wire was heated by a measured (direct) current. The value of resistance (detd. while the heating is in progress) and current together determine the heat conducted and radiated from the wire through the gas to the glass vessel. Parallel expts. conducted in a vacuum eliminated the radiation; the heat conducted was detd. from the rise in temp. of the surrounding bath. At 0° the mean value detd. was $k_0 = 0.0001091$ (g./cal.)/(sec./cm.), and the temp. coeff. (mean value) was 0.00259. The corresponding temp. coeffs. for air, A, and He are 0.00253, 0.00260 and 0.00318, respectively. E. B. MILLARD.

The freezing point of benzene as a fixed point in thermometry. J. MEYER. *Z. physik. Chem.* 90, 721-2(1915); cf. *C. A.* 8, 3524.—M. cites a number of objections to the use of C₆H₆ for the standardization of thermometers. H. J. CREIGHTON.

The moving of boundaries in electrolytic solutions. M. V. LAUR. Frankfurt a/M. *Z. anorg. allgem. Chem.* 93, 329-41(1915).—The theory of moving boundaries in electrolytic solns. was developed by Kohlrausch and Weber on the assumption of complete ionization. This paper is a rigorous mathematical development of the theory for more concd. solns. in which the electrolytes are incompletely ionized. For the compd. $A_\mu B_\nu$, assuming the mobilities U and W to be independent of the concn., the speed of the moving boundaries is given by the expression: $\Delta x/\Delta t = UI/m_\nu F(U + W)\alpha$, in which I is the current density, m the valence of ion A , α the total concn. of $A_\mu B_\nu$. It will be observed that this expression differs from that derived by K. and by W. in the concn. term; the total concn. replacing the ion concn. GEORGE W. MORF.

Conduction of the electric current in ethyl ether. J. FASSBINDER. Univ. Greifswald. *Ann. Physik* 48, 449-80(1915).—The dissociation of pure Et_2O is exceptionally small. The cond. values previously found can only be explained by the presence of impurities. Small quantities of impurities are not dissociated by Et_2O . The ions which carry the current are produced chiefly at the electrodes, where the solute is absorbed and ionized. The elec. field then tears these ions from the electrodes. Consequently, the current-strength increases only with the strength of the elec. field; it is independent of the vol. of the liquid, *i. e.*, of the distance which the electrodes are apart. It depends to a large degree, however, upon the quantity of solute contained in the Et_2O . Pt electrodes absorb the solute to but a slight extent and give up the ions readily from their surface. On the other hand, Ag electrodes absorb the solute to a large extent and hold the ions on their surface. H. JERMAIN CREIGHTON.

The electric conductivity of tetrazole and derivatives at various temperatures. E. OLIVERI-MANDALÀ. *Gazz. chim. ital.* 45, I, 303-6(1915).—In a preceding paper (C. A. 9, 884) it was shown that the temp. coeff. of tetrazole and the corresponding amide, calcd. from elec. cond. data, increases with increasing temp. and this increased ionization was interpreted as due to the production of the more acid form arising by the passage of H from 1 N atom to the other. This explanation seemed justified by the behavior of tetrazole, the 2 isomeric ethers of which were obtained by the action of alkyl iodides on the Ag salt and by the direct action of diazomethane. The study has been continued with the use of a larger amt. of tetrazole and extended to another deriv.: ethyl tetrazolecarboxylate (a), $\text{N:N.N.NH.CCO}_2\text{Et}$. The temp. coeffs. of

tetrazole $(u_h - u_l)/(h - l)$ for dilns. of 32, 64, 128, 256 for 0-10° are 0.162, 0.222, 0.287, 0.392, resp.; for 10-20°, 0.180, 0.246, 0.343, 0.465; for 20-30° 0.201, 0.266, 0.355, 0.499. The dissociation consts. for dilns. of 32, 64, 128, 256 for 0° are 0.0000092, 0.0000089, 0.0000085, 0.0000079; for 10° 0.000012, 0.000011, 0.000010, 0.0000098; for 20° 0.00014, 0.000013, 0.000013, 0.000013; for 30° 0.000018, 0.000017, 0.000016, 0.000015. The limit values of the mol. cond. of (a) were calcd. from the data given according to Kohlrausch's law $[\mu_{\infty RH} = \mu_{\infty RNa} + (\mu_{\infty HCl} - \mu_{\infty NaCl})]$ and were as follows at 0°: μ_{∞} for (a) is 241.51, at 10° 299.88, at 20° 356.76, at 30° 410.04. The dissociation consts. for dilns. of 32, 64, 128, 256 for 0° are 0.000030, 0.000029, 0.000028, 0.000027, resp.; for 10° 0.000038, 0.000037, 0.000037, 0.000033; for 20° 0.000056, 0.000056, 0.000055, 0.000048. E. J. WITZEMANN.

Arcs in gases between non-vaporizing electrodes. G. J. M. MACKAY AND C. V. FERGUSON. *J. Frank. Inst.* 181, 209-16(1916).—A preliminary paper on arcs from hot W in atms. of H, A, N, and air. Enclosed arcs were constructed which acted as rectifiers of a. c., carrying 10 to 20 amps. with such slight deterioration of the W that a life of many hundred hours could be obtained. The electrodes operate at 2600° to 3200° K., and there appears to be no more loss of metal than can be accounted for by the normal rate of evapn. of W at these temps. If the pressure of the surrounding gas is several cm. there is no trace of cathode sputtering which occurs so violently at lower pressures, on account of a decrease in the high cathode-drop. Curves are given showing the characteristics of the arcs in the various gases. Rapid vaporization and chem. reaction at the electrode surfaces are merely incidental to the phys. phenomena involved, which are undoubtedly the most important. A more detailed report is to be given later. E. B. MILLARD.

Application of the theory of allotropy to electromotive equilibria. II. The passivity of iron. A. SMYTH AND A. W. H. ATEN. Univ. A. Chem. 90, 723-43(1915); cf. C. A. 8, 2514; 9, 1140.—

polarization and the passivity of iron resulting from chem. means or through anodic polarization are described. Several theories are discussed, and it is shown that the primary phenomenon of the passivity of iron cannot be explained by the oxidation theory. The O charging and the contingent oxide formation are secondary phenomena. It is emphasized that the passivity has its seat in the surface of the metal, and, in accordance with the theory of allotropy, it is shown that the appearance of the passivity of iron, brought about either by anodic soln. or by the action of chem. reagents, as well as the transition from the passive condition to the active, and the abnormal cathodic polarization may be explained from the same point of view. The appearance of polarization is not due to the fact that the heterogeneous equil. between the metal and the soln. is slowly established, but to the fact that the metal is forced to dissolve more quickly, so that the inner equil. may be established, whereby an ennobling of the surface of the metal occurs. A strong support for the new conception is to be found in the fact that Fe in a soln. of $\text{Fe}_2(\text{SO}_4)_3$ exhibits a more positive potential than in a soln. of FeSO_4 of the same concn. It has been shown that the activation curve refers to a discontinuity in the mixing proportions of the pseudo components. The abnormal cathodic polarization has been discussed and explained in the light of the theory. H. J. CRIGHTON.

The true nature of the so-called adsorption potential. R. BEUTNER. *Elektrochem. Z.* 22, 177-82 (1915); cf. C. A. 8, 2300.—The charge on oil drops in H_2O is affected by the addition of salts. This is not caused by any action of the surface charge on the ions but depends upon the division of the salt between the oil and the H_2O , a certain dissociation of the salt in the oil and the application of the osmotic law for the potential difference between oil and H_2O . This law is analogous to Nernst's law for electrode potential. An approx. measure of the proportion of salt in the oil and in the H_2O is obtained by conductivity measurements which show that the relative proportion is dependent upon the chem. nature of the salt. W. E. RUDER.

Overvoltage. C. W. BENNETT AND J. G. THOMPSON. *Cornell. Trans. Am. Electrochem. Soc.* 29, adv. copy, 24 pp. (1916).—Heretofore overvoltage has been considered from the relative standpoint, using an arbitrary standard. When H overvoltage is considered to be the difference between the voltage required to liberate H at the surface of a platinized cathode, and the voltage required at the surface of the metal in question, the values obtained vary, according to whether the point of gas evolution or the break in the voltage current curve is taken. The values also increase with an increase in c. d. Le Blanc considers H overvoltage to be the excess of back e. m. f. generated at the electrode, over that at a platinized Pt electrode. Metals have definite overvoltages, but none of the definitions of overvoltage apply to metal overvoltage. In the general sense, overvoltage may denote the excess of back e. m. f. of the system (cathode or anode) over the e. m. f. of the system consisting of the final product obtained (at anode or cathode) in the soln. used. Thus Zn overvoltage would be the excess of the back e. m. f. of the system, $\text{Zn} \longrightarrow \text{Zn soln.}$, during electrolysis, over the e. m. f. of the reaction, $\text{solid Zn} \longrightarrow \text{dissolved Zn ion}$. The overvoltage represents, then, the excess energy required to form a substance, over that given by the resolution of the substance formed to the original state, and measures the irreversibility of the process. The various theories which aim to explain overvoltage are considered, but none of them will afford an explanation of metal overvoltages, as well as gas overvoltages. If H is considered it is found that there is a form intermediate between ion and gas, which is more reactive than either, and which is a stronger reducing agent than Zn. This active H is produced at the cathode during electrolysis of an acid, during soln. of a metal in an acid, by action of Ra emanations, by action of electrical discharges, and by photochemical effects. In a similar manner, active O is formed from the dissolved ion irreversibly, and it will oxidize substances which

are not affected by H_2O_2 or ozone. The reactions involving the active products are not reversible. H_2 gas forms H^+ ion by first taking on an elec. charge. This reaction generates a certain qu with a definite intensity, and the total energy is the product of the t direction H gas is not formed until a concn. of active H is reached than, equil. requires. When equil. is exceeded, energy of a greater required to carry out the formation of gas quickly. The total volt is that occasioned by the active H present, and the excess of bac voltage, is that occasioned by the active H present in excess of process is not reversible by the energy, or heat of formation of acti as it is present above equil. In the case of a metal, atomic metal, and metal, is the unstable, intermediate form. With Zn, the intermedia to be more strongly reducing than massive Zn. These intermedia to be sufficiently active to account for the irreversibilities found v the change from atomic to molecular material is rapid, then the low, and any influence which can affect the speed of this reaction, voltage. Any condition which can increase the concn. of the int will increase the overvoltage. SH

The dependence of the photoelectric charging potential upon GEHRCKE AND L. JANICKI. Charlottenburg. *Ann. Physik* 47, (presence of H, He and H_2O vapor retards the appearance of a positive In a high vacuum the charging potential is +2.3 v. Expts. with gave no indication of an effect depending upon the nature of the is explained by assuming that the fastest photoelectrons result t itself, but from the H occluded therein. H. JER

Optical investigations on the constitution of inorganic acids K. SCHAEFER. *Z. Elektrochem.* 21, 181-91(1915); cf. *C. A.* 9, 416 of the absorption spectra of the O acids of S, Cl and N shows that acid differs from that of the corresponding salt. In the case of s undissociated mol. and ions differ. This is particularly advantag the study of electrolytes, as it makes it possible to follow the con the neutral part of the electrolyte.

The natural optical activity of liquids and gases. M. BOR 251-8(1915).—In "Dynamik der Kristallgitter" Teubner, Born sl cular double refraction exhibited by a crystal when light passes thro tion of the optical axis may be related to the grating structure o present paper treats of the optical activity of liquids and gases in manner. The mol. is considered as a system of mechanically gro possessing a certain mass and charge. The simplest optically ac to be an asymmetric tetrahedron. The discussion is entirely (

The Doppler effect of canal rays in argon. K. FREIDERSDO *Ann. Physik* 47, 737-62(1915).—Many of the results obtained by baum (*C. A.* 8, 1382) in the region 4300-4000 Å. units, have be region 4965.4-2884.1 Å. units. The lines of the red A spectrum univalent ions, and those of the blue to bivalent or polyvalent ion the particles of different valence is established through neutraliz The number of univalent ions decreases with increasing voltag zero at 42000 v. In addition to bivalent and trivalent ions, t appear in A canal rays at high voltages. H. JER

Studies in catalysis. III. Preliminary measurements of the infra-red absorption spectra of hydrogen chloride, potassium chloride and methyl acetate in aqueous solution. R. H. CALLOW, W. C. McC. LEWIS AND G. NODDER. *J. Chem. Soc.* 109, 55-67 (1916); cf. *C. A.* 9, 262, 1420.—A radiomicrometer of the H. C. Jones type has been used to measure the infra-red absorption of HCl, KCl and MeOAc over the range 1 to 2.1μ . The solutes exhibit remarkably similar behavior in respect to the position of the absorption bands which occur at 1.12μ , 1.55μ , and 2.1μ (approx.), and thus correspond to the bands of H_2O itself, with a slight displacement in the direction of the longer wave length. The behavior observed is perhaps due to the formation of additive compds. between the solute and the solvent. HCl possesses a much greater absorptive power than KCl in the short infra-red region. This is in agreement with the radiation theory of homogeneous catalysis, according to which a positive catalyst is one which increases the radiation d. at certain points of the short infra-red region. It is known that the existence of an absorption band increases the radiation d. abnormally for wave lengths below the band and diminishes it for wave lengths above the band. IV. Stoichiometric and catalytic effects due to the progressive displacement of one reactant by another in the "acid" hydrolysis of methyl acetate. R. O. GRIFFITH AND W. C. McC. LEWIS. *Ibid* 67-83.—Detns. of the velocity of hydrolysis of MeOAc by N , $0.5 N$ and $0.1 N$ HCl and $0.5 N$ CCl_3COOH have been carried out with varying initial concns. of the ester. The unimol. consts. (after correction for the reverse reaction) were const. in each expt., but their values depended on the initial concn. of the system, the value rising with the concn. of the ester. Change in the dissociation of the catalyzing acid as more ester was added, and the accompanying change in catalytic activity, could not account for the change of the consts. If the reacting substance is considered to be an ester- H_2O additive complex, the degree of dissociation of which decreases as the water concn. decreases, the variation in the reaction velocity can be explained. In other words the H_2O is considered as a negative catalyst in virtue of its high dissociating power at the same time as it acts stoichiometrically. The equil. const. for the reaction between MeOAc and H_2O in the presence of HCl of a concn. less than N was 4.6. E. B. MILLARD.

Single-line spectra of magnesium and other metals and their ionizing potentials. J. C. McLENNAN. *J. Frank. Inst.* 181, 191-207 (1916); cf. *C. A.* 10, 146.—Radiation from Mg vapor traversed by electrons has been investigated by the method of McL. and Henderson (*C. A.* 9, 3155). If the electrons bombarding the vapor possess energy lying within a certain range (not yet definitely detd., but covering a portion of the ranges for Hg, Zn and Cd) corresponding to potentials of 5 or 10 v., Mg vapor is stimulated to the emission of a single-line spectrum of wave length $\lambda = 2852.22 \text{ \AA}$. The absorption spectrum of non-luminous Mg vapor contains a band at $\lambda = 2852.22 \text{ \AA}$ and one at $2073.36 \text{ \AA}$. As these lines are the first members of Paschen's series $\nu = 2$, $p_2 - m$, S and $\nu' = 1.5$, $S - m$, P , resp. (*C. A.* 6, 828), the absorption spectrum of Mg vapor has been shown to be analogous to the spectra of the vapors of Hg, Zn and Cd. The single-line spectra of Ca, Sr, Ba and Tl vapors should have the wave lengths $\lambda = 4226.91 \text{ \AA}$, $\lambda = 4607.52 \text{ \AA}$, $\lambda = 5535.69 \text{ \AA}$ and $\lambda = 5350.65 \text{ \AA}$, resp. The ionizing potentials for these elements were Hg 4.9, Zn 3.96, Cd 3.74, Mg 4.28, Ca 2.89, Sr 2.65, Ba 2.24, Tl 2.28 v. If Bohr's theory (*C. A.* 8, 1906; 9, 3016) affords an explanation of the origin of single-line spectra, then Frank and Hertz, and also Newman must have placed a wrong interpretation on their exptl. detns. of the ionization potentials of Hg atoms. Also in *Proc. Roy. Soc. London (A)* 92, 305-12 (1915). E. B. M.

Observations of the effect of the electric field upon spectral lines. V. Fine decomposition of the hydrogen series. J. STARK. Aachen. *Ann. Physik* 48, 193-209 (1915); cf. *C. A.* 8, 2103.—The lack of sharpness of H lines decomposed by the elec.

field raises the question as to whether or not the number of the components would not be increased by stronger decompn. In the present investigation, elec. static fields of 104,000 v./cm. instead of 30,000 v./cm. have been employed. As in previous expts., the light intensity is considerably increased. The inhomogeneity of the potential field in the canal ray tube produces bent lines. This permits the differentiation of the decompn. components from foreign lines. The directions of the canal rays and the elec. field are opposed. As expected, the fine decompn. gives more components than the coarse decompn. VI. Polarization and strengthening of a series. *Ibid* 210-35.—On the supposition that the carrier of a series line possesses polarity and anisotropy of the emission at the at. axis, S. expects a polarization of the series line which need not be connected with a splitting. Three lines of the 3rd Li side series have been investigated, and it has been found that in the elec. field polarization without splitting occurs. The magnitude of the strengthening of the 3rd Li side series is remarkable (cf. C. A. 10, 556). Phenomena similar to those observed for Li have been found in the case of He.

H. JERMAIN CREIGHTON.

Spectra of ruthenium, columbium and tantalum. E. PAULSON. *Physik. Z.* 16, 352-4(1915); cf. C. A. 9, 2029.—In an earlier paper an arrangement has been given of 548 lines in the Ru spectrum which group themselves into 65 more or less complete groups of 18 lines each. As an extension of the work 91 other lines have been added to this system. In the Ta spectrum many pairs of lines with a difference in wave length of 237.00 have been found, and in the Cb spectrum there are 5 lines repeated at intervals. The calcns. are based on the measurements of Exner and Haschek.

E. B. M.

A new line series in the helium spectrum. J. KOCH. Gothenburg. *Ann. Physik* 48, 98-108(1915).—In strong elec. fields there appear new He lines, which are related to a parallel chief series. Their limit is the same as that of the side series of univalent He.

H. JERMAIN CREIGHTON.

Physical photometer in theory and practice. W. W. COBLENTZ. *J. Frank. Inst.* 181, 233-41(1916); cf. C. A. 9, 3162.

E. B. MILLARD.

The influence of magnetization on the direct current resistance of graphite in the direction of the principal axis. G. E. WASHBURN. Bosscha Lab. *Ann. Physik* 48, 236-50(1915).—The investigation covers samples of Ceylon, Mexican and American graphite. The specific resistance in the direction of the principal axis is from 80 to 90×10^{-4} ohm/cm. while at right angles to this axis it is about 0.80×10^{-4} ohm/cm. This ratio of about 100 is, perhaps, the greatest cond. difference observed for any one substance. When the samples were placed in a magnetic field making an angle with the principal axis, the relative change in the resistance ($\Delta R/R$) parallel to the principal axis was found to be equal to the relative change when the sample was placed perpendicular to the field plus a term proportional to the component of the field in the direction of the axis. The ratio of the resistance change when the axis is parallel to the field to the change when the axis is perpendicular is about 7 to 1. For a field of 30 kilogauss and the axis parallel to the field the increase in resistance is about 80%.

O. A. R.

Alcoholysis of salts. H. GOLDSCHMIDT. *Z. Elektrochem.* 22, 11-5(1916).—Calcns. are given which show that the addition of H_2O to an alc. soln. results in a decrease in the concn. of free base and acid, if the salt is alcoholized, together with an increase in concn. of OH^- and a decrease in the alcoholysis of the salt. Expts. have been made on the elec. cond. of mixts. of bases and acids at several concns. in abs. alc. In one series of expts. equiv. amts. of aniline and salicylic acid were used; in another series a const. excess of 0.1 equiv. aniline was present. Other expts. were made with aniline and different acids, and finally a series in which H_2O in various amts. was added

to the alc., with aniline or toluidine and several acids. Secondary and tertiary bases are much more alcoholized than primary bases, i. e., they are weaker than the primary ones; but in H_2O the opposite is the case, the tertiary being much the strongest. In these cases the alcoholysis is much more strongly influenced than it should be according to the equations developed, since the affinity const. of the base is changed by the addition of another solvent. Addition of H_2O to alc. solns. has an effect that is the same as the catalytic effect of an acid. The assumption that the negative catalytic effect of H_2O in a H^+ catalysis is due to a distribution of the H^+ between the H_2O and the other solvent is supported by these expts.

E. B. MILLARD.

The chemistry of amorphous solids. W. H. LEWIS. *J. Soc. Chem. Ind.* 35, 12-5 (1916).—Some generalizations giving the relations of plasticity of a material to its mol. size. The mol. of an amorphous solid may be written V_n , V being a small unit ($C_6H_{10}O_5$ for cellulose, C_4H_8 for rubber) and n an integer differing in value under different conditions but not capable of being made to assume any value since the final aggregate is probably formed by a succession of condensations. Plasticity and chem. and physical inertness decrease with increased mol. size and with falling temp. Solvents and mechanical manipulation by decreasing the size of the aggregates tend to increase plasticity. The "setting" of plastic bodies is accomplished by lowering the temp. (in glass), by increasing the size of the mol. (tanning hides, vulcanizing rubber, which increases V rather than n), by chem. conversion into less plastic materials (ceramics, cement), by removal of a solvent, by increasing n (bakelite).

H. I. MATTILL.

The distillation of organic acids with water. ORCHSNER DE CONINCK AND A. RAYNAUD. Univ. Montpellier. *Rev. gén. chim.* 18, 134-5 (1915).—Separate mixts. of 5 cc. acid and 25 cc. distd. water were slowly distd. Five cc. portions of the distillates were titrated with 0.1 N KOH. The amts. of formic and acetic acids in the resp. fractions increased regularly, propionic acid very regularly, butyric and isobutyric very irregularly.

L. H. CHERNOFF.

Chemistry and technology from original historical scientific writings. EDMUND O. VON LIPPMAUN. *Chem. Ztg.* 40, 3-5, 26-8, 48-50 (1916).—A review of theories, recipes and processes in the 10th-12th centuries, with a bibliography of 115 references.

J. H. MOORE.

New Röntgen tube for spectroscopic purposes (SIEGBAHN) 1. Apparatus for the determination of surface tension (HARKINS) 1. Operation of low voltage apparatus from high voltage circuits (SCHRÖTER) 4. Fundamental units of electricity (SMITH) 4. Potential difference at liquid contact surfaces (CUMMING) 4. Pasteur's principle of relationship between molecular and physical asymmetry (JAEGER) 8.

3. RADIOACTIVITY.

WILLIAM H. ROSS.

Measurement of dielectric losses with the cathode ray tube. H. W. FISHER, et al. *Proc. Am. Inst. Elec. Eng.* 35, 21-34 (1916).—Discussion of Minton's paper (cf. *C. A.* 9, 2735).

C. G. F.

The existence of a polonium-hydrogen compound. ROBERT W. LAWSON. Radium Inst., Vienna. *Monatsh.* 36, 845-52 (1915).—During a detn. of the ionization over the range of α -rays from Po in H abnormally rapid increases in the ionization were noted when no solid window intervened between the Po and the ionization chamber. This was not due to a volatility of the Po itself nor to a transfer of a part of the Po along with the recoil atoms of Ra G. It is best explained by the assumption that a hydride,

similar to H_2S and H_2Se , is formed, which diffuses into the ionization chamber. The compd. is immediately destroyed by small amts. of air, probably through the activating action of the α -rays. Such a hydride would explain the observation of Hévesy and Paneth (*C. A.* 8, 13) that Pt and Pd have a very high sp. absorptive power for Po.

G. L. WENDT.

The new element brevium and attempts to discover its isotopes. O. H. GÖHRING. *Dissertation*, Techn. Hochschule, Karlsruhe, 1914; *Neues Jahrb. Min. Geol.* 1915, II, Ref. 15.—A review of previous work by Fajans and Göhring (cf. *C. A.* 7, 3916; 8, 297). The newly discovered element known heretofore as $U X_2$ has received the name *brevium*. Attempts to discover the mother substance of Act in pitchblende showed that it is very doubtful whether Act is formed by an α -ray transformation.

E. A. TSCHUDY.

Radiography of crystals. F. STRÖBER. *Bull. soc. franc. min.* 37, 76-97(1914).—A general discussion of recent work on this subject, with suggestions as to possible new interpretations of certain phenomena, especially secondary rays. The results obtained with amorphous substances may be interpreted as due to inclusions of minute crystals, and it is pointed out that there is a wide field for study of substances whose character is intermediate between cryst. and amorphous.

E. T. WHERRY.

The Röntgenograms of carborundum crystals (HAUER) 8.

4. ELECTROCHEMISTRY.

COLIN G. FINK.

Recent advances in theoretical electrochemistry. ANON. *Elektrochem. Z.* 22, 213-8(1916).—A review of recent literature.

W. E. RUDER.

Electricity. Fundamental units. F. E. SMITH. London. *National Phys. Lab.* 1914-5, 40-4.—Abs. measurements of resistance showed with the Lorenz app. one international ohm = 1.00052 ohm (10^6 C. G. S. units) and no change from the test of the previous year. With hermetic seal, coils showed a change of less than one part in 100,000 except in a 10,000 ohm coil. Without the seal the changes are greater. In the Weston cell, hydrolysis of Hg_2SO_4 caused presence of complex ions. Acidity detns. are difficult. Tests on solubilities, conductivities, etc., of Hg_2SO_4 and $CdSO_4$ with and without acid were tried. Results show a decrease in e. m. f. if the depolarizer is partially hydrolyzed, the rate depending upon the extent of the hydrolysis in the layer of salt next to the Hg surface. The formation of complex ions leads to an increase in e. m. f., but the Hg ion concn. diminishes rapidly near the surface of the Hg. Compass and optical glass tests were satisfactory.

W. H. BOYNTON.

Power situation at Niagara Falls. F. A. LIDBURY, et al. *Mel. Chem. Eng.* 14, 239-41; *Elec. World* 67, 471-2(1916).—Report of a meeting of electrochemists and engineers at Niagara Falls. The shortage of power is seriously hampering the electrochem. industries and through them the industries of the country at large. The urgent need of immediate government support and legislation to relieve the situation was emphasized. A shortage in the supply of Niagara ferro-silicon, ferro alloys, Al, artificial abrasives, etc., would embarrass the industries throughout the U. S. The very important N-fixation works of the American Cyanamid Co. had to be located in Canada for lack of sufficient cheap power in the U. S.

C. G. F.

New war products. ALBERT H. HOOKER. *Trans. Am. Electrochem. Soc.* 29 (advance copy); *Mel. Chem. Eng.* 14, 261-2(1916); *J. Ind. Eng. Chem.* 8, 288(1916).—The number and importance of the electrochem. products made at Niagara Falls

were discussed, and a plan proposed for future development there. The present diversion of water from the falls produces some 50,000 horse power, and water to produce well over 1,000,000 h. p. more could be diverted without injury to the scenic value of the falls. For every 100,000 h. p. diverted, the government should provide that 10,000 h. p. be devoted to the fixation of atm. N. The development of electrochem. industries is an important feature of Germany's efficiency, and in this country, stimulation and organization of chem. manufacturing, and the ability to make new war products, must be the basis of any adequate military preparedness.

SHERMAN EASTMAN.

Thermal efficiency of the electric furnace. W. MCA. JOHNSON. *Proc. Eng. Soc. West. Penn.* 31, 488-98(1915).—Thermal efficiency may be detd. by obtaining the radiation and cond. losses either by direct means or by calcn. from available data, by calcg. the net heat required of the charge, or by detg. the power required to keep the furnace at its working temp. when running on dry slag. In order to increase the efficiency, the smelting rate and the size of the furnace may be increased and its shape made to approach a sphere or cube; in such a case its walls should be made thicker and the outside painted with Al.

W. E. RUDER.

A simple carbon-helix resistance furnace and a photographic temperature recording apparatus. ERNST JANECKE. *Z. Elektrochem.* 21, 439-43(1915).—The furnace consists of a C helix (cf. Arsem furnace) placed vertically in a concentric clay cylinder, the space between the helix and the cylinder being filled with powdered MgO. At the upper and lower end, the C helix is fitted tightly into water-cooled Fe plates to which the terminals of a 110 v. line are connected. The material to be heated is placed in a MgO crucible which sits upon a MgO support. When in operation an atmosphere of H₂ or N₂ is maintained in the furnace. As much as 2 kg. can be melted at a time and a temp. of 1800° is practicable. The temp. recording device consists of a reflecting galvanometer in series with a thermocouple and set up in a dark room in such a way that its mirror reflects a spot of light upon a sheet of photographic paper which is passed before a slit at a const. rate by a motor-driven drum. Cuts and photos are shown.

F. A. STRAUSS.

The electric furnace as a soaking pit in the steel mill. T. F. BAILY. *Iron Age* 97, 311(1916).—Statistics show a current consumption of 60 kw.-hr. per ton absorbed by the metal and 40 kw.-hr. per ton wall loss for hot ingots. Elec. soaking pits can compete with gas-fired pits, and have a non-oxidizing atm. which saves 1-2% of the wt. of the ingot. They occupy 1/3 the space of gas-fired pits of the same capacity, and eliminate ingot surface defects due to scale or oxidation.

W. H. BOYNTON.

The electric furnace in the foundry. R. C. GOSROW. *Met. Chem. Eng.* 13, 882-3(1915).—G. discusses the various points of superiority generally ascribed to the elec. furnace.

W. E. RUDER.

The electric furnace in the foundry. N. PETINOT. *Met. Chem. Eng.* 13, 650 (1915); cf. *C. A.* 9, 2189.—Discussion of W. G. Kranz's paper on this subject. P. does not believe that the elec. furnace so completely reduces Fe that Al, W, Ti added will not disappear but will alloy with the Fe. He always found Al present when added as a deoxidizer but always in the form of Al₂O₃. The great advantage of the elec. furnace as a deoxidizer is doubted if it is still necessary to deoxidize in the ladle.

W. E. R.

Large electric furnace for pig iron. HELFENSTEIN-ENGELHARDT. *Monat. Rundsch.* 7, 110(1915); *Chem. Zeit.* 39(1915); *J. Soc. Chem. Ind.* 34, 1011(1915).—The first furnace of this kind had a capacity of 10,000-12,000 h. p. and was erected in Domnarfvet. It is rectangular in cross-section, and has a permanent cover with holes for the escape of gases and for charging. The av. output was 65 tons per 24 hrs. It consumed 2000 kw.-hr., 300-400 kg. of charcoal and 70 kg. of electrode material

per ton of pig Fe. Up to 70% of unbriquetted fine ore may be used. Costs are said to be lower than for other types of furnaces.

The fixation of atmospheric nitrogen. R. G. SKERRETT (1916).—A general descriptive article. The agricultural and industrial uses of N are stated. The Birkeland-Eyde plants in Norway and the Caro plants in Germany and the Canadian plant of the American Cyanamid Co. are described briefly. The ultimate product of the Scandinavian process is less expensive than that of the German cyanamide process, in which lignite is used. The latter can be converted into urea, which the U. S. imports for making creatine and HNO_3 can also be made from cyanamide. The American Cyanamid Co., which uses the arc process, but its commercial success depends on the high price of HNO_3 .

Liquid chlorine. G. ORNSTEIN. *Met. Chem. Eng.* 14, 21 (1916). Processes for producing Cl_2 are described, together with the methods of storing and handling liquid Cl_2 . The history, advantages and uses of Cl_2 , especially bleaching and H_2O sterilization, where it has proved to be superior to other methods.

Recent progress in electrolysis of alkali chlorides in fused alkali compounds for preparation of metals. R. SACCHINI. *chim. applicata* 4, 346-58 (1915).—A review.

Electrolytic zinc at Bully Hill. C. A. HANSEN. *Met. Ind.* (1916).—The $Zn(OH)_2$ process was developed to a point where it is possible to produce 10-20 tons of Zn per day at Bully Hill. The process, not applicable to use in the Montana, Idaho and Utah district, with regeneration of acid, was adapted to successful commercial use so that a complete 200 ton per day electrochem. plant including overhead would cost about \$2,500,000 as compared with \$4,000,000 for an equiv. retort plant. Furthermore, Butte-Superior concentrates carry a power rate of \$25.00-\$30.00 per h. p. yr. A table of costs for the process in Oklahoma and electrochem. process at Butte, Mo. N. Y. cost of \$49.00 for the former and \$41.42 for the latter. Pb and Cu residues of \$7.20 against \$22.70 for the latter. Pb and Cu are shown.

Multiple series electrolytic copper refining. P. L. GUNN. *Met. Ind.* 9-10 (1916).—A comparison of the advantages and disadvantages of the multiple series electrolytic copper refining process.

The structure of copper deposits from technical processes. W. WIMPELMANN. *Z. anorg. allgem. Chem.* 93, 287-310 (1916). Deposits from various sources and of various thicknesses were examined under a microscope. The crystals always grow at right angles to the surface. If of curved surfaces or corners they intersect each other. Low c. d. gives a coarse structure which is, however, less regular in the latter. Increases with increased c. d. and at 0.15-0.2 amp./sq. cm. f. s. With a rotating tube cathode, very small crystals are formed. By the polishing device used in the process. High c. d. and electrolyte increased the hardness to abrasion of the cathode side. The greatest hardness was obtained in the finely cryst. sample.

Progress in electroplating. C. H. PROCTOR. *Metal. Ind.* (1916).—The processes for bronze or brass plating and electro-cleaning are carried out in solutions containing H_2O 4550 cc., soda ash 170 g., commercial $NaOH$ 17 g.

Al silicate 7.05 g., NaCN 28.35 g., and CuCN 28.35 g., worked at a temp. of 180°, voltage 4-6, amp. 25 per sq. ft. gives good results. The soln. is prepd. in an Fe tank. Anodes of respective metals are connected with the tank. The salts are added in the order named and partial replacement of CuCN by Zn(CN)₂ causes brass deposition. Metal deposits rapidly, but requires high amperage. W. H. BOYNTON.

Electroplating engineering (drying and driers). C. B. WILLMORE. *Metal. Ind.* 14, 8-10(1916).—The first of a series of articles deals with drying and driers (4 types illustrated). The spontaneous drying process consists of dipping the work into hot H₂O, swinging around and allowing to stand in the air. A steam table with hot box-wood or maple sawdust is better for work not simple in design. A rapid current of hot air on the work in a wire basket is effective except when the work contains pockets or surfaces not readily reached by the air blast. W. H. BOYNTON.

Removing iron scale by pickling; theory and practice. CARL HERING. *Met. Chem. Eng.* 13, 785-6(1916).—The advantage of the electrolytic process, in which the metal is made the cathode in dil. H₂SO₄, over simple dipping in the acid is pointed out, there being much less metal wasted. W. T. HALL.

Zinc-coating heating coils. ANON. *Elektrochem. Z.* 22, 203-4(1916).—A short discussion of the comparative value of the electrolytic and dipping processes. W. E. RUDER.

Selenium cells. W. R. COOPER. *Electrician* 76, 676-8(1916).—A general account of the properties of the different modifications of Se, the effects of light, etc. Also a review of the various theories advanced, details of cell construction, important applications, etc. C. G. F.

Potential differences at liquid contact surfaces. The effect of the size of the boundary between liquid surfaces upon the electromotive force. A. C. CUMMING AND E. GILCHRIST. *Elektrochem. Z.* 21, 290-4; 22, 9-13(1915).—Cell combinations of the type (a) Hg | HgCl | 0.1 N KCl | 5 N HCl | 0.1 N KCl | HgCl | Hg (b) in which the Hg contact surfaces *a* and *b* were dissimilar, were investigated. When one contact surface was compact and the other broken up, no appreciable p. d. between the 2 ends of the cell combination was observed. According to values calcd. from the equations of Henderson and of Planck, however, a p. d. should exist. The discrepancy may be due to insufficient difference in the sharpness of the contact surfaces, or to inaccuracies in the equations. When the 2 contact surfaces were fixed and defined in tubes of different diams., a p. d. was observed which usually increased with the time of contact. This effect was most pronounced when one surface was fixed in a capillary and the other in a tube of considerable width. The authors conclude that in order to obtain accurate measurements, it is necessary to produce a fresh contact surface shortly before making the measurement. Capillary tubes should be avoided, and it is advisable to mix the liquids mechanically at the contact surface shortly before measuring. Some measurements are given with cells of the type N KCl | N HCl or N NaOH | N KCl in which a membrane is interposed at one contact surface. Parchment, hardened filter paper, "cargil" membrane, gold-beaters' skin, collodion on silk and fine silk were tried. All except the latter gave appreciable p. ds., the e. m. f. changing sign when NaOH soln. was substituted for HCl. F. A. STRAUSS.

A new dry storage battery. ANON. *Elec. Rev. West. Elec.* 68, 169(1916).—A description of a Pb cell, about the size of a standard No. 6 dry cell, which may be recharged indefinitely. The outer case of turnplate steel is lined with acid-proof material, insuring great durability and rigidity, combined with light wt. The electrolyte is packed in around and between the cylindrical plates to form a compact, solid mass. A mineral condenser at the top of the cell checks escape of moisture by automatically condensing

and returning it to the battery. Cylindrical Pb plate construction allows tight packing and eliminates danger of short circuit or distortion. The battery has a capacity of 30 amp. hrs. at a discharge rate of 2.5 amp. for nearly 12 hrs. The charging rate is 3.5 amp. for about 8 hrs. It is immune to "sicknesses" to which the liquid Pb batteries are prone. No further details are given.

W. H. BOYNTON.

The reduction of lead sulfate. G. A. PERLEY AND C. W. DAVIS. *J. Phys. Chem.* 20, 151-63(1916); cf. *C. A.* 6, 714, 1259.—A study of the reduction of PbSO_4 in contact with Pb and NaOH soln. Pure Pb exposed to 3 *N* NaOH soln. in a closed vessel was found to dissolve very slowly even when warmed. Cold dil. NaOH soln. reacted with PbSO_4 to form yellowish green crystals, but no reduction to metallic Pb took place. Pb strips with grooves filled with PbSO_4 paste were immersed in 3 *N* NaOH soln. The PbSO_4 first turned yellowish green and then a black ppt. was formed, starting first where the PbSO_4 was in direct contact with the Pb. All the PbSO_4 was finally replaced by a deposit of finely divided Pb. During this reaction the Pb strip became corroded, and weighings showed that the process resulted in a net loss of Pb. To det. whether reduction was caused by the establishment of a concn. cell, a series of measurements was made with a salt bridge cell, varying the electrodes and the electrolyte. It was found that the rapid formation of fine Pb crystals is due to a concn. cell consisting in principle of $\text{Pb} | \text{NaOH} | \text{Na}_2\text{SO}_4, \text{PbSO}_4 | \text{Pb}$. The NaOH dissolves the PbSO_4 and the denser soln. thus formed flows to the bottom of the container while fresh soln. flows in from above to replace it, thus causing concn. changes. It seems necessary to assume that the conversion of Pb^{2+} ions into PbO_2^{--} ions takes time, and that the amt. of PbSO_4 dissolved as such is greater than it should be until equil. is reached. The formation of Pb crystals on the lower edge of the plate is due to another concn. cell: Pb dil. $\text{Na}_2\text{PbO}_2 | \text{concd. Na}_2\text{PbO}_2 | \text{Pb}$.

F. A. STRAUSS.

The regeneration of sulfated storage cells. G. A. PERLEY AND C. W. DAVIS. New Hampshire Coll. *J. Phys. Chem.* 20, 164-7(1916); cf. preceding abstract.—Badly sulfated storage battery grids were immersed in normal solns. of various Na salts and a charging current passed through at a c. d. of 6.5 amp. per sq. ft. Reduction of the sulfate deposit at the cathode was accomplished only by the use of solns. of NaOH, Na_2SO_4 , Na_2CO_3 , Na_2HPO_4 and Na_2SO_3 . Far better reduction occurred when 2 dummy positive grids were employed outside the negative plates in addition to the usual + plates. The rate of reduction was greatest and corrosion least with Na_2SO_3 soln. The use of NaOH caused deposition of much PbO , considerable corrosion and removal of the active material of the grids. Na_2CO_3 soln. caused the formation of difficultly reducible basic Pb salts at the cathode. Na_2HPO_4 soln. caused corrosion and the deposition of basic salts at the anode. The use of Na_2SO_3 soln. caused a hard cryst. metallic deposit at the cathode which produced buckling of the grids.

F. A. STRAUSS.

Standby battery for a. c. distribution service. J. LESTER. Woodbridge. *Elec. World* 67, 257-60(1916).—An illustrated paper describing the use of a storage battery in a substation to protect against interruptions in service. The app. was arranged so that in case of trouble the battery would take up the local a. c. load without interruption, but would not feed into the entire high tension distribution system through the 13,800-volt feeders and tie lines. An Exide battery of 344 cells, with a capacity of 2250 amp. for 1 hr., or 4650 amp. for 20 min. was connected to the railway bus bar between the terminals of the motor generator sets and the outgoing railway feeders, and a reverse current relay installed in the d. c. circuit between the battery and the motor generator sets. Trouble on the high tension circuits would reverse the current between the battery and the generators, and the relay would trip the 2 oil switches, opening up the connection between the high tension feeders and the local distribution circuits, leaving

the battery connected to the latter through the motor generator sets. In order to maintain a const. voltage during emergency discharge, the battery was provided with motor operated end-cell switches, automatically controlled by a contact voltmeter across the battery terminals.

SHERMAN EASTMAN.

Battery charging equipment. T. H. SCHORFF AND A. M. CANDY. *Elec. J.* 13, 28-36(1916).—A discussion of the general requirements and characteristics of battery charging equipment. Photographs and descriptions of a number of commercial installations are given.

F. A. STRAUSS.

The mercury-arc rectifier for charging electric vehicle batteries. Q. A. BRACKETT. *Elec. J.* 13, 37-40(1916).—A description of an outfit designed especially for this purpose.

F. A. STRAUSS.

Battery-room floors impervious to acid. ANON. *Elec. World* 67, 433(1916).—Description of the floors of the N. Y. Edison Co.'s battery room. These are laid on ordinary concrete floors reinforced by steel girders. Over this is a 1:2:4 mix of concrete with a cement mortar finish. The surface is then painted with "Hydrex" compound and covered with 3 layers of butt-jointed acid-proof felt, the strips being run with the flow line of the room. Joints are bonded with hot "Hydrex" compound. Additional layers of felt and this compound are used around the corners and under the drain box. On top of this is another layer of concrete, felt, etc., and the whole covered with $2\frac{1}{4} \times 4 \times 8$ in. vitrified brick, the spaces between which are filled with $\frac{1}{4}$ in. hot "Hydrex" compound. The floors are graded to a gutter which empties into a lime box. When passing over steel girders a layer of neat cement and sheet Pb (4 lb. per sq. ft.) is added.

W. E. RUDER.

Electrolysis on underground pipe systems. A. F. GANZ. *Gas World* 64, 54-6 (1916); cf. *C. A.* 10, 428.—Extracts from a lecture.

F. W. SMITHER.

Consumption of carbon in the electric arc. I. Variation with current and arc length. II. Influence upon the luminous radiation from the arc. W. G. DUFFIELD. *Proc. Roy. Soc. London (A)* 92, 122-43(1915).—When the arc is extremely short the loss from the cathode of one C atom is accompanied by a transfer between the poles of the equiv. of 4 electronic charges. The loss per coulomb for a given c. d. increases with increasing arc length until a nearly const. value is reached at about 8 mm. The anode loss per coulomb is gradual at first and increases more rapidly as the poles are further sepd.; the cathode slope is very steep at the outset and shows no point of inflection. The ratio between anode and cathode losses for 2, 4, and 6 amps. was 1.36, 1.40 and 1.64, resp. For short arcs the loss per coulomb was about 3×10^{-8} g., which is very close to the electrochem. equiv. of C, namely 3.11×10^{-8} if C is assumed to be quadrivalent. Even with 100-amp. arcs this equiv. was closely followed. There follows a discussion of the theory of arcs and the mechanism of emission.

E. B. MILLARD.

The electric arc in vapors and gases at reduced pressures. W. A. DARRAH. Ohio. *Trans. Am. Electrochem. Soc.* 29 (advance copy); *Met. Chem. Eng.* 13, 915-8 (1915).—The object of this research was to find an arc lamp in which the supply of the material for the arc did not come from the electrodes but from a surrounding gas or vapor: an arc lamp which would not require trimming or materially more attention than the present incandescent W or C lamp. After a number of trials an arc lamp was constructed having 2 W electrodes enclosed in a heat-resistant glass bulb (Corning, G. 702 P). Into this hermetically sealed bulb various volatile halogen compounds were in turn introduced and the characteristics of the arcs investigated. Among the compounds tried out were: CCl_4 , SnCl_4 , TiCl_4 , SbCl_3 , SiCl_4 , PCl_3 and AlCl_3 . Particularly good luminous effects were obtained with TiCl_4 and TiCl_3Br_2 . Efficiencies as good as 0.25 watt per candle were obtained. Fortunately, since the chloride and bromochloride

of Ti dissociated at a higher temp. than WCl_4 , these vapors will not attack the W electrodes while the arc is playing. Numerous curves and photos are shown. C. G. F.

The history of the arc lamp. F. CONRAD AND W. A. DARRAH. *Elec. J.* 13, 103-8, 140-4(1916).—In these instalments the authors consider the enclosed arcs, Ti arcs, Hg vapor and C flame arcs. Profusely illustrated. C. G. F.

The manufacture of drawn tungsten wire. ANON. *Electrician* 76, 633-4(1916); see C. A. 10, 18. C. G. F.

Recent developments in electric incandescent lamps in relation to illuminating engineering. J. T. MORRIS. E. London College. S. R. MULLARD AND F. W. WILLCOX. *Illuminating Engineer* 9, 6-26(1916).—A symposium on the advances of elec. lighting in recent years. Particular emphasis is put on the new W arc lamp. Many tables and cuts are shown. C. G. F.

Operation of low voltage apparatus from high voltage circuits. F. SCHRÖTER. *Elektrotechn. Z.* 51, 677-9(1915); *Elec. World* 67, 441(1916).—Further applications of the Geissler tube having a Na or K amalgam cathode and an Fe anode with an atm. of mixed Ne and He (cf. C. A. 9, 2035). When an a. c. of a few milliamps. passes, the tube has a drop of 190 v. The tube may be used to operate a relay or in connection with a storage battery. The "double-battery system" for signals, etc., is also described. Various connections are shown in diagram. W. E. RUDER.

Artificial insulating materials. ANON. *Electrician* 76, 627-9, 670-81(1916).—The ideal electrical insulating material must mould readily besides having the desired electrical properties. There are 4 classes: (1) Good insulators at ordinary temperatures but not at higher temp. (2) Insulators with high dielectric strength which will not soften up to a temp. of 80°. (3) Insulators that are fireproof. (4) Insulators that will withstand very high temperatures. Of all materials tested to date mica shows the highest dielec. const. Bakelite exceeds mica in mechanical strength. A detailed, illustrated account is given of the important compounds and products on the English market today. C. G. F.

Recent progress in electrical smoke precipitation. F. G. COTTRELL. *Eng. Mining J.* 101, 385-92(1916); cf. C. A. 9, 1272.—A bibliography is given with this illustrated historical review. E. J. C.

Electrochemical synthesis of phenylhydroxylamine. F. M. FREDERIKSEN. *Trans. Am. Electrochem. Soc.* 28, 345-50(1916); see C. A. 10, 331. SHERMAN EASTMAN.

Silver plate for glass and porcelain (J. P.) 19. The Schoop electric oven (KORDA) 1. Switch and transformer oils (DIGBY) 22. Ignition of explosive gas mixtures by electric sparks (MORGAN) 24.

Storage battery. B. FORD. U. S., 1,169,788, Feb. 1. Structural features.

Electrodes for accumulators. A. CONNELL and H. S. HORNE. *Brit.*, 20,671, Oct. 7, 1914. A grid, preferably cylindrical, has rectangular apertures formed by vertical bars having grooves at the sides, and horizontal bars having holes to retain the paste. Such a grid can be cast in one piece.

Depolarizer for batteries of the Leclanché type. C. ELLIS. U. S., 1,169,943, Feb. 1. A depolarizer is formed of non-colloidal MnO_2 cemented to particles of graphite by 10% of a binder of colloidal MnO_2 . The depolarizer is a firm mass not readily broken and is especially suitable for use in small flash-light batteries.

Galvanic cell. M. L. KAPLAN. U. S., 1,170,819, Feb. 8. Depolarizers for Leclanché batteries are formed of particles of graphite bonded together with slightly

porous MnO_2 produced by heating graphite with Mn nitrate to 170° . Cf. C. A. 10, 563.

Porous copper electrodes for primary or secondary batteries. F. S. B. DE MELLO. U. S., reissue 14,051, Jan. 25. Cf. original pat. 1,148,152, C. A. 9, 2488.

Dry battery. W. HOPPIE. U. S., 1,169,258, Jan. 25. Positive electrodes of dry cell batteries are coated with a mixt. of glucose and flour to prevent deterioration of the cell before being put into active use.

Burning carbon electrodes. F. NAGELSCHMITZ. U. S., 1,170,313, Feb. 1. Electrodes formed of coke or anthracite with a binder of tar are packed in raw electrode material and gradually heated with a final temp. sufficiently high to drive out gases and volatilize the volatilizable portion of the tar. The gases and volatile substances driven off are collected and burned to heat the furnace.

Arc-light electrode. G. EGLY. U. S., 1,169,942, Feb. 1. A mixt. formed of Ce peroxide 3, CaO 1 and CaF_2 1 part is used as illuminating ingredient of arc-light electrodes. La or Di peroxide and BaO or SrO also may be used.

Anticathode for Röntgen-ray tubes. M. GUNDELACH. U. S., 1,170,247, Feb. 1. Metallic U is used alone or with other metals to form anti-cathodes, which produce rays of unusually great penetrating power especially suited for the treatment of carcinomata.

Volatilizing metals from ores. O. C. RUDOLPH. U. S., 1,171,255, Feb. 8. Complex ores containing volatilizable metals such as Zn, Pb and Ag combined with S are fused electrically without reduction and at the same time part of the constituents are volatilized. Air is then blown through the fused charge to volatilize additional metal. The volatilized Zn is dissolved in SO_2 soln. and the Pb is pptd. and recovered by filter-pressing. The Zn is recovered electrolytically.

Tungsten filaments. R. H. HENDERSON. U. S., 1,169,819, Feb. 1. W filaments are drawn through dies or otherwise mechanically reduced to the desired size while highly heated.

Apparatus and method for electrically ozonizing air. W. T. HOOFNAGEL. U. S., 1,169,825, Feb. 1.

Gas reactions in electric furnaces. A. HELFENSTEIN. U. S., 1,169,817, Feb. 1. N is blown into a molten quartz bath in an elec. furnace and passes into a bed of granular C overlying the molten quartz, forming Si_3N_4 . CCl_4 is made by introducing C, S and Cl into an elec. heated mixt. of C and S vapor above a bath of molten inert silicate slag. HCN is made by introducing equal vols. of C_2H_2 and N through a vertical electrode into a bath of slag carrying an overlying layer of animal charcoal.

Treating gases in the electric furnace. K. GRUHN. Ger., 285,665, June 19, 1913. The furnace is designed for the treatment of gases which deposit C. A mechanism is provided for the rotation of the electrodes, and for longitudinal adjustment.

Electric printing process. W. SCHUNIG and F. WINKLER. Ger., 286,124, Jan. 20, 1914. The design is applied, elec. conductive, to the form, on an insulated base. Between the printing form and the counter cylinder or plate, together with the paper to be printed, a color sheet is run, and upon it is a substance which develops a color upon the passage of the current, and this colored product is transferred to the mordanted paper. The paper may be coated with $\text{Al}(\text{OH})_3$ or an Al salt, which combines with the dye substance formed by the elec. current, as a lake.

Electrolysis of alkali halides. J. F. WEBB and W. W. WILLIAMS. Brit., 20,714, Oct. 8, 1914. In app. for the production of bleaching-liquor from a soln. of NaCl

or MgCl_2 , an anode having a substantially vertical active surface is provided with non-conducting deflectors which transmit the Cl to the back of the anode and distribute it through the liquid so as to cause circulation thereof. The deflectors, which may be of glass, traverse inclined slots in the anode and project slightly from its face and to varying distances from its back. Similar deflectors may be fitted in the cathode but do not project backwards, so that the H is confined to a definite path. The electrodes may be built up from bars of compressed artificial graphite, the upper faces of which are recessed to form slots. In the case of the cathode, these recesses are alternately near the ends and middle of the bars to give larger contact areas between the bars. The electrode bars are clamped at their ends against slate, porcelain, or like separators by vertical conductor bars of C , graphite, or the like, provided with terminals. Each anode conductor bar rests against a vertical flange on an end plate, and each cathode conductor bar is forced inwards by a wedge supported by an inclined flange on the end plate. Above the anode is a vertical insulating partition clamped between the same parts as the anode. The electrode elements may be compressed vertically by screws working in lugs on the end plates and engaging porcelain or slate blocks on said insulating partition. A bottom plate and tie-bars at the top connect the 2 end plates, which may be of slate or porcelain. As the anode is liable to disintegrate, the anode gas deflectors are partly supported by grooves in the anode conductor bar. Behind the cathode, and held between the wedges and inclined flanges, is a partition perforated so as to allow equalization of temp. while confining the H . The cathode may be of Pb instead of being formed by graphite bars. An anode may be arranged on each side of the cathode, which then has deflectors inclined alternately in opposite directions, so that the gas repeatedly passes from each side to the other. Six sets of 3 electrodes may be placed tangentially and symmetrically around an axis. Cylindrical electrodes may also be used. A cooling coil may be provided.

Electrolytic production of alkalis and chlorine. HORSCH & Co. Ger., 286,011, Mar. 30, 1913. The app. comprizes a horizontal or practically horizontal Hg cathode. Chloride solns. are employed. Cf. C. A. 9, 1281.

Electric endosmosis. GES. FÜR ELEKTRO-OSMOSE. Brit., 21,189, Oct. 19, 1914. Diaphragms capable of use in the sepn. or purification of colloids have their potential altered as required, either before or during use, by adsorption of substances or removal of previously adsorbed substances. Electro-osmotic methods may be employed for effecting adsorption or removal. The positive potential of a leather diaphragm may be increased by adsorption of Cr_2O_3 . Organic dyestuffs of positive or negative character may be adsorbed by diaphragms of vegetable, animal or inorganic origin. A negative diaphragm of viscose may, e. g., be changed towards positive potential for methylene blue. Removal of silicic acid from a clay diaphragm by boiling with NaOH soln. renders the diaphragm indifferent instead of electro-negative. In the treatment of glue soln. by elec. endosmosis between diaphragms, of which the 1 near the cathode is of viscose, Al_2O_3 added to the soln. is adsorbed by the viscose with consequent change of potential towards electro-positive. Migration of electro-positive substances towards the cathode is thus hindered. During the process, the soln. becomes acid, the Al_2O_3 is dissolved, and basic substances then migrate towards the cathode. Cf. C. A. 9, 2840.

Carbides of tungsten or molybdenum. VOIGTLÄNDER & LOHMANN METALL-FABRIKATIONS-GES. M. B. H. Ger., 286,184, Apr. 14, 1914. Because of their hardness, 9.8 on Mohr's scale, the carbides of W and Mo are technically valuable. Heretofore the production of these carbides has been difficult and costly since the elec. energy required in the elec. arc to produce the necessary temp. was diverted to the graphite crucible, which is a better conductor than W . These carbides are now produced, in as

large quantities as desired, in C-tube resistance furnaces. The formation of the carbides is effected from acid anhydrides or oxides mixed with suitable quantities of pulverized C, in a C crucible in the C-tube resistance furnace whose connections with the source of current are also of C. In this manner several kg. of W or Mo carbide can be fused at one time, and a uniform product of the highest degree of hardness obtained.

5. PHOTOGRAPHY.

LOUIS DERR.

Intensification. W. T. P. CUNNINGHAM. *Phot. J.* 56, 2-8(1916).—The best method for scientific work is to bleach the negative in HgCl_2 , rinse in dil. HCl , wash thoroughly, and redevelop with ferrous oxalate; this method allows repetition of the process. For less exacting work, the Cr intensifier is simple and apparently permanent. The procedure advocated is to bleach in a bath of K_2CrO_7 10 parts, HCl 5 parts, water 480 parts; decreasing the acid concn. to 1 part in 5 parts of K_2CrO_7 and 480 parts water increases the intensification. As soon as bleaching is complete the plate is removed from the bath and washed until stain disappears, then redeveloped with amidol. The process may be repeated.

L. DERR.

Some deductions from Swarzschild's rule. F. F. RENWICK. *Phot. J.* 56, 11-3 (1916).—Papers containing free sol. Ag salts apparently darken according to the law that the product of light-intensity and time of exposure gives a measure of the photographic effect, irrespective of the ratio of the factors; but this does not hold for washed emulsions, for which the equation must be written $I^m t = \text{const.}$, the exponent m averaging about 1.16. For detg. development factor and inertia of plates, it is, therefore, necessary to adopt some standard exposure if different makers are to obtain comparable speed numbers for their plates. An exposure of 10 sec. is suggested.

L. DERR.

Color reproduction by the Lippmann process. REINHOLD ARON. Leipzig. *Z. wiss. Phot.* 15, 65-78, 97-125(1915).—From extended expts. on the plates used in the Lippmann color-photography process, especially in regard to intensity and color of image of various types of source, the following conclusions, among many others, are drawn: The spectral image of the exposure to a homogeneous color is frequently not simply a broadened spectral line but is crossed by dark interference bands which bear a relation to the number of elementary mirrors formed and to the loss of intensity of the light by passage through a single elementary mirror. The wave length of the reproduced color is affected by fixing and humidity. The intensity of the reproduction of a monochromatic radiation at first increases with increasing exposure time, then reaches a max., and finally decreases slowly but continuously. The relation is much more complicated when several colors are superposed.

PAUL D. FOOTE.

Color photography. W. BUCHANAN-TAYLOR, T. F. DAWE, F. WILLMOT and J. F. SHEPHERD. *Brit.*, 20,433, Oct. 1, 1914. In a process, applicable also for cinematography, 2 or 3 negatives are taken through color screens, and black and white positives are printed from them in the usual way. One of the positives, say the positive which is to be the blue positive, is treated with a soln. of $\text{K}_2\text{Cr}_2\text{O}_7$ so as to sensitize the gelatin in the emulsion layer. A print is made from a second positive, and the film dyed with the corresponding dye for the second color, and washed. If 3 negatives and positives are used, the film is again sensitized with $\text{K}_2\text{Cr}_2\text{O}_7$ soln., printed from the 3rd positive, dyed a 3rd corresponding color, and washed. The film may then be treated in a bath containing ferric NH_4 citrate and $\text{K}_3\text{Fe}(\text{CN})_6$ to tone the 1st positive picture blue.

diaminocobaltic hydrogen tartrate, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2[\text{CHOH}]_2\text{CO}_2\text{H}$; the corresponding *meso-tartrate*, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2[\text{CHOH}]_2\text{CO}_2\text{H}$; *glutaric acid-trans-dichlorodiethylenediaminecobaltic hydrogen glutarate*, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2[\text{CH}_2]_3\text{CO}_2\text{H} \cdot [\text{CH}_2]_2(\text{CO}_2\text{H})_2$; *thiodiacetic acid-trans-dibromodiethylenediaminecobaltic hydrogen thiodiacetate*, $[\text{Br}_2\text{Co en}_2]\text{CO}_2\text{CH}_2\text{SCH}_2\text{CO}_2\text{H} \cdot \text{S}(\text{CH}_2\text{CO}_2\text{H})_2$, (from the dibromo-bromide and thiodiacetic acid); *sulfonyldiacetic acid-trans-dichlorodiethylenediaminecobaltic hydrogen sulfonyldiacetate*, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2\text{CH}_2\text{SO}_2\text{CH}_2\text{CO}_2\text{H} \cdot \text{SO}_2(\text{CH}_2\text{CO}_2\text{H})_2 \cdot 2\text{H}_2\text{O}$; *thiodilactylic acid-trans-di-chlorodiethylenediaminecobaltic chloride*, $[\text{Cl}_2\text{Co en}_2]\text{Cl} \cdot \text{S}(\text{CHMeCO}_2\text{H})_2$; *trans-dichlorodiethylene-diaminecobaltic hydrogen adipate*, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2[\text{CH}_2]_4\text{CO}_2\text{H}$ (with the *cis*-dichloro-chloride, the normal *cis*-salt, $[\text{Cl}_2\text{Co en}_2][\text{CO}_2]_2[\text{CH}_2]_4$ was obtained); *trans-dichlorodiethylenediaminecobaltic hydrogen dihydriacetate*, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2\text{CH}_2\text{S}_2\text{CH}_2\text{CO}_2\text{H} \cdot \text{H}_2\text{O}$; *trans-dichlorodiethylenediaminecobaltic hydrogen dihydriacetylacate*, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2\text{CHMeS}_2\text{CHMeCO}_2\text{H} \cdot \text{H}_2\text{O}$; *maleic acid-trans-dichlorodiethylenediaminecobaltic hydrogen maleate*, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2\text{CH}:\text{CHCO}_2\text{H} \cdot \text{CO}_2\text{HCH}:\text{CHCO}_2\text{H}$; *trans-dichlorodiethylenediaminecobaltic hydrogen fumarate*, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2\text{CH}:\text{CHCO}_2\text{H}$; *trans-dichlorodiethylenediaminecobaltic hydrogen citraconate*, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2\text{CMe}:\text{CH} \cdot \text{CO}_2\text{H}$; *trans-dichlorodiethylenediaminecobaltic hydrogen mesaconate*, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2\text{CMe}:\text{CHCO}_2\text{H}$ and *trans-dichlorodiethylenediamine cobaltic hydrogen itaconate*, $[\text{Cl}_2\text{Co en}_2]\text{CO}_2\text{CH}_2\text{C}(:\text{CH}_2)\text{CO}_2\text{H}$. The compds. thus formed are rapidly deposited from soln. as microcryst. ppts. Those derived from the *trans*-chloro-chloride are all green and, as many different shades of green are obtained, it is impossible to distinguish them clearly by color. The aq. solns. of all these compds. are more stable than that of the dichloro-chloride from which they were prepd., but on keeping, they slowly change in color, probably with the formation of chloro-aquo-compds. Owing to this transformation, none of the compds. could be recrystd., but according to the analytical figures they were always pptd. in the pure condition.

L. T. FAIRHALL.

Ethylamino-chromic compounds. HJ. MANDAL. Upsala. *Ber.* 48, 2055-7 (1915).—Sublimed CrCl_3 was treated with anhydrous EtNH_2 at low temp. (snow-salt). The resulting red powder was extd. with alc. or water and the ext. allowed to evap. The red cryst. product was found to be *pentaethylamino-chloro-chromic chloride*, $[\text{Cl}(\text{C}_2\text{H}_5\text{NH}_2)_5\text{Cr}]\text{Cl}_3$. It is readily sol. in water, gives the usual reactions of purpleo-Cr compds. and ppts. with H_2PtCl_6 , HgCl_2 and $\text{K}_2\text{Cr}_2\text{O}_7$, resp. The picrate, dithionate, and phosphomolybdate are also little sol., $\text{K}_4\text{Fe}(\text{CN})_6$, $\text{K}_2\text{Fe}(\text{CN})_6$, H_2SiF_6 , $\text{Na}_4\text{P}_2\text{O}_7$ and $(\text{NH}_4)_2\text{C}_2\text{O}_4$ give no ppts. From the chloride the *bromide*, *iodide* and *hydrogen sulfate* were prepd. Ag_2O gives aquopentaethylamino salts analogous to the roseo-Cr salts. These give an insol. cryst. ferricyanide.

A. R. MIDDLETON.

Antimony pentachloride and iodine. O. RUFF. Danzig. *Ber.* 48, 2068-76 (1915); cf. C. A. 4, 875; MOLES, C. A. 9, 2342.—From analytical data and investigation of temp.-conc. curves, R. concludes that for SbCl_5 solns. with less than 1.5% I, the reaction $\text{SbCl}_5 + \text{I}_2 = \text{SbCl}_3 + 2\text{ICl}$ takes place. With increased amts. of I the reactions $2\text{SbCl}_5 + \text{I}_2 = \text{SbCl}_3 \cdot 2\text{ICl} + \text{SbCl}_3$ and $3\text{SbCl}_5 + 2\text{I}_2 = \text{SbCl}_3 \cdot 3\text{ICl} + 2\text{SbCl}_3 + \text{ICl}$ also take place. Some ICl_3 and SbI_3 are also formed. The existence of the compds. with ICl was well established. Both form blue-black prisms much like I but orange yellow in transmitted light. They are distinguishable from each other only when side by side. Both melt at $62-3^\circ$ and are rapidly decomposed by atm. moisture. Both dissolve easily and completely in water, CCl_4 and CHCl_3 , slightly in SbCl_3 and ICl .

A. R. M.

Action of ultraviolet rays on mercuric chloride solution and on some mercury salts. JEAN POUQUET. *Compt. rend.* 161, 348-51 (1915).—A soln. containing 1 g. HgCl_2 in 20 cc. water, enclosed in quartz, was exposed at 15 cm. to a Hg-arc lamp. HgCl formed at once. The unreduced HgCl_2 found after 10 min. was 0.831 g.; after

10 min., 0.494 g.; 30 min., 0.582 g.; 50 min., 0.552 g.; 70 min., 0.528 g.; 90 min., 0.524 g. Hg is precipitated in H_2O is slowly changed to $HgCl_2$ and Hg, the reaction becoming more rapid with time. Qual. observations are appended on 22 salts of Hg, dry and moist, under the rays. Most are darkened more or less; a few are unaltered.

A. R. M.

Decomposition of potassium cyanate by heat. A. PORTEVIN. *Compt. rend.* 161, 1014-10 (1915).—On heating to $700-900^\circ$ a certain amt. of KCN is produced. At 700° 20.94% KCN was formed in 2 hrs., 28.49% in 4 hrs. At 900° 53.08% and 48.91% were formed in 2 and 4 hrs. resp. A mixt. of KCNO with 50% KCN contained 60.06% KCN after 4 hrs. at 700° ; a mixt. with 75% KCN contained 82.40% KCN in one case and 82.62% in another after 4 hrs. at 900° ; a mixt. with 50% KCN after 4 hrs. at 900° contained 70.26% KCN; a mixt. with 25% KCN after 4 hrs. at 900° contained 59.81% KCN.

A. R. M.

Oxidation of sodium azide by iodine. F. RASCHIG. *Ber.* 48, 2088-92 (1915). cf. Sommers and Brown, *J. A.* 10, 578.—The action of I on NaN_3 when a small crystal of thiosulfate is added is not due to tetrathionic acid. R. here describes some expts. from which he concludes that the catalyzer is probably a substance like $NaIS_2O_3$ which readily gives up I to NaN_3 , the residue NaS_2O_3 again taking up I from soln. If 10 cc. of 0.1 N NaN_3 soln. is quickly added to 20 cc. 0.1 N I soln., and 1 cc. portions are added to 10 cc. NaN_3 soln. at 10 sec. intervals, the first causes vigorous evolution of N_2 gas, which is soon up; the action is less vigorous in each succeeding portion and ceases after 10 min. If 10 cc. each of thiosulfate and I are mixed, allowed to stand a few min. and then 10 cc. more I are added, the mixt. has no action on NaN_3 . Free NaI does not prevent the oxidation; formation of H_2SO_4 by a side reaction destroys NaN_3 . NaN_3 solns. are likewise unaffected by Br in presence of Na acetate. No other N compds. which are unoxidized by NaI . Sulfonic acids, urea, etc., are similarly oxidized upon adding thio-
The addition of a crystal of $Na_2S_2O_3 \cdot 5H_2O$ acts similarly to thiosulfate on NaN_3 .
The formation of $NaIS$. $SnCl_2$, $FeSO_4$ and $HAsO_3$, which can take up NaN_3 as catalyzers toward NaN_3 , nor do acid or neutral sulfitcs.

A. R. M.

Deposition of manganese solutions in presence of the air. VICTOR LENHER. *J. Soc. Chem.* 38, 638-40 (1916).—Solns. contg. 1% $MnCl_2$ were sealed up in tubes of glass spar and a piece of metal, mineral or metallic compd., and the deposition of MnO_2 formed by neutralization and oxidation was observed for a certain time. Pb and Bi accelerate the deposition of MnO_2 , more forming in a shorter time than was formed in several weeks in a tube in which only $MnCl_2$ and $CaCO_3$ were present. Hg, Cu, Zn, Ni, Co, Cd, Ag, Au, HgS , millerite, pyrite, chalcoppyrite and blende were without effect, even after several months. The same acceleration was observed with Pb compds. as with the metal itself; salts of Mn, Sb, and Sn retarded the action, probably on account of their reducing action on MnO_2 . The presence of arsenates, Sb_2O_3 or SnO_2 allows the deposition of MnO_2 as well as if no "catalyzer" at all were present. The acceleration of pptn. of MnO_2 by Pb compds. may account for the presence of MnO_2 in nature, though no Pb is known to be associated with the MnO_2 deposits.

E. B. MILLARD.

Ternary system calcium oxide, aluminium oxide, magnesium oxide. G. A. RANKIN AND H. E. MERWIN. *J. Am. Chem. Soc.* 38, 568-88 (1916); cf. C. A. 3, 2925; 4, 702.—The system is a simple one in which there is no ternary compd. stable in contact with the melt, so that the equil. is between the components and the compds. $3CaO \cdot Al_2O_3$, $3CaO \cdot 3Al_2O_3$, $CaO \cdot Al_2O_3$, $3CaO \cdot 5Al_2O_3$ and $MgO \cdot Al_2O_3$ in ternary solns. The relations found to subsist between the components and the compds. in binary and

ternary systems are shown in concn.-temp. diagrams for CaO-MgO , $\text{MgO-Al}_2\text{O}_3$, spinel- Al_2O_3 , together with a space model of the system. Optical and crystallographic properties of these compds. have been given in previous papers, but a few additional notes are made on $5\text{CaO} \cdot 3\text{Al}_2\text{O}_3$ and $\text{CaO} \cdot \text{Al}_2\text{O}_3$. A new form of Al_2O_3 ($\beta\text{-Al}_2\text{O}_3$) was discovered whose relations to corundum ($\alpha\text{-Al}_2\text{O}_3$), the only other form previously known, could not be definitely established, although it appears that $\beta\text{-Al}_2\text{O}_3$ is monotropic with respect to $\alpha\text{-Al}_2\text{O}_3$. The relations of each of these forms, in the binary system $\text{MgO-Al}_2\text{O}_3$, involved solid soln., the extent of which was detd. E. B. MILLARD.

Oxidation of hydrogen sulfide by ozone in water vapor at 120° . U. BRESCIANI. Pisa. *Ann. chim. applicata* 4, 343-6(1915).—Steam from an Fe boiler was passed through a long tube heated by gas flames, so that its temp. was about 120° , and then into an asbestos-covered Sn worm about 2 m. long. At the inlet to the worm, H_2S and O_3 were admitted by side tubulures, and the vapors issuing from the worm were led into another Sn worm and there condensed. The H_2S had a concn. of about 0.02% in the gaseous mixt., 100 cc. of it being used in a given time together with 1110 cc. of ozonized O (from the decompn. of NH_4 persulfate by HNO_3). The condensed liquid was immediately treated with CdCl_2 , the pptd. CdS sepd., and the liquid concd. to small vol. The excess of CdCl_2 was eliminated by KOH , the filtrate rendered acid with HCl , and BaCl_2 added to ppt. the H_2SO_4 present from the oxidation. In this way it was found that only about 5% of the H_2S used was transformed. S. LEVY.

Further note on black phosphorus. P. W. BRIDGMAN. *J. Am. Chem. Soc.* 38, 609-12(1916); cf. *C. A.* 8, 3160.—There are 2 varieties of "red" P, a bright brick-red variety formed by heating white P to red heat at a pressure of 500 kg. in an atm. of N, and a violet P (probably the same as that of Smits) made by heating white P under pressure in the presence of Na as a catalyzer. White P with a trace of Na was put under 4000 kg. pressure at room temp., and the temp. raised to 200° at const. vol. The rise of pressure during this heating was only 500 kg. The pressure was increased to 13000 kg. for 45 min., but the transition to black P did not occur. On cooling and releasing the pressure the white P was entirely changed to violet P, and a piece of bright red P which had been placed originally at the bottom of the mass was unchanged. The change from white to violet took place during the heating at a temp. below 200° . The d. of violet P is 2.348. A piece of violet P and a piece of red in the presence of I were both placed in the pressure app., and 8000 kg. applied at 20° , then warmed to 200° at const. vol. and the pressure increased to 12500 kg. for 5.5 hours. On cooling and releasing the pressure no black P was found. There was no change whatever in the violet P, but the red piece had changed to the same violet as the other. The violet form is the stable one between 8000 and 12000 kg. at 200° . An attempt to change red P to black by surrounding it with white P and changing the latter to black in the usual way was without result; the red was found unaltered in the midst of a mass of black. E. B. MILLARD.

The preparation of phosphorescent calcium sulfide. P. BRETEAU. *Compt. rend.* 161, 732-3(1915).—According to B., it is not necessary to add Na_2CO_3 and NaCl to the fusion mixt. in prepg. phosphorescent CaS . 100 g. of freshly pptd. CaCO_3 , free from alkali metal carbonate or chloride, are heated with 30 g. of pulverized S in a muffle furnace at red heat for 1 hr. After cooling, the mass is impregnated with $1/10000$ of its wt. of Bi (using an EtOH soln. of the basic nitrate). The resulting product exhibits marked phosphorescence. Mo, W or V may be substituted for Bi. Also in *J. pharm. chim.* 13, 33-7(1916). L. T. F.

Reduction of lead sulfate (PERLEY) 4. The various modifications of carborundum (BAUMHAUER) 8.

7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

The preparation of decinormal solutions. C. M. VAN DER FREN. *Chem. Weekblad* 12, 1021-2 (1915).—When $(\text{CO}_2\text{H})_2$ is used for normal acid solns. it should be crystd. from HCl and then repeatedly recrystd. from H_2O . Acids, bases and AgNO_3 can be standardized by means of NaCl, which is easily obtained chemically pure, and solns. of which are reliable and unchangeable. Commercial AgNO_3 does not suffice for the prepn. of 0.1 N AgNO_3 soln. even when previously melted. The best way is to standardize a AgNO_3 soln. against pure NaCl, as recommended by Fresenius. 0.1 N HCl is standardized after neutralization with CaCO_3 by means of 0.1 N AgNO_3 soln. and can be used for the standardization of 0.1 N base. J. T. FLOHIL.

The determination of the acid or alkali content of solutions of organic colors. J. F. SACHER. *Farben-Ztg.* 21, 323 (1916).—Titration of solns. of org. colors is practically impossible, since the color of the indicator is masked. A neutral aq. soap soln. can be used as indicator, since the addition of acid causes a turbidity due to the liberation of fatty acids. Unsaponifiable oils must be absent, but the presence of a small amt. of glycerol does not interfere. A convenient indicator is prepd. as follows: 1 g. of shellac is dissolved in 100 cc. of 96% EtOH, a small amt. of KOH is added, and the soln. filtered. The perfectly clear filtrate is made exactly neutral, and 1 cc. of this soln. is added to 100 cc. of the color to be tested, which is then titrated with standard acid or alk. E. W. BOUGHTON.

A new method for the volumetric determination of thiosulfate in the presence of sulfide, and remarks on the determination of thiosulfate in the presence of sulfite, bisulfite and sulfide. A. SANDER. Darmstadt. *Chem. Ztg.* 39, 945-7 (1915).—*Thiosulfate and sulfide*: The method, which is rapid and accurate, is based on the reactions: $3\text{HgCl}_2 + 2\text{Na}_2\text{S} = 4\text{NaCl} + \text{HgCl}_2 \cdot 2\text{HgS}$, and $2\text{Na}_2\text{S}_2\text{O}_3 + 3\text{HgCl}_2 + 2\text{H}_2\text{O} = 2\text{Na}_2\text{SO}_4 + 4\text{HCl} + \text{HgCl}_2 \cdot 2\text{HgS}$. First, titrate a measured vol. of the soln. with 0.1 N I. To an equal vol. add an excess of HgCl_2 and swirl a few sec. till the ppt. turns pure white; then add NH_4Cl and titrate the turbid soln. with 0.1 N NaOH and Me orange. Half the NaOH soln. required = the cc. 0.1 N I for the thiosulfate; the difference between this and the cc. I in the 1st titration = cc. 0.1 N I for the sulfide. *Thiosulfate and sulfite*: The method of Bosshard and Grob (*Z. physik. Chem.* 9, 192 (1892)) is used. Titrate a measured vol. with 0.1 N HCl till the sulfite is changed to bisulfite, then add an excess of HgCl_2 and titrate with 0.1 N NaOH, as above. The difference in these titrations is the acid equiv. to the thiosulfate. Or, titrate with 0.1 N I, then to another portion add an excess of HgCl_2 and titrate the acid formed from the thiosulfate. *Bisulfite and sulfite*: Titrate a vol. with 0.1 N I. To an equal vol. add excess HgCl_2 and titrate with 0.1 N NaOH. Twice the cc. NaOH = the cc. 0.1 N I required for the bisulfite. *Thiosulfate, sulfide and sulfite*: These may be accurately detd. in less than 10 min. Allow 10 or 20 cc. of the soln. to flow into a measured vol. of 0.1 N I to which has previously been added, say, 10 cc. 0.1 N HCl. Titrate excess of I with $\text{Na}_2\text{S}_2\text{O}_3$, the difference (A) being the I equiv. to all. Add 2 drops Me orange and titrate with 0.1 N NaOH. The result less the 10 cc. HCl added at first is the cc. I (B) equiv. to the sulfite. To an equal vol. of the sample add excess HgCl_2 , swirl till the ppt. turns white, add NH_4Cl and titrate with 0.1 N NaOH and Me orange (C). Therefore, the cc. 0.1 N I required for the 3 substances are: thiosulfate, $C/2$; sulfite, B; sulfide, $A - (B + C/2)$. Other methods are discussed, comparative results tabulated, and a short bibliography appended. Cf. C. A. 1, 2069; 7, 3584; 8, 1071, 2132; 9, 279, 2042, 2357, 3114. J. H. MOORE.

Analysis of a mixture of alkali sulfides, thiosulfates, and dithionates. J. A. MULLER. *Bull. soc. chim.* 19, 8-9(1916).—Det. S present as sulfate by making the very dil. soln. slightly acid with AcOH and adding BaCl₂, keeping the soln. in an atm. of CO₂; finally weigh as BaSO₄. To det. sulfides and thiosulfates, obtain the titer with I soln. of an aliquot after dilg. with H₂O and acidifying with AcOH; place another aliquot in a small flask, acidify with AcOH, evacuate with H₂O pump for 10 min. with continual shaking to remove H₂S and titrate with I soln. to obtain thiosulfates; thionates do not interfere as the action of I in the cold for such short periods is negligible (*C. A.* 4, 722). **Thionates:** Acidify an aliquot with AcOH and remove H₂S as above, make strongly alk. with KOH, transfer to a Ag crucible, add a little KNO₃, evap. to dryness, cover and heat to dull redness. Take up with H₂O, acidify and det. as BaSO₄ in the usual manner; subtract BaSO₄ corresponding to sulfates and thiosulfates and calc. remainder to dithionate, as alkali sulfide present would reduce thionate compds. (tri- and tetra-) to dithionates. If S seps. during expulsion of H₂S (as with disulfides and polysulfides), it coagulates when the last of the dissolved H₂S is removed, and is filtered off on a small filter, dissolved in KOH + KNO₃, detd. as above, and used in calcg. the compn. of the mixt. An analysis reported of a known mixt. of Na₂S, Na₂S₂, Na₂S₂O₃ and Na₂S₂O₄ shows excellent results. F. W. SMITHER.

Decomposition of tetrathionates in alkaline solution as a source of error in certain iodine titrations. R. M. CHAPIN. *J. Am. Chem. Soc.* 38, 625-6(1916).—Tetrathionates are affected by the presence of NaOH, but not by NaHCO₃, especially in the presence of CO₂. No distinctly alk. substance should be added to an acid soln. before titration. A dil. soln. of Na₂SO₃ is recommended as a substitute for Na₂S₂O₃ (unreliable) as a discharge agent for I under the conditions prevailing in the detn. of As. E. B. MILLARD.

Oxalic acid titratable with methyl orange and iodide-iodate. G. BRUHNS. *Z. anal. Chem.* 55, 23-51(1916).—An exptl. study reported in detail from which B. concludes: (1) Pure crystd. (CO₂H)₂ is an excellent standardizing agent for volumetric analysis; it may be easily tested for impurities and can be kept for years in glass-stoppered bottles without undergoing any decompn. (2) (CO₂H)₂ may be detd. in the presence of alkalies and methyl orange with a sharp end point after the addition of at least an equal amt. of CaCl₂; the results do not vary from the calcd. sufficiently to affect ordinary investigations. The CaCl₂ should not be added until approx. all of the (CO₂H)₂ has been neutralized with alkali; otherwise the CaC₂O₄ carries down significant amts. of the acid. (3) There is a distinct tendency of (CO₂H)₂, even in very dil. solns., to form acid salts with the alkali earths (cf. *Z. anal. Chem.* 45, 575(1906); *Centr. Zuckerind.* 15, (1906); Gröger, *Z. angew. Chem.* 1890, 356). F. W. SMITHER.

The determination of bromine and iodine in the presence of chlorides. L. W. WINKLER. *Z. angew. Chem.* 28, I, 477-80(1915).—To det. Br in the presence of small amts. of Cl only (20 mg. in 100 cc. soln.), add to a 100 cc. soln. of the salt in a 200 cc. flask, a little powdered pumice stone and 25 cc. of a 50% H₂SO₄ soln. Heat to boiling and titrate with 0.05-0.1 N KMnO₄ soln. to a permanent pink. With Cl amounting to 100 mg. in 100 cc. add to 100 cc. of the sample contained in a distg. flask, pumice and acid as before but after each addition of KMnO₄ soln. distil off 2-3 cc. and note the color of the distillate. Absence of a brown tinge indicates the end point. Increase the density of the KMnO₄ soln. used by the addition of 250 g. Na₂SO₄·10H₂O per l. in order to facilitate its mixing with the Br soln. Sulfates and nitrates do not interfere but reducing agents must be absent. Should iodides be present, I will first distil off and condense in the tube leaving the distillate colorless. The appearance of a brown color indicates the end of the I oxidation but if there is doubt shake the distillate with CCl₄. In the case of sea water or mineral waters containing large amts. of Cl add KMnO₄

soln. and distil over the Br into dil. H_2SO_4 ; boil off the excess of SO_2 and det. Br as before. Reduce high iodide contents by adding to 100 cc. of the soln. 5 cc. H_2SO_4 and 5 cc. $\text{FeCl}_3 \cdot 6\text{H}_2\text{O}$ (50 g. per l.) and distg. off 5 cc. Br in the distillate may be detd. iodometrically.

H. L. OLIN.

The chlorate and persulfate methods for determining manganese. H. KINDER. *Stahl u. Eisen* 35, 918-24, 947-53(1915).—Hampe's chlorate method was carefully tested in 8 different labs. with solns. containing known amts. of Mn and with crucible steel, "spiegel" and basic Bessemer steel. With small quantities of Mn excellent results were obtained but with high Mn a correction was necessary for Mn that went into the filtrate on washing the MnO_2 ppt. Such losses, however, were less with dil. K_2SO_4 or KNO_3 soln. (1.5:1000) than by washing with water. Oxalic acid soln. was found a little better than ferrous ammonium sulfate soln. for dissolving the MnO_2 . The results were, as a rule, a little lower than those obtained by the Volhard-Wolff method, the difference being due in part to the fact that the excess KMnO_4 used in the final titration causes high results in the latter method and low results in the former. The influence of Cu, Cr, Ni, Co, Ti, V, W, Mo, As, Pb and Sn was studied. In the case of Cr-steels the method was found unsuitable and ppts. of H_2TiO_3 , H_2SnO_3 or WO_3 cause trouble either by carrying down Mn or by running through the filter and making the final end point uncertain. In the analysis of cast Fe, the results are somewhat low if the graphite is not filtered off, but the effect of the graphite is not so great as in the Volhard method. The chief advantages of the chlorate process over the Volhard method are that larger samples may be used and the titration may be carried out in the flask originally used. The following directions are recommended: Dissolve 1 to 3 g. of Fe or steel in 60 cc. HNO_3 (d. 1.2). After the disappearance of brown fumes add 6 to 8 g. KClO_3 , in tablets or large crystals, and evap. the soln. to about 20 cc. Cool somewhat and filter, without dilg., through asbestos. Wash first with cold water and then with hot water. Transfer the filter and ppt. back to the original flask, add 10 to 20 cc. $\text{H}_2\text{C}_2\text{O}_4$ soln. (25 g. $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$ dissolved in 1000 cc. water and poured into a mixt. of 400 cc. concd. H_2SO_4 + 1600 cc. water) 10 cc. H_2SO_4 (1:3) and dil. with hot water. When all the MnO_2 has dissolved, titrate the excess of reducing agent with KMnO_4 . In studying the persulfate method, the effect of temp. as well as of varying amts. of persulfate, AgNO_3 , HNO_3 and H_2SO_4 was detd. The results showed that varying results were obtained if the proper conditions were not maintained but that under favorable conditions the method is accurate and much more rapid than either the chlorate or Volhard methods. Cu, Ni, Ti, V, Mo and W have no influence upon the results but the presence of Cr or Co causes trouble with the end point. Cr-steel is not completely sol. in HNO_3 and is unsuitable for this reason also. As a result of many expts. the following procedure is recommended: Dissolve 0.2 g. of filings in 15 cc. HNO_3 (d. 1.2) and heat until all nitrous fumes are expelled. Add 50 cc. 0.1 N AgNO_3 soln. and 2 cc. persulfate soln. (500 g. $(\text{NH}_4)_2\text{S}_2\text{O}_8$ per l.), or more if above 1% Mn is present, and heat to 60°. After maintaining this temp. 5 min., cool, dil. to about 125 cc., add 3 cc. NaCl soln. (12 g. per l.) and titrate promptly with Na_2AsO_3 soln. (5 g. As_2O_3 and 15 g. Na_2CO_3 dissolved in hot water and dild. to 10 l.).

DONALD BELCHER.

The determination of cobalt and nickel in cobalt metal. C. A. KNITTEL. *Metal Ind.* 14, 77-8(1916).—Treat 1 g. of drillings in a 150 cc. conical flask provided with a trap (made of a CaCl_2 tube) with 20 cc. of HCl (d. 1.12), heating gently until all action ceases; add 1 cc. concd. HNO_3 and heat till action ceases, rinse and remove trap and evap. soln. to a sirup. Add 30 cc. of H_2O , filter, wash with H_2O (+ a few drops of HCl); ignite the residue and fuse with 5 times its wt. of $\text{K}_4\text{S}_2\text{O}_7$, dissolve, melt in a little H_2O and add to main filtrate. Warm the slightly acid soln. and saturate with H_2S , filter off sulfides of As, Cu, etc., wash with acidulated H_2S water (1 cc. HCl :100 cc. H_2O),

receiving filtrate and washings in a 350 cc. casserole; evap. down to a few cc., oxidize Fe^{2+} with a few drops of $\text{Br} + \text{H}_2\text{O}$, add 0.2 g. of NH_4Cl , and evap. to dryness at H_2O -bath temp. Take up with a little H_2O , add 0.1 g. HCOONH_4 , dil. to 50 cc., heat until a ppt. of basic Fe formate seps., add very dil. NH_4OH until the soln. is only slightly acid; heat for a min. or so, let settle, filter, and wash with a hot 0.1% HCOONH_4 soln. Dissolve ppt. off the filter with hot HCl (1:5), receiving filtrate in the casserole in which the pptn. was made, neutralize with NH_4OH , add HCOONH_4 and proceed as above. To the united filtrates from the 2 Fe sepsns. add 8 cc. concd. H_2SO_4 , and evap. to copious SO_3 fumes; take up with H_2O , transferring to a 180 cc. tall beaker and keeping the vol. within about 50 cc.; add gradually 60 cc. of concd. NH_4OH (keeping soln. cool), then 10 cc. of 20% $(\text{NH}_4)\text{HSO}_4$ soln., electrolyze with a current of 2.5 amp. till soln. is colorless, rinse down cover glass and side of beaker with H_2O , reduce current to 0.5 amp. and electrolyze till a few cc. of the electrolyte show no Co or Ni with K_2CS_2 . Remove and dry cathode with usual precautions; weigh Co + Ni; dissolve deposit with 30 cc. of HNO_3 (1:3), rinse and remove cathode, boil to expel nitrous fumes; dil. to 500 cc., neutralize with NH_4OH , make faintly acid with HNO_3 , heat to $50\text{--}60^\circ$, add 30 cc. of a 1% alc. soln. of dimethylglyoxime, followed by 10 cc. of 20% AcONH_4 soln. Let stand 4 hrs., filter on a gooch, wash twice with hot H_2O , redissolve, and repeat the pptn. in a vol. of 200 cc.; let stand 1 hr. in a warm place, filter on a gooch, wash with hot H_2O , dry at $130\text{--}140^\circ$ for 45 min., cool, and weigh. $\text{Wt. of ppt.} \times 0.20316 = \text{Ni}$. Obtain Co by difference from Ni + Co found by electrolysis. Co metal as now commonly found in the market contains 98–98.5% Co (+ Ni). K. used cathodes of the perforated type with an effective surface of 90 sq. cm., spiral anodes made of 0.04 in. wire, $\frac{5}{8}$ in. diam., $6\frac{1}{2}$ turns. Notes and precautions are given. F. W. SMITHER.

Separation of gold and platinum from other metals. A. C. CHRISTENSEN. *Archiv. Pharm. Chem.* 22, 105–6(1915).—A slightly acid soln. is treated with hydrazine sulfate on the water bath and allowed to stand for 1 hr. The ppt. after digestion with HNO_3 contains the Au and Pt. The sepn. is quant. A. R. ROSE.

The qualitative analysis of the iron group in the presence of phosphates. R. GILMOUR. *Chem. News* 113, 1–3, 13–5(1916).—Inaccuracies in existing methods are discussed. When PO_4 is present with the alk. earths, the basic acetate sepn. is unsatisfactory; a better method is to ppt. the alk. earths as sulfates before sepgg. the Fe group. Expts. showed that a considerable excess of Na_2O_2 is required in the peroxide sepn. of Al, Cr and Zn. Unless a very large excess of NH_4Cl is present, Mg is pptd. with Al by NH_4OH . The phosphate sepn. as usually carried out with $(\text{NH}_4)_2\text{HPO}_4$, AcOH , AcONa and FeCl_3 , is inaccurate in the presence of Ba, and to a less degree in the presence of Sr or Ca, since appreciable amts. of these metals remain with the FePO_4 ppt. FePO_4 is probably hydrolyzed on boiling and BaHPO_4 , which is insol. in AcOH , is formed. Expts. showed that, in general, 4–5 cc. of 2 N AcONa and 1 cc. of 4 N AcOH in a vol. of 60–70 cc. will ensure complete removal of Fe up to at least 140 mg. The basic acetate sepn. of Fe and PO_4 from Co and Mn was found to be quite satisfactory under the conditions given above. The pptn. of Co and Ni by means of H_2S in a hot soln. containing 1 cc. of 4 N AcOH and 6 cc. of 2 N AcONa is complete. A complete scheme for the examn. of a soln. for metallic radicals is given, of which the following is an outline. Remove Pb, Ag and Hg^{2+} with HCl in the usual manner. Remove and sep. the metals of the Cu and Sn groups by G.'s method (cf. C. A. 9, 1725). Boil the soln. to remove H_2S . Remove the alk. earth metals by means of H_2SO_4 and EtOH . The pptd. sulfates are converted into carbonates and analyzed by G.'s method (C. A. 9, 1725). Heat the filtrate on the water bath for some time to remove EtOH , add NaOH and then a considerable quantity of Na_2O_2 . Boil for some mins. and filter. The filtrate contains Al, Cr and Zn and most of the PO_4 if the latter is present. The ppt.

contains $\text{Fe}(\text{OH})_2$, $\text{Ni}(\text{OH})_2$, $\text{Ni}(\text{OH})_2$, $\text{MnO}(\text{OH})_2$, $\text{Co}(\text{OH})_2$, $\text{Mg}(\text{OH})_2$, and phosphates of these metals. The filtrate is examd. as usual for Al, Cr and Zn. The ppt. is dissolved in HCl and the soln. evapd. to dryness. The residue is taken up in H_2O , tested for Fe, and the Fe and PO_4 removed by the basic acetate process as follows: Add Na_2CO_3 soln. until a slight permanent ppt. forms; remove this by adding dil. HCl drop by drop, then add 1 cc. of 4 N AcOH and 6 cc. of 2 N AcONa, followed by FeCl_3 until the mixt. assumes a pale yellow color. Boil for 1 min. and filter hot. The filtrate contains Ni, Co, Mn and Mg. Heat to boiling and pass in H_2S , pptg. Ni and Co as sulfides. Identify Co as K cobaltinitrite and Ni as $\text{Ni}(\text{OH})_2$ after sepg. from Co by means of KCN and bromine H_2O . Make the filtrate from the NiS and CoS alk. and pass in H_2S , pptg. MnS. Mg is identified in the filtrate by pptn. as MgNH_4PO_4 . Na and K are tested for in a portion of the original soln., after removing all other metals by means of NH_4OH , NH_4Cl , H_2S and $(\text{NH}_4)_2\text{CO}_3$. If Mg is present make a sepn. with EtOH and $(\text{NH}_4)_2\text{CO}_3$. Test for Na and K, after removal of NH_4 salts by ignition, in the usual way, viz., by flame tests and formation of K cobaltinitrite. The method of Mathers and Lee (cf. C. A. 9, 1730) with fluoboric and fluosilicic acids may be used. Directions are given in minute detail. Trials of the scheme with unknowns showed it to be quite satisfactory.

E. W. BOUGHTON.

Use of hydrofluoric acid in the separation of some heavy metals from tin, antimony, tungsten and molybdenum, by means of the electric current. L. W. MCCAY AND N. H. FURMAN. *J. Am. Chem. Soc.* 38, 640-52(1916); cf. C. A. 9, 277.—Standard solns. of most of the metals were prepd. and mixed as required. The paper is a report of the details of sepn. of each of the metals from the others by electrolysis.

E. B. MILLARD.

Crum's and Marshall's tests for manganese. L. DOBBIN. *J. Soc. Chem. Ind.* 35, 80-1(1916).—This article discusses the origin of the persulfate test for Mn. Minute quantities of Mn in soln. can be detected by warming with persulfate in presence of H_2SO_4 or HNO_3 with the addition of a drop of dil. soln. of AgNO_3 . This and the possibility of a quant. application was stated by Marshall in 1901 (*Chem. News* 82, 76). Many writers have mentioned Walters as the author of this, although his work was only a development of Marshall's publication.

H. M. LANCASTER.

Rapid method of separation of copper from other metals. A. APPELBANEY. *Chem. Analyst* 15, 18(1915).—The method is applicable to sepn. of Cu from Al, Co, Ni, Cr, Fe and Zn. Dissolve 1 g. of alloy sample in 10 cc. HCl and 2 cc. HNO_3 , and remove excess of acid by evapn. Dissolve the mixed chlorides in 50 cc. water, adding 4 g. $\text{KHC}_4\text{H}_4\text{O}_6$ to assist soln. and add a soln. of KOH. Cool, add a soln. of pure glucose and boil for 1 to 2 min. The sepn. of Cu as Cu_2O should be complete. The ppt. seps. rapidly in granular form but if the glucose is added to a warm soln. the ppt. is flaky and hard to wash. The Cu_2O may be dissolved in HNO_3 and estd. by the electrolytic or iodide method. Solns. of Bi on similar treatment ppt. metallic Bi, which can be easily filtered and washed.

H. M. LANCASTER.

The analysis of graphite. E. DONATH AND A. LONG. *Stahl u. Eisen* 35, 870-3 (1915); cf. C. A. 9, 1158.—The following reactions for anthracite are given: (1) on heating, very small amts. of volatile matter escape; (2) on boiling with concd. HNO_3 a brownish red soln. is obtained which gives $\text{Fe}(\text{OH})_3$ on addition of NH_4OH and a brown ppt. on addition of CaCl_2 and $\text{Pb}(\text{OAc})_2$; (3) KMnO_4 is reduced in boiling soln. with the formation of $\text{H}_2\text{C}_2\text{O}_4$ in appreciable amts.; (4) Na_2SO_4 , heated with the material to sintering, gives a mass whose soln. ppts. PbS with $\text{Pb}(\text{OAc})_2$. Only when all these reactions are encountered, especially (2) can one conclude the presence of anthracite. In reaction (3) HCOONa is used to reduce the excess KMnO_4 because the use of NaHSO_4

often misleads the analyst by the subsequent pptn. of CaSO_4 . 1% of anthracite may be detected. Several tables of complete analyses are given. Artificial graphites are generally free from S. Natural graphites decolorize blue and red litmus soln.; artificial do not. Natural graphites turn *p*-phenylenediamine soln. brown; artificial graphites behave indifferently. D. B.

Zinc-dust precipitation tests (discussion of paper of Nathaniel Herz). GILBERT RIGG. *Bull. Am. Inst. Mining Eng.* 1916, 513-4; *Mining Eng. World* 44, 122(1916); cf. *C. A.* 9, 2631.—A criticism of statements concerning the solubilities of Pb and Cd in Zn. A bibliography of the subject is appended. H. L. OLIN.

Rapid determination of iron in presence of organic substances. F. FERRARI. Pisa. *Ann. chim. applicata* 4, 341-3(1915).—To the soln. having a vol. of at least 150 cc. and contg. excess of HCl, add chlorine H_2O in small portions till the odor of Cl persists. Add a cold, clear soln. of cupferron drop by drop with const. agitation till there is an excess of at least $\frac{1}{4}$ of the amt. of reagent needed to complete pptn. of the Fe (9.01 g. Fe require 0.0833 g. cupferron). When the pulverulent ppt. has formed into large cryst. masses (after 15-20 min.), break it up with a glass rod, filter, dry with moderate air-suction, wash twice with cold H_2O acidulated with HCl, then with H_2O alone, till all acid is washed out, then treat several times with NH_4OH (to liberate the Fe compd. from the cupferron, the presence of which would be harmful during the subsequent ignition), and finally wash again with H_2O alone. Then completely dry and carefully ignite in a covered Pt crucible, and finally in the open air; weigh as Fe_2O_3 . The whole time required is not over $1\frac{1}{2}$ hrs. The method gives exact results, but is not applicable in presence of Cu, Ag, Pb, Hg, Sn, Bi, Ti, Zr, all of which form insol. salts with the cupferron. S. LEVY.

The detection of nitrates in the presence of organic matter. A. TINGLE. *J. Soc. Chem. Ind.* 35, 77-8(1916).—The method for inorg. nitrates proposed earlier (cf. *C. A.* 9, 2042), has been improved and extended to include org. nitrates mixed with org. matter. The reagent can be prepd. by dissolving 3 g. salicylic acid in 100 cc. concd. H_2SO_4 , although exact proportions are not important. A soln. of KNO_3 (0.1%) was satd. with cane sugar at lab. temp. and to 2 cc. of this sirup 2 cc. reagent were added. The mixt. was gently warmed until fuming, the charred mass boiled with 10 cc. H_2O and the resulting soln. poured off, cooled and extd. with an equal vol. of Et_2O . A portion of the ext. shaken with a little NH_4OH assumed an orange color. The remaining portion was shaken with 2 cc. FeCl_3 soln. (1%). The aq. layer slowly became red (cf. Torti, *C. A.* 9, 2126). The soln. of KNO_3 with sugar gave a negative result in testing for nitrates with Cu and H_2SO_4 . The method was also successfully applied to the detection of cellulose nitrate in a photographic film. H. M. LANCASTER.

The estimation of carbon dioxide in air by Haldane's apparatus. R. C. FREDERICK. *J. Soc. Chem. Ind.* 35, 96-9(1916).—A description of the form and the details of manipulation of Haldane's app. is followed by a simple modification applicable to higher content of CO_2 , ranging from 100-500 parts per 10,000. A propelling app. for the Hg reservoir lessens the labor of repeatedly raising and lowering the levelling bulb. H. M. LANCASTER.

Detection and determination of halogens in organic compounds. I. DROGIN AND M. A. ROSANOFF. *J. Am. Chem. Soc.* 38, 711-6(1916); cf. Bacon, *C. A.* 3, 873. —Walker and McRae's observation that B's. method gives low results (*C. A.* 5, 2055) has been confirmed; Maryott's method (*C. A.* 5, 880) gives still poorer results. A systematic study of B's. method, however, has shown that by increasing the amt. of Na by 10% and carrying out the Volhard detns. with all necessary care uniformly excellent results are obtained; in 64 consecutive detns. on PhCl , PhBr , C_6Cl_6 , $\text{C}_6\text{H}_5\text{Cl}$, *m*- and *p*- $\text{ClC}_6\text{H}_4\text{CO}_2\text{H}$, *m*- and *p*- $\text{BrC}_6\text{H}_4\text{CO}_2\text{H}$, PhCH_2Cl , α - $\text{C}_{10}\text{H}_7\text{Br}$ and CHI_3 , the

max. deviation from the calcd. was -0.31% , and in only 4 cases did it exceed 0.20% . The method is described in detail. It may also be used to detect halogens qual.; by means of it Cl can be plainly detected in 1 drop of a soln. of 1 drop CCl_4 in 30 cc. C_6H_6 .
CHAS. A. ROULLER.

Theory of acidimetric indicators (WEGSCHEIDER) 2. An apparatus for mixing powdered substances (HUDIG) 1. Possible source of error in colorimeter observations (LONG) 11B.

8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

Pasteur's principle of relationship between molecular and physical asymmetry. F. M. JÄGER. *Z. Kryst. Min.* 55, 209-48(1915).—Luteo-triethylenediaminecobaltisalts were used in the expts. and their relations found to agree with the postulates of Pasteur's principle. The following conclusions are drawn: There is no rational relationship between the optical orientation due to mol. asymmetry and enantiomorphic crystal structure; for the recognition of enantiomorphism of crystal structure the chem. differences of the substances is the best criterion; two influences must be differentiated, (a) that of the form not coverable by its mirror image, (b) the more or less great chem. difference of the thus orientated elements or radicals; the influence of (a) demands optical activity, that of (b) enantiomorphism of the crystal structure, and because of this, polarity of the homologous directions in the resulting crystals; in the case of asymmetric atoms there is, of course, a strong requirement or indication of Pasteur's dissymmetrical molecules; both of the indicated influences are superimposed, for where (b) is present (a) may be expected; in any case it is plain that the Pasteur phenomenon of optical activity on the one hand, and the enantiomorphism of crystallographic form and the related pyroelectric and piezoelectric conditions on the other, play unequal roles.

A. WANDTKE.

The various modifications of carborundum and the occurrence of polytypes. H. BAUMHAUER. *Z. Kryst. Min.* 55, 249-59(1915).—From his expts. B. draws the following conclusions: (1) All 3 modifications may be formed at the same time, from the same melt, and under the same conditions. (2) The 3 forms can be referred to the same axes. (3) Except for the base, there is no form that appears on all 3 at the same time. (4) Crystals of each separate type or of all 3 types intergrow with parallel axes. (5) Each type gives a different Röntgenogram (cf. following abstr.), showing a peculiar atomic or mol. structure. (6) The 3 types fall into the following crystallographic classes: types 1 and 2: trigonal hemihedral hemimorphic (ditrigonal pyramidal); 3, hexagonal hemimorphic (dihexagonal pyramidal).

A. WANDTKE.

The Röntgenograms of carborundum crystals. F. v. HAUER AND P. KOLLER. *Z. Kryst. Min.* 55, 260-3(1915).—By exptl. work H. and K. substantiate the conclusions of Baumhauer (preceding abstr.). The Röntgenograms obtained are reproduced.

A. WANDTKE.

Malachite. Remarks concerning pseudomorphic forms. R. E. LIESegang. *Z. Kryst. Min.* 55, 264-70(1915).—L. endeavors to give an explanation as to why malachite occurs as pseudomorphs, and again in reniform masses. Expts. were conducted, using NaCl crystals and AgNO_3 soln. These compds. were used because the reaction is more rapid than that between cuprite and the atmosphere. L. then shows that by using a concd. soln. of AgNO_3 , and keeping it so, and by letting it act upon a cube of salt, a pseudomorphic replacement occurs; if the soln. is not concd. a less sharp

pseudomorph is formed; if a dilute soln. be employed a shapeless replacement results. The rod-like forms of malachite are next discussed. These L. thinks are due to the formation and bursting of a semipermeable membrane, the action being entirely comparable to that of FeSO_4 in a Na silicate soln. L. concludes that the type of pseudomorph formed depends upon the concn. of the soln. and the permeability of the membrane formed at the surface of the substance which is being replaced.

A. WANDTKE.

The variable composition of melanochalcite. W. F. HUNT AND E. H. KRAUS. Univ. Mich. *Am. J. Sci.* 41, 211-4 (1916).—The sample analyzed by Koenig (cf. *Ibid* 14, 404-9 (1902)) gave CuO 76.88, SiO_2 7.80, CO_2 7.17, H_2O 7.71, ZnO 0.41, Fe_2O_3 0.07, total 100.04%. A sample from the same locality, Bisbee, Arizona, analyzed by Hunt gave CuO 88.94, SiO_2 4.31, CO_2 1.78, H_2O 4.48, ZnO 0.12, Fe_2O_3 0.22, total 99.85%. While in outward appearance these minerals are identical, the second sample gives a darker streak and a higher sp. gr., 4.704, instead of 4.141. Although admitting other interpretations, Koenig had favored the formula $\text{Cu}_3(\text{Si,C})\text{O}_4 \cdot \text{Cu}(\text{OH})_2$, a basic salt of ortho-silico-carbonic acid. Calcg. the mol. ratios from both analyses and tabulating with the mol. ratios of malachite, chrysocolla and tenorite, H. and K. find that their sample apparently consists of tenorite 68.6, chrysocolla 20.0, and malachite 11.4%; the other may have contained tenorite 30.8, chrysocolla 30.8 and malachite 38.4%. Microscopic and polariscopic examns. confirm the conclusion that melanochalcite is not a chem. compd. but a mixt. of these 3 minerals in varying proportions. L. W. RIGGS.

Origin of the zinc and lead deposits of the Joplin region. C. E. SEIBENTHAL. U. S. Geol. Survey, *Bull.* 606, 283 pp. (1915).—The geology of the region and occurrence of the ores are outlined, and the genesis of the ores is discussed in detail, both corroborative and non-corroborative evidence being reviewed. It is concluded that the ores were segregated, from disseminated Zn and Pb minerals in the Cambrian and Ordovician rocks of the Ozark uplift, by artesian-circulating alkaline-saline S-bearing waters. This view is based on: observations as to the circulation of the waters of the region; analyses of well-waters; chem. expts. which prove the competence of these waters to dissolve and transport the metals; demonstration of the presence of Zn and Pb in the waters and the reservoir sediments deposited from them, as well as in the Cambrian and Ordovician limestones, in the same ratio throughout, whereas other possible sources, such as the cryst. rocks, contain the metals in variable and quite different ratios; the relation of the ratios of sulfides of Zn, Pb and Cu to their soly. and to age relations of the deposits; the concentric arrangement of the ore deposits around the center of the structural uplift, in the order corresponding to the soly. of the sulfides of the 3 metals; the association of the ore deposition with dolomitization and silicification of the limestones; the absence of ore-deposits above an impervious shale bed, and their presence where this is absent or broken by faulting; the demonstration of a persistent ore horizon below this shale; the continuous character of the deposits where the impervious shale is absent; the occurrence of ores at depths which could only be reached by meteoric waters having artesian circulation; the presence of S in mine waters which represent most closely those depositing the ores; the occurrence of ore at the base of (impervious) Pennsylvanian rocks; the occurrence of bitumen associated with the ores, at this horizon, indicating that the solns. bearing the hydrocarbons fractionated by the shale were ascending; the association of Zn and Pb deposits with all anticlinal uplifts; the occurrence of the ores in breccias, which would favor adsorption of the metallic salts and the escape of gases from ascending solns.; the constancy of the amt. of water in deep mines independent of seasonal variations, and its connection with the number of mines, which indicate its artesian character; and calcns. as to the changes of water necessary for the concn. of the ores, which show that the NaCl content of the ground waters agrees closely with the theoretical dilution demanded.

E. T. W.

A reconnaissance in the Kofa Mountains, Arizona. EDWARD L. JONES, JR. U. S. Geol. Survey, *Bull.* 620-H, 151-64(1915).—A brief description of Au, Cu and Pb deposits associated with andesite, granite and monzonite-porphyry, respectively.

E. T. W.

Observations on certain types of chalcocite and their characteristic etch patterns. C. F. TOLMAN, JR. *Bull. Am. Inst. Mining Eng.* 1916, 401-33.—A study of the genesis of the mineral, with 40 photomicrographs.

H. L. OLIN.

The iron ores of the Philippine Islands. WALLACE E. PRATT. *Bull. Am. Inst. Mining Eng.* 1916, 247-62.—The principal deposits are: the magnetite-hematite ores of the Bulacan, Santa Inez and Camarines (cf. C. A. 10, 163) regions in southeastern Luzon, related in origin and the product of metamorphism resulting from intrusion; and the laterites of Surigao in northeastern Mindanao. The latter bear a striking resemblance to those of the Mayari district in Cuba (cf. Kemp, C. A. 9, 903) having an av. Fe content of 54%, with only a trace of P. The area covered is 40 sq. miles of which 28 are commercially important and the estd. metric tonnage is 430,000,000.

H. L. OLIN.

Potash in certain copper and gold ores. B. S. BUTLER. Note on muscovite. GEORGE STRIGER. U. S. Geol. Survey, *Bull.* 620-J, 227-36(1915).—The presence of large amts. of potash in Cu and Au ores, and the probability of its occurrence chiefly in the tailings from the concn. of the metals, is pointed out by B., many analyses being cited (cf. C. A. 10, 807). S. discusses the possible extn. of potash from muscovite, describing expts. which show that $\frac{1}{3}$ of the K present can be rendered sol. by boiling with even quite dilute HCl, and practically all by heating with NH_4Cl in a sealed glass tube to 350°.

E. T. W.

Rhode Island coal. GEORGE H. ASHLEY. U. S. Geol. Survey, *Bull.* 615, 62 pp. (1915).—Coal occurs at a number of places near Providence and Newport, R. I., but has not proved commercially workable. The rocks of the region have been subjected to intense lateral pressure, and, with the enclosed coal, have flowed and accumulated in lenses where the pressure was least. The coal has been changed in the process to high-C anthracite and even locally to graphite. Crevices in the coal are filled with asbestos and fibrous quartz. Shale has become forced into the coal, so that where it has been squeezed thinnest it contains the most ash. The coal may be classed in general as a high-ash, high-moisture, graphitic-anthracite of high sp. gr. Results of tests on a commercial scale are given.

E. T. W.

Petroleum and natural gas resources of Canada. F. G. CLAPP AND OTHERS. Canada Dept. Mines, Mines Branch, *Bull.* 291, 386 pp.(1915); cf. C. A. 8, 2246.—The stratigraphy and geological structure of the various localities and the history of the drilling operations of the wells are given, together with analyses of some oils. The oils vary much in compn.; one sample of an amber hue had a sp. gr. of 32° Baumé and contained 33.5% lubricating oil and a small % of benzene and gasoline. Another specimen known as white oil had a sp. gr. of 62° Baumé and consisted largely of gasoline, so that it could be used with satisfactory results in automobile tanks. This last evidently resulted from filtration of the lighter portions of ordinary petroleum through clay. Much of the oil is used for lubrication, as a wood-preserved, and for the manufacture of Pintsch gas. Some oil shales may become satd. with oil to such an extent that the oil oozes out in the form of springs or drippings from a mine, but will not flow or seep fast enough to yield oils in commercial quantities by drilling. Albertite is a solid bitumen representing the residuum of petroliferous seepages; it occurs in veins, is a jet-black, shiny mineral, and is classed among the indications of oil. Where geological formations rise in a certain direction and disappear by thinning out, one is likely to find an ideal structure for the accumulation of natural

gas. Other conditions favoring this are: a porous formation to hold the gas, an impervious overlying structure to prevent its escaping, and suitable geological structure to form a reservoir for it. One sample of gas reported consisted of 92.2% hydrocarbons, 5.6% N, 1.4% CO₂, and traces of O, H, CO, H₂S. Statistics showing the valuation of oil and of natural gas produced in the different provinces during the past 14 years are given. The government laws relating to gas and oil production and disposal are added in an appendix.

R. L. SIBLEY.

Magmatic differentiation in effusive rocks. SIDNEY POWERS AND ALFRED C. LANE. *Bull. Am. Inst. Mining Eng.* 1916, 535-48.—The paper presents the results of an investigation of the gravimetric differentiation in lava flows based on quant. microscopic and chem. study of a Triassic basalt from Nova Scotia, confirmed by data from a study of certain Keweenaw ophites. Results show a concn. of the leucocratic, felsic constituents at the top of the flow, and the melanocratic, mafic constituents at the base. The quickly chilled top and bottom show, when free from alteration, the original compn. of the magma. The grain of the rock in thick flows varies with depth and is greatest just below the center where cooling takes place most slowly, although the study is made difficult by the presence of several generations of crystals due to convection currents and the subsidence of partially cooled upper portions of the flow.

H. L. OLIN.

Petrography of the Hühnberg rocks between Schnalkalden and Friedrichroda. A. UTENDÖRFER. *Centr. Min. Geol.* 1915, 623-31, 642-9.—The rocks are stated to be intrusives, and U. believes that they were consolidated at not more than 500 meters depth. These rocks, having the mineral nature of a diabase, are characterized by a development of primary quartz, which U. thinks is due to the assimilation of the red sandstone into which the rocks were intruded. The rocks also show interstitial glass. The age of the intrusives is Permian.

A. WANDTKE.

Inorganic constituents of alcyonaria. F. W. CLARKE AND W. C. WHEELER. U. S. Geol. Survey. *Proc. Nat. Acad. Sci.* 1, 552-6(1915).—The figures of 22 analyses are given showing the inorganic compn. of 20 species, representing 17 genera of alcyonarians. The localities from which the specimens were obtained, and in some cases the depth and temp. of the water, are given. In 18 specimens the amt. of organic matter ranged from 13 to 61%, the remaining 4 containing very little. In the tables the organic portion is rejected and the remaining inorganic portion calcd. to 100%. Excluding 2 erratic specimens and arranging the results in the order of ascending MgCO₃ content, a remarkable relation appears, connecting compn. with the temp. of the habitat. Those north of Lat. 40° N. contain from 6.18 to 9.05% MgCO₃, while species between 33° N. and 8° S. contain from 11.56 to 15.73%. Species from cold northern or very deep tropical waters contain less MgCO₃ than those from warm waters. The same relation appeared in the analyses of echinoderms (*C. A.* 9, 1023). It is also noteworthy that the higher proportions of Ca₃P₂O₈ are commonly associated with high values for Mg.

L. W. RIGGS.

Oxidation of manganese solutions in presence of air (LENHER) 6. Preliminary report on the diffusion of solids (VAN ORSTRAND) 2.

9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Interpretation of assay curves for drill holes. EDWARD H. PERRY AND AUGUSTUS LOCKE. *Bull. Am. Inst. Mining Eng.* 1916, 195-201.—In the exploration of a Cu

deposit by drilling, distinction must be made between primary and secondary ore. The first may extend downward indefinitely and fluctuate independently of depth while the latter has a limited vertical extent since enrichment decreases downward. If, therefore, in drilling, a hole descends from profitable ore to that below the commercial minimum, the question of further operation depends upon the genesis of the deposit. If primary, wt. must be given to the possibility of improvement with depth. Curves made by plotting assays against depths are helpful in detg. the character of the ores.

H. L. OLIN.

Chemistry of furnace efficiency and air supply. C. E. LUCKE AND E. D. THURSTON. *School Mines Quart.* 36, 326-30(1915).—Furnace efficiency = 1 — (loss on combustion/"heat originally in fuel"). The general equation which the authors develop is: Furnace efficiency = $1 - (C' / (CO_2 + CO)) [(10193 CO + 8702 H_2 + 28578 CH_4) / (51892 - 37348 C')]$. C' = the fractional part by wt. of the combustible existing as C, free or combined. The values of CO, CO₂, H₂ and CH₄ are obtained from the flue gas analysis.

L. P. WEBBERY.

The operation of the blast furnace. J. E. JOHNSON, JR. *Met. Chem. Eng.* 14, 210-5(1916).—J. recognizes 4 zones through which the raw materials pass: (1) drying and warming; (2) reduction of the ore, calcination of the stone and soln. of some C; (3) incipient fusion and the beginning of slag formation; (4) the reduction of the ore remaining in the slag, the final carbonization of the Fe and the addition of Si, P and Mn. While the use of crushed stone is generally preferable, slipping caused by the deposition of carbon dust may sometimes be prevented by using lumpy stone which calcines at lower levels, i. e., those at which C is pptd., and removes the obstructing C through the solvent action of the CO₂ liberated. Fine sandy ores like the Mesabi require higher fuel consumption than the lumpy Old-Range because of their extremely intimate contact with the coke which results in high soln. losses and lowered efficiencies (cf. C. A. 10, 445). For the successful operation of the furnace the slag in the final stage must reach the temp. required to set free the Fe it contains and to render it sufficiently fluid to cover the coke and absorb the S as soon as it is liberated, thereby keeping it out of the Fe.

H. L. OLIN.

Modern development in the combustion of blast-furnace gas with special reference to the Bradshaw gas burner. K. HEUSSENER. *Bull. Am. Inst. Mining Eng.* 1916, 443-74; cf. C. A. 9, 1838.—H. surveys the principles involved in the combustion of blast-furnace gas in boilers and stoves. The concurrent development of the steam engine and steam turbine and the inability of the gas engine to maintain a high efficiency except with high and const. load have brought about a revival of interest in the use of gas for steam production. The problems of successful gas burning under varying pressure of top gas is solved in the Bradshaw burner by the application of the Venturi principle which maintains a const. ratio of gas and air. Under given conditions efficiencies depend upon the boiler loads; with loads of 100% an efficiency of 80% is possible and it need not drop further than 75% with higher loads. Gas washing is profitable for stoves but losses usually occur where it is done for boilers. The best temp. for washing is 100° F.

H. L. OLIN.

Coal-dust firing in reverberatory furnaces. C. R. KUZELL. *Eng. Mining J.* 101, 302-6(1916).—Mainly a summary of descriptions and facts already published. Coal-dust firing of reverberatories was adapted from cement-kiln firing practice. The grade of coal permissible is not fixed by close limits, but the coal must be dried sufficiently so that it will be easily suspended in the air blast, but not dry enough to make spontaneous combustion likely. Coal is pulverized so that 90% will pass 100- and 80% pass 200-mesh. The blast pressure varies from 8 to 16 oz. per sq. in. Furnaces of

capacity 400 to 700 tons ore per day burn 60 to 100 tons of coal dust. Improved new charging methods largely obviate fettling and necessitate relocation of matte-tap holes. Furnace repairs are less costly than in the older firing practice. Diagrams, flow sheet of coal-pulverizing plant, and a bibliography are given. F. W. S.

The chemical evidence of smelter smoke injury to vegetation. J. P. MITCHELL. *J. Ind. Eng. Chem.* 8, 175-6(1916).—Expts. were made in turn on potted plants in small cabinets, plants in green-houses and finally on vegetation under field conditions to det. the effects of various constituents of smelter smoke. The action of SO_2 is distinctly different from that of SO_3 or H_2SO_4 . The latter destroys the plant tissue, causing brown or black "burns" while SO_2 , less immediately destructive, on being absorbed by the plant combines chemically with some constituent and finally interferes with the normal physiological processes. Chemical evidence of the deposition of poisons like Pb and As on the surface of plants is easily obtained; evidence of the activity of SO_2 is less apparent. High S values indicate exposure to the gas but absorption of S from the soil is a possibility and to eliminate error from this source proceed by 3 steps; (1) det. the S content of the vegetation in question; (2) compare results with those obtained from similar plants not exposed to SO_2 fumes; (3) det. the S content of the soil in which sample of vegetation grew. Results based on this procedure have been uniformly satisfactory and in accord with botanical studies in the same districts.

H. L. OLIN.

The prevention of hydrolysis in cyanide solutions. H. M. LESLIE. *J. Chem. Met. Soc. S. Africa* 16, 77-9, 110-3(1915); cf. *C. A.* 10, 165.—**Discussion.** W. A. CALDSCOTT. The hydrolysis consists of the interaction of KCN and CaO with H_2O forming HCNO; this will decompose, giving humus-like products, some of them insol. and extremely difficult of estn. It is desirable to know whether the proportion of protective alkali is a const., or the losses are influenced by light and other conditions. J. WARSON describes expts. with two sep. halves of the same soln., one closed, the other open. In 73 days, the loss (as KCN) in the open was 62.72%, in the closed, 6.57%. The alkalinity diminished in the open test, and increased by a few thousandths in the closed test. On the theory of hydrolysis, increase should have been over 0.1. Existence of hydrolysis is not proved. A. WHITBY gives expts. pointing to increase of Zn in soln. and its subsequent deposition as insol. compds. in the changes under discussion. It is necessary to consider the interactions of KCN, CaO, Zn and of atmospheric influences.

E. WALLER.

The hydrometallurgical treatment of complex gold and silver ores. G. H. CLEVINGER. *Met. Chem. Eng.* 14, 203-10(1916).—A general discussion of the principles of Au and Ag extn. with historical introduction and bibliography. H. L. OLIN.

Metallurgy of native-silver ores of southwestern Chihuahua. W. M. BRODIE. *Eng. Mining J.* 101, 297-301(1916).—A review. Native Ag occurs in fissure veins in diabase. In coarse-grained rock no native Ag has been found in commercial quantity. Occasional small amts. of argentite and ruby Ag are found. Present milling comprizes concn., amalgamation, cyanidation, and smelting. The product of the mine is often shipped as bullion within 48 hrs. of blasting. Also in *Mining Sci. Press* 112, 347(1916).

F. W. SMITHER.

The calcination of zinc carbonate. W. P. SIMPSON. *Met. Chem. Eng.* 14, 181-3 (1916).—The process applied to ZnCO_3 involves heating the ore to temps. at which it is converted to ZnO without loss of Zn. Among the advantages of its application are: (1) reduction of transportation costs; (2) lowering of fuel expense and (3) decrease in the time element involved in the further working of the ore. A lab. calcination assay is made by heating a 10 g. sample in a 3 in. scorifier in an assay muffle to a dull

Chemical Abstracts.

... hours. $(10-L)/P$, where L is calcination loss ... gives the percentage of Zn in the concentrate ... its operation. H. L. OLIN

... conical ball mill. ARTHUR F. TAGGART AND R. W. ... *Eng.* 1916, 435-42.—Brass waste contained in ... furnaces melting scrap brass, sweepings, and similar ... in the conical ball mill with the subsequent separa- ... the dirt by screening. A 54 in. by 16 in. Hardinge mill ... H. L. OLIN.

... at the Braden Copper Co. R. E. DOUGLASS AND B. T. ... 101, 315-21(1916).—A detailed description with illustra- ... well, Chile, have been worked for over 100 yrs. The new ... and coarse concn., followed by regrinding in Marcy and Har- ... by oil flotation; H_2SO_4 plant, making acid for flotation, consists ... furnaces and chambers of the usual type. The choice of the blast ... the reverberatory, for smelting concentrates was governed by ... wholly apart from metallurgy. The smelting mixt. made furnace ... Converter slags were made with only 10% of SiO_2 . Oil flotation ... conditions and made smelting easier. F. W. SMITH.

... Packard reduction plant at Rochester, Nevada. K. FREITAG. *Miner.* ... 43, 847-8(1915).—A modern mill treating a soft cerargyrite ore with high ... and low costs. H. L. OLIN

... improved apparatus for photomicrography of metals. ANON. *Met. Chem. Eng.* ... 1915).—The app. is designed and supplied by Sauveur and Boylston, Cam- ... W. T. H.

Alumina in steel. GEORGE F. COMSTOCK. *Met. Chem. Eng.* 13, 891-5(1915).— ... inclusions are in the form of small rounded spots, arranged close together in an ... streak. They are of a dark blue-gray color when viewed under the light ... an elec. arc but appear black unless highly magnified. In polishing, pits are formed ... the inclusions so that unless care is taken it is often hard to see the original ... The appearance under the microscope is different from that of ordinary ... slag inclusions and the spots of Al_2O_3 can be distinguished without difficulty from oxide ... of Ti, Cr or Ni. W. T. HALL.

Specifications for alloys for high-speed superheated steam turbine blading. W. B. PARKER. *Inst. of Metals*, Sept. 1915, 47 pp. (adv. proof); *J. Soc. Chem. Ind.* 34, 1015-6; *Metal Ind.* 14, 68-71, 114-6(1916).—Material used in blading high-speed turbines driven by superheated steam should satisfy the following requirements: It should be in a physically stable condition, free from internal stresses, non-corroding in damp steam, and resisting steam erosion. The proportionality limit (i. e., the point at which the elongation ceases to be proportional to the load) should be at least 10 tons per sq. in., and should remain const. within 10% over the whole range of 100-400°. The max. stress should be at least twice the proportionality limit, and remain const. over the same range of temp. The greater the natural hardness of the metal in the soft or annealed condition the better; 30° by Shore's scleroscope would be desirable. The thermal expansion should preferably be low, with a const. coeff. between 100° and 500°. Ductility is not of special importance, while low sp. gr. would be an advantage. Definitions are given of the terms used in describing the phys. properties of alloys, together with a list of non-ferrous alloys used, or formerly used, in the manuf. of blades. Brass is too soft and anneals readily in superheated steam. Pure Cu is suitable, while pure Ni free from C is difficult to obtain. Co has not been suffi-

siently investigated. Pure Monel metal (Cu-Ni) may be used for stationary blades under certain conditions. Al-bronze anneals readily, like brass. Cu-Al-Mn and Cu-Al-Ni alloys, rich in Cu, may repay further investigation. The most useful alloy up to the present is pure P-bronze. Alloy steels are being used chiefly for want of a better non-ferrous material, in spite of their common tendency to rust. E. J. C.

The nickel chromium alloys patent situation. ANON. *Elec. World* 67, 80-1 (1916).—A brief account of the patent situation covering the Ni-Cr resistance wires.

C. G. F.

Zinc-dust precipitation tests (RIGG) 7. Structure of copper deposits (SIEVERTS) 4. The Schoop electric oven (KORDA) 1.

Crucible melting furnace. EUGEN STOLL and J. ENGEL. Ger., 286,027, Feb. 3, 1914.

Grate plate for blast crucible melting furnaces. ERNST BRABANDT. Ger., 285,998, June 11, 1914. The plate is provided with peripheral transverse incisions.

Charging machine for metallurgical furnaces. C. MEHLER, MASCHINENBAU-ANSTALT, G. M. B. H. Ger., 286,063, Mar. 27, 1914. The charge is introduced by centrifugation.

Charging blast furnaces. H. STÄHLER. Ger., 284,757, Oct. 31, 1913.

Device for operating the charging bell of blast furnaces. J. POHLIG. AKT.-GES. and A. KÜPPERS. Ger., 286,149, Mar. 10, 1914.

Pouring machine for a plurality of blast furnaces. DEUTSCHE MASCHINENFABRIK AKT.-GES. Ger., 285,359, Feb. 23, 1913. Cf. C. A. 9, 2377.

Worm driven tilting device for casting pans. SIEG-RHEINISCHE LOKOMOTIV- UND MASCHINENFABRIK G. M. B. H. Ger., 285,388, June 16, 1914.

Device for removing the accumulations at the mouth of converters. JÜNKER-RÄTHER GEWERKSCHAFT. Ger., 285,611, May 27, 1914.

Operating regenerative metallurgical furnaces. J. E. BELL. U. S., 1,170,397, Feb. 1. Air heated in a regenerator is mixed with pulverized solid fuel which is burned in suspension to form producer gas, with which additional air is then mixed to form fuel for use in the furnace. The temp. produced in the combustion chamber is regulated by injecting steam if desired.

Apparatus for sintering and smelting iron and other ores. A. S. DWIGHT. U. S., 1,169,384, Jan. 25. The ore is first sintered into a continuous cake upon a moving platform and then the cake is passed between electrodes, one of which is in contact with the cake, to heat it further before passing to a smelting zone.

Blast furnace for roasting ores, waste and foundry products. W. BUDAUS. Ger., 285,888, Oct. 12, 1913.

Apparatus for breaking up and preparing ores for wet dressing. COPPER PROCESS Co. Ger., 285,767, Aug. 28, 1913. A large part of the gang, together with the fine metallic particles, is prevented from going into the slime.

Slime hearth for dressing ores, coal. DEISTER MACHINE CO. Ger., 285,909, Feb. 10, 1914. Cf. C. A. 9, 1601.

Apparatus for hardening files. F. KÜRSCHNER. Ger., 286,126, June 12, 1914.

Drying air for metallurgical use. W. WENSE. U. S., 1,169,371, Jan. 25. Air is purified and dried by first removing CO₂ and then passing the air through a shower of a strong soln. of NaOH.

Volatilizing constituents of ores. S. I. CLAWSON. U. S., 1,169,530, Jan. 25. Crushed ore is treated in a heated chamber with Cl and with a current of N which carries off the volatile compds. formed. These are passed to a fume arrester where most of the volatile compds. are sepd. and the N with some of the volatilized compds. still mixed with it is combined with additional Cl and returned to the ore-treatment chamber.

Concentrating ores. E. H. NUTTER. U. S., 1,170,665, Feb. 8. Finely crushed ore, *e. g.*, Cu ore tailings, is mixed with H_2O and a small amt. of acid sludge from petroleum refining and the mixt. is aerated and agitated to form a froth which is then sepd. after heating to 36° . Wood creosote may also be added to assist in the flotation.

Agglomerating fine ores. SELAS AKT.-GES. Ger., 285,913, Apr. 24, 1914. The fine ore, mixed with coke, is fed on to a moving grating which passes under a blast and over a suction box.

Concentrating ores. A. H. HIGGINS. U. S., 1,170,637, Feb. 8. Finely crushed ore, *e. g.*, Zn ore containing Pb, is mixed with H_2O and with a small amt. of sulfonated castor oil and the froth which is produced by aeration and agitation of the mixt. is sepd. β -Naphthol or olive oil may also be treated with H_2SO_4 to form the frothing agent. Cf. C. A. 10, 586.

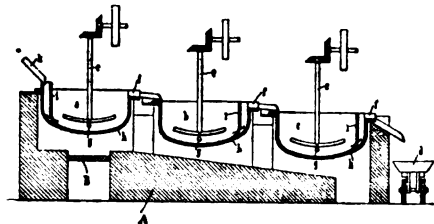
Recovering metals from sulfides. U. WEDGE. U. S., 1,169,444, Jan. 25. Sulfide ores of Fe, Zn, etc., are heated to a temp. sufficient to volatilize S, in an atm. containing CO_2 or only 4-6% O or other gas which will promote the oxidation of the metal without oxidizing the S and the oxide thus formed is exposed to a reducing atm. to obtain the free metal.

Roasting ores. U. WEDGE. U. S., 1,170,375, Feb. 1. Ore, *e. g.*, sulfide ore, is roasted successively on hearths in 2 different stages. In the first stage heated air is supplied to the ore to burn the combustible constituents of the ore; combustion gases from the second stage are not allowed to come into contact with ore in the first stage of roasting. The gases formed may be used in making H_2SO_4 . In the second stage, combustion gases formed outside the roasting furnace are introduced into the charge and the hot gases from the second stage of roasting are used to preheat the air used in the first stage.

Ore-roasting furnace. U. WEDGE. U. S., 1,170,376, Feb. 1. Superposed hearths are arranged to carry out the roasting method of U. S. pat., 1,170,375 (*supra*).

Smelting fine ores. A. S. DWIGHT. U. S., 1,169,139, Jan. 25. Finely divided ores, *e. g.*, of Pb or Fe, are formed into coherent and rigid but highly porous cakes by sintering and are then subjected to the action of CO and smelted in a reverberatory furnace. Sintered cakes of Fe_3O_4 may be oxidized to Fe_2O_3 (for use in open hearth decarburization of steel) by treatment with steam.

Tin. J. RUEB. Brit., 20,609, Oct. 6, 1914. In smelting Sn ores, concentrates, slags, tin-plate waste, etc., with pyrites to obtain a tin-iron mat, as described in 27,145, 1912 (C. A. 8, 1561), lime or $CaSO_4$ is added to the charge to increase the % of Sn in the mat.



Apparatus for treating silver ores E. LANGGUTH. U. S., 1,169,270, Jan. 25. An ore of Ag, which may also contain Au, Pb or Zn, is heated with $ZnCl_2$ in the vat *a* to decompose the ore. Pb (preferably carrying Ag) is added in this vat to take out the Au and the main portion of Ag present. The remainder of the Ag and a

small part of the Pb is extd. in the vat *b* by addition of Zn and the main part of the Pb is quantitatively pptd. in the vat *c* by addition of Zn. The Pb from the vat *b*, carrying some Ag, may be used for the first desilverization of the charge in vat *a*.

Superficial oxidation of iron and steel. B. GUERINI. U. S., 1,169,397, Jan. 25. Fe or steel articles, *e. g.*, tools or gun barrels, are immersed in a soln. of Na picrate and NaOH and the bath is gradually heated to about 130–150° while the articles are subjected to its action to produce an oxidized surface.

Iron and steel. A. E. DAVIES. Brit., 20,582, Oct. 6, 1914. In a basic open-hearth process, the furnace lining is coated with the finishing slag; after tapping the metal, by tilting the furnace backwards and forwards repeatedly, the slag is enriched and thickened by additions of lime and Fe ore and oxides.

Zinc. F. THARALDSEN. Ger., 286,229, Mar. 31, 1914. Addition to 261,188 (C. A. 7, 3310). In the practical application of the principal process, according to which the charge is introduced under a liquid slag, a not inconsiderable amt. of the Zn has been found to be retained by the slag, in part mechanically and in part chem. In order to recover the Zn from this slag bath the latter is drawn off periodically into a slag vat and the Zn therein is reduced by the introduction of a reducing agent. This vat is provided with a distn. head, and the Zn vapors are drawn off and condensed in the usual manner.

Briquetting ores. E. MILLINGTON and KITTEL & Co. Brit., 20,832, Oct. 10, 1914. Finely divided ore is mixed with coal dust or charcoal and flux, and moistened with tar or pitch, and the mixt. is pressed into briquets, which are coked at a temp. of 700–850°, and cooled, before use in an elec. or other reduction furnace.

Remelting ferromanganese and like alloys. ROMBACHER HÜTTENWERKE and J. I. BRONN. Ger., 285,956, Nov. 5, 1910. An elec. hearth furnace is used, with a clearly visible bath surface and electrodes extending down from above. Between each of the movable mounted electrode blocks and the molten bath a fall of less than 30 v. is secured by using a suitable current and adjusting the electrode very close to the surface of the bath.

Hard copper alloy. F. C. FRARY and S. N. TEMPLE. U. S., 1,169,392, Jan. 25. An alloy for making castings which are free from blow holes is formed of Cu 99 and Ca, Ba, Sr or Mg 1%.

Uniting copper to steel. W. M. PAGE. U. S., 1,171,066, Feb. 8. Molten Cu is treated with about 2% its wt. of Fe and with P to prevent oxidation. A steel billet is dipped in the bath of deoxidized Cu-Fe alloy thus produced and pure Cu is subsequently cast on the billet carrying a film of the Cu-Fe alloy.

Alloy for castings. E. D. GLEASON. U. S., 1,169,536, Jan. 25. Cu is combined with a fusion product of CaF₂ and H₂BO₃ to obtain castings free from O or other gases.

Ore-amalgamator. J. E. DICK. U. S., 1,169,740, Jan. 25.

Alloy for jewelry, scientific instruments, etc. R. J. PESCHKO. U. S., 1,169,753, Jan. 25. An alloy of Au 60, Pt 10 and Pd 30 parts is hardened by addition of 0.1–2% of Ir.

Sherardizing. E. F. COLLINS and J. A. CAPP. U. S., 1,169,529, Jan. 25. During sherardizing, the temp. is maintained at 350–375° and a Zn dust of 80–92% purity is used. A firmly adherent coating is obtained which will not crack, flake or peel off when the coated articles are bent or swaged. The Zn should be free from Pb and contain little matter except Zn and ZnO.

Coating articles with atomized metal. METALLISATOR. Ger., 285,823, Sept. 13, 1912. Construction of a suitable app. is specified.

10. ORGANIC CHEMISTRY.

CHAS. A. ROULLER.

N-Halogen derivatives of the *p*-halogen-substituted benzenesulfonamides. ROBERT R. BAXTER AND FREDERICK D. CHATTAWAY. *J. Chem. Soc.* 107, 1814-23 (1915).—The recent employment in the treatment of infected wounds (Dakin, *Brit. Med. J.* Aug. 28, 1915) of the sol. Na salts of sulfonmonochloroamides described by C. (J. Chem. Soc. 87, 145 (1905)) has made it seem desirable to extend the series. The dichloroamides are produced as follows: $\text{ArSO}_2\text{NH}_2 + 2\text{HOCl} \longrightarrow \text{ArSO}_2\text{NCl}_2 + 2\text{H}_2\text{O}$, and react with alk. hydroxides to form the salts $\text{ArSO}(\text{ONa})\text{:NCl}$, which are, according to D., powerful, practically non-irritating antiseptics. The required Na sulfonates were prepd. by slowly adding, with stirring, PhCl , PhBr , and PhI to fuming H_2SO_4 (d. 1.9, 10% free SO_3) in slight excess, keeping the temp. below 60° ; after 1 hr. the cooled mixt. is slowly run into 6 vols. satd. NaCl soln. at 0° , the $p\text{-XC}_6\text{H}_4\text{SO}_2\text{Na}$ sepg. with some NaCl , which is left behind on drying and extg. with hot alc. A small amt. of the sulfone crysts. from the alc. with the Na salt, and is removed by washing with Et_2O . The Na salts are ground up with 1.25-1.5 mols. PCl_5 , heated 0.5 hr. on the H_2O bath, cooled, poured onto ice, washed with ice- H_2O , taken up with Et_2O , this dried and evapd., leaving the chlorides as oils which solidify on cooling, and are converted into the amides by adding to cooled 1:1 aq. NH_3 . For the prepn. of the *N*-halogen derivs., see C.'s 1st paper. *p*-Chlorobenzenesulfondichloroamide, prisms, m. 83° ; potassium *p*-chlorobenzenesulfonchloroamide, prisms with 1 H_2O , loses H_2O on heating and decomps. violently, at about 160° ; sodium salt, prisms, with 1 H_2O , decomps. violently at about 190° ; *p*- $\text{ClC}_6\text{H}_4\text{SO}_2\text{NBr}_2$, pale yellow prisms, m. 102° ; *p*- $\text{BrC}_6\text{H}_4\text{SO}_2\text{NCl}_2$, m. 108° , not 106° (Kastle, Keiser, and Bradley, *Am. Chem. J.* 18, 493 (1896)); potassium *p*-bromobenzenesulfonchloroamide, needles with 1 H_2O , explodes 165° ; sodium salt, needles with 1 H_2O , explodes, with previous fusion, at 178° ; *p*-bromobenzenesulfondibromoamide, pale yellow prisms, m. $132-3^\circ$ (decompn.); potassium *p*-bromobenzenesulfonbromoamide, needles with 1 H_2O , explodes 193° ; sodium salt, needles with 1 H_2O , explodes 211° ; *p*-Iodobenzenesulfondichloroamide, prisms, m. 147° ; potassium *p*-iodobenzenesulfonchloroamide, needles with 1 H_2O , explodes 150° ; sodium salt, plates with 1 H_2O , explodes 185° . The above decompn. pts. were obtained on rapid heating. In the presence of $\text{C}_6\text{H}_5\text{N}$, the sulfonyl chlorides reacted readily in Et_2O with amines to form substituted amides and anilides, all of which yield *N*-halogen derivs. *p*-Chlorobenzenesulfonmethylanilide, plates, m. 59° ; chloroamide, $\text{ClC}_6\text{H}_4\text{SO}_2\text{NClMe}$, prisms, m. 66° ; bromoamide, pale yellow prisms, m. 99° ; *p*-chlorobenzenesulfonbenzylanilide, needles, m. $108-9^\circ$; chloroamide, prisms, m. 124° ; bromoamide, pale yellow prisms, m. 112° . In the case of the anilides, the Et_2O is distd. off, and the reaction completed by heating for a short time on the H_2O bath. In cases in which intramol. rearrangement may occur in the prepn. of the chloroamides, the free HOCl is best liberated by means of KHCO_3 . The anilides were all analyzed by conversion into the chloroamides, purifying these by recrystn. from a mixt. of CHCl_3 and light petroleum, and estimating the *N*-halogen by its power to replace I. *p*-Chlorobenzenesulfonphenylchloroamide, prisms, m. 100° ; *p*-bromobenzenesulfonphenylchloroamide, prisms, m. 104° ; *p*-iodobenzenesulfonphenylchloroamide, rhombs, m. $139-40^\circ$. *p*-Chlorobenzenesulfon-*m*-chloroanilide, rhombs, m. 106° , chlorophenylchloroamide, prisms, m. 90° ; *p*-chloroanilide, needles, m. 148° ; *p*-chlorophenylchloroamide, prisms, m. 127° ; 2,4-dichloroanilide, plates, m. 108° ; 2,4-dichlorophenylchloroamide, prisms, m. 100° ; *p*-bromoanilide, prisms, m. 163° ; *p*-bromophenylchloroamide, prisms, m. 127° ; 2,4-dibromoanilide, prisms, m. 116° ; 2,4-dibromophenylchloroamide, prisms, m. 110° (decompn.); *p*-iodoanilide, needles, m. 173° ; *p*-iodophenylchloroamide, m. 70° (decompn.), decomps. not even

for a few min. at room temp.; *o*-nitroanilide, pale yellow prisms, m. 114° (decompn.); *o*-nitrophenylchloroamide, faintly yellow prisms, m. 148° (decompn.); *m*-nitroanilide, pale yellow needles, m. 124°; *m*-nitrophenylchloroamide, very faintly yellow prisms, m. 131° (decompn.); *p*-nitroanilide, yellow needles, m. 159° (decompn.); *p*-nitrophenylchloroamide, very faintly yellow prisms, m. 143° (decompn.); *o*-toluidide, needles, m. 111°; *o*-tolylchloroamide, prisms, m. 127° (decompn.); *p*-toluidide, prisms, m. 88°; *p*-tolylchloroamide, prisms, m. 110° (decompn.); *p*-tolylbromoamide, pale yellow prisms, m. 91°. *p*-Bromobenzenesulfon-*p*-chloroanilide, prisms, m. 138°; *p*-chlorophenylchloroamide, prisms, m. 142°; 2,4-dichloroanilide, prisms, m. 134°; 2,4-dichlorophenylchloroamide, prisms, m. 97°; *p*-bromoanilide, prisms, m. 141°; *p*-bromophenylchloroamide, prisms, m. 141°; 2,4-dibromoanilide, prisms, m. 147°; 2,4-dibromophenylchloroamide, prisms, m. 117°; *p*-iodoanilide, prisms, m. 160° (decompn.); *p*-iodophenylchloroamide, decomps. in a few min. at room temp., decomps. completely below 100°; *o*-nitroanilide, yellow needles, m. 130°; *o*-nitrophenylchloroamide, faintly yellow prisms, m. 160° (decompn.); *m*-nitroanilide, yellow needles, m. 140°; *m*-nitrophenylchloroamide, yellow prisms, m. 140° (decompn.); *p*-nitroanilide, yellow needles, m. 183°; *p*-nitrophenylchloroamide, pale yellow prisms, m. 164°; *o*-toluidide, prisms, m. 119°; *o*-tolylchloroamide, prisms, m. 129° (decompn.); *p*-toluidide, prisms, m. 99°; *p*-tolylchloroamide, prisms, m. 131°. *p*-Iodobenzenesulfon-*p*-bromoanilide, plates, m. 174°; *p*-bromophenylchloroamide, prisms, m. 137° (decompn.); *p*-iodoanilide, plates, m. 167° (decompn.); *p*-iodophenylchloroamide, prisms, m. and decomps. 142° when rapidly heated, begins to decomp. after keeping a few min. at room temp.; *o*-nitroanilide, faintly yellow plates, m. 137°; *o*-nitrophenylchloroamide, faintly yellow prisms, m. 167°; *m*-nitroanilide, yellow prisms, m. 157°; *m*-nitrophenylchloroamide, faintly yellow prisms, m. 164°; *p*-nitroanilide, faintly yellow plates, m. 154°; *o*-toluidide, plates, m. 161°; *o*-tolylchloroamide, prisms, m. 110°; *p*-toluidide, prisms, m. 135°; *p*-tolylchloroamide, prisms, m. 137° (decompn.).

M. HEIDELBERGER.

Hydrazides of cyanoacetic, isonitrosocyanoacetic and nitrocycanoacetic acids.
A. DARAPSKY AND D. HILLERS. *J. prakt. Chem.* 92, 297-341 (1915).—Angeli has shown (cf. *Gazz. chim. ital.* 23, II, 101 (1893)) that $N_2H_4 \cdot H_2O$ forms a cryst. addition product with $(CN)_2$ in H_2O , which reacts energetically with aldehydes and ketones. The same compd. was obtained by Curtius and Dedichen (cf. *J. prakt. Chem.* 50, 245 (1894)) and called "Carbohydrazinin." C. and D. also found that $N_2H_4 \cdot H_2O$ and nitriles at higher temps. formed "hydrazincarbimines," which Pinner (cf. *Ber.* 27, 3274 (1894)) showed to be identical with isodihydratetrazines, and which Bülow (cf. *Ber.* 39, 2618, 4106 (1906)) calls "*N*-aminotriazoles." A monohydrazidine, $RC(:NH)NHNH_2$, is first formed which reacts with another mol. of the nitrile, giving a dihydrazidine, $[RC(:NH)NH]_2$. The latter further reacts with $N_2H_4 \cdot H_2O$, losing 2 NH_3 with the

formation of a *N*-aminotriazole, $H_2NN \cdot CR:N:N:CR$, and a trace of the isomeric di-

hydratetrazine, $HN \cdot CR:N:N:CR \cdot NH$. $NCCH_2CO_2Me$ reacts with $N_2H_4 \cdot H_2O$ in only 1 way, giving cyanoacethydrazide (a), $NCCH_2CONHNH_2$, which with $NaNO_2$ forms cyanoacetazide (b), $NCCH_2CON_2$. On heating with alc. (b) yields cyanomethylurethan, $NCCH_2NHCO_2R$, which on hydrolysis yields glycine, identical with that obtained from $ClCH_2CO_2Et + NH_3$, thus proving the equivalency of the 2 valencies of the Me C atom in $AcOH$ attached to Cl and CO_2H , resp. (a), prepd. by boiling 60 g. $N_2H_4 \cdot H_2O$ with 99 g. $NCCH_2CO_2Me$ in 5 vols. abs. alc. for 1 hr., long prisms, m. 114.5-15°. The HCl deriv., obtained by adding $Et_2O \cdot HCl$ to (a) in 10 vols. warm abs. alc., m. 145°, fine, white ppt. It was converted, by dissolving in H_2O , covering with Et_2O , adding shaking and evapg. the Et_2O ext., into (b), pale yellow, explosive in Et_2O it gave cyanoacetanilide, white leaves

from alc., m. 198.5-200°. On boiling (b), obtained from 6.8 g. of (a) (HCl deriv.), in 34 cc. abs. alc. until evolution of N ceased (1 hr.), and distg. off the alc., *cyanomethylurethan* was obtained as an oil which gradually crystd., lustrous needles or prisms from ligroin, m. 145°. On hydrolysis with 20% HCl it gave $\text{H}_2\text{NCH}_2\text{CO}_2\text{H}$ and NH_4Cl . *Methyl isonitrosocynoacetate hydrasine salt*, $\text{NCC}(:\text{NON}_2\text{H}_3)\text{CO}_2\text{Me}$, was obtained by adding 0.5 g. $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ to 1.28 g. $\text{NCC}(:\text{NOH})\text{CO}_2\text{Me}$ in 2 vols. alc. at room temp., yellow cryst. ppt., sinters 78°, decomp. 100°. With BzH it yields benzaldazine. By further action of $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ on the above salt, by short warming on a H_2O bath, *isonitrosocynoacethydraside hydrasine salt* (c), $\text{NCC}(:\text{NON}_2\text{H}_3)\text{CONHNH}_2$, was formed, beautiful yellow needles from alc., decomp. 135°; with FeSO_4 it gave a deep violet color which is permanent after addition of NaOH: *silver salt*, brown ppt.; *lead salt*, brown ppt. By decomp. (c) in H_2O with the calcd. amt. of HCl the free *isonitrosocynoacethydraside* (d) was obtained, brown, lustrous leaves, decomp. 166°. (d) possesses amphoteric properties due to the presence of the acid (:NOH) and basic (NHNH_2) groups, so that with warm $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ in H_2O it forms the original salt, and with HCl a *hydrochloride*, yellow, cryst. ppt., decomp. 204°. *Benzalisonitrosocynoacethydraside*, prepd. by slowly adding 3.18 g. BzH to 1.6 g. of (c) in 32 cc. H_2O , pale yellow needles from alc., decomp. 148°. Benzaldazine was also formed, and was sepd. by extrn. with Et_2O . The same benzal deriv. was also obtained from (d) and BzH. It is pptd. unchanged from alkalis by acids. Me_3CO reacts vigorously with (c), forming the *acetone derivative*, $\text{NCC}(:\text{NOH})\text{CONHN}:\text{CMe}_3$, bright yellow crystals, m. 205°. Some bisdimethylazimethylene was also formed. On mixing 2.8 g. NaNO_2 in H_2O with 3.2 g. (c) in H_2O , covering with a layer of Et_2O , then gradually adding with cooling and shaking 7.3 cc. HCl (d. 1.10), and evapg. the Et_2O ext., *isonitrosocynoacetamide* (e), $\text{NCC}(:\text{NOH})\text{CONH}_2$, was obtained, yellow oil which soon crystd., explodes on heating. Yield, 79%. It reacts with PhNH_2 on standing in Et_2O for 2 days, forming an anilide, identical with the cyanoximidoacetanilide obtained by Dimroth and Dienstbach (cf. C. A. 3, 536). On boiling with abs. alc. until evolution of N ceased it gave *isonitrosocyanomethylurethan*, $\text{NCC}(:\text{NOH})\text{NHCO}_2\text{Et}$, crystals from C_6H_6 , m. 96-7°. Hydrolysis with concd. HCl gave CO_2 , NH_3 , NH_2OH and $(\text{CO}_2\text{H})_2$. *Methyl nitrocynoacetate potassium salt*, $\text{NCC}(:\text{NO}_2\text{K})\text{CO}_2\text{Me}$, was prepd. by gently warming 38.4 g. of $\text{NCC}(:\text{NOH})\text{CO}_2\text{Me}$ in 100 cc. H_2O with 1 l. N KMnO_4 , lustrous leaves from H_2O , m. 264-6° (decompn.) (yield 57%); with AgNO_3 it gave a *silver salt*, which when decompd. with H_2S yielded *methyl nitrocynoacetate*, $\text{NCCH}(\text{NO}_2)\text{CO}_2\text{Me}\cdot\text{H}_2\text{O}$, lustrous needles, m. 76°. With KOH it forms the original K salt, and with $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ in warm MeOH the corresponding *hydrasine salt*, crystals, m. 168°. Further action of $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ converts it into *nitrocynoacethydraside hydrasine salt*, silky needles, sinters 140°, decomp. 200°. On shaking with an excess of BzH, benzaldazine together with a red N_2H_4 salt was obtained. *Nitrocynoacethydraside potassium salt* was obtained by gently warming 9.1 g. $\text{NCC}(:\text{NO}_2\text{K})\text{CO}_2\text{Me}$ with 10 g. $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ in 40 cc. H_2O , long, stellar prisms, explodes on heating. *Nitrocynoacethydraside* was obtained in 2 forms: (1) *anhydrous* (f) by adding dil. HCl to the N_2H_4 salt in H_2O , and (2) *hydrated* (g), in a similar way from the K salt. Prepd. by the latter method, it contains 1 H_2O which is not expelled *in vacuo* over H_2SO_4 , nor by heating at 110-20°, but on boiling in H_2O , the soln. becomes yellow and (f) seps., short, yellow prisms. Both forms darken but do not m. below 285°. (g) becomes dark red when boiled with 3 N NaOH, and is pptd. chiefly in the anhydrous form on addition of dil. HCl. Boiling concd. HCl has no effect on (g). (f) forms an isomeric series of salts, colorless or leuco, and colored or chromo salts. The white N_2H_4 salt can also be prepd., besides the method given above, by triturating (g) with $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$. The *red salt* prepd. by adding 3 cc. $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ to (f), warming gently and adding several vols. of abs. alc. to the intensely red liquid, sinters 185-95°, decomp. 200°, orange crystals; with dil. HCl (f) is regenerated. By

adding a slight excess of NH_4OH to (g) the *white monoammonium salt* is formed, needles. The corresponding *red salt* was prepd. by dropping NH_4OH into 0.72 g. (f), suspended in 4 cc. H_2O , until the liquid became red, and then gently warming and finally concg. to about 0.33 of the original vol., long, orange needles. Neither form m. below 275° . *Benzalnitrocyanoacetylhydrazide*, obtained by shaking a mixt. of 1.1 g. BzH and 1.62 g. (g) in dil. HCl , chars without melting and in H_2O has strong acid properties. It is decompd. by warm H_2O , giving BzH and (f). With NaNO_2 , and decompn. of the resulting salt with dil. H_2SO_4 , (g) yields *nitrocyanoacetazide*, $\text{NCCH}(\text{NO}_2)\text{CON}_3\cdot\text{H}_2\text{O}$, yellow, hygroscopic crystals; it reacts in Et_2O with PhNH_2 , forming an *aniline salt* + H_2O , yellow crystals. Boiling alc. did not convert the azide into the expected urethan, but gave a dark brown, resinous mixt. from which nothing cryst. could be sepd. It is decompd. violently by boiling H_2O , giving N, CO_2 , HCN and some CO.

D. BREMER JONES.

Quinhydrones. W. SIEGMUND. Vienna. *J. prakt. Chem.* 92, 342-70(1915).—With reference to the compn. of quinhydrones most text books of org. chem. state that quinone adds 2 mols. of a monohydric, or 1 mol. of a dihydric phenol. Several exceptions to this rule have been recently observed. S. has increased these exceptions by the prepn. of a large number of mixed quinhydrones; he makes the following distinction between a true and a mixed quinhydrone: a true quinhydrone is one formed by the combination of a quinone with its corresponding quinol, and is an intermediate product of the reduction of a quinone to a quinol, or of the oxidation of the latter to the former; a mixed quinhydrone on the other hand is an addition product which can be formed by a quinone with a phenol which is not a dihydric phenol formed by reduction of the quinone. The following mixed quinhydrones were prepd. by warming their components in Et_2O , C_6H_6 , or petr. ether: *quinhydrone*, 2:3 [the mol. proportion of the compds. will be given in the order, quinone:phenol], from equimol. amts. of toluquinone + quinol, reddish brown leaves with metallic luster, m. $133-5^\circ$; *quinhydrone*, 1:1, from toluquinone + resorcinol; *quinhydrone*, 1:1, from toluquinone + pyrocatechol, m. $50-1^\circ$, very unstable; if the components are used in the ratio 1:2, only a dark oil is obtained; *quinhydrone*, 2:3, from thymoquinone + quinol, ruby needles, decomp. 137° ; yield, 85%; *quinhydrone*, 1:1, from thymoquinone + resorcinol, decomp. $43-5^\circ$; *quinhydrone*, 1:2, from *p*-xyloquinone + quinol, red needles, m. $153-6^\circ$; yield, quant.; *quinhydrone*, 1:2, from *p*-xyloquinone + pyrocatechol, red monoclinic crystals, m. 87° ; *quinhydrone*, 1:2, from *m*-xyloquinone + quinol, dark red leaves, m. $120-1^\circ$; *quinhydrone*, 2:3, from *m*-xyloquinone + pyrocatechol, long, red needles, m. $44-5^\circ$; *quinhydrone*, 1:1, from *o*-xyloquinone + quinol, red, lustrous needles, m. 118° ; *quinhydrone*, from *o*-xyloquinone + pyrocatechol, lustrous needles, m. $60-2^\circ$; *quinhydrone*, 1:1, from toluquinone + toluquinol, black needles, m. $96-7^\circ$; *quinhydrone*, 1:1, from thymoquinone + thymoquinol, m. 64° (cf. Kremers and Wakemann, *Pharm. Rev.* 26, 329). The following were prepd. from chlorinated quinones and quinol: *quinhydrone*, 2:3, from $\text{C}_6\text{H}_5\text{ClO}_2$, bronze crystals, m. $123-4^\circ$, identical with that obtained by Schmidlin, which he considered as a mixt. (cf. *C. A.* 5, 3252(1911)); *quinhydrone*, 1:1, from $m\text{-C}_6\text{H}_3\text{Cl}_2\text{O}_2$, reddish brown needles, m. 135° , identical with that obtained by Ling and Baker (cf. *J. Chem. Soc.* 63, 1314(1893)). The following were prepd. from phenolic acids: *quinhydrone*, 1:2, from $\text{C}_6\text{H}_4\text{O}_2$ + gentisinic acid, dark red needles, decomp. gradually without melting; *quinhydrone*, 1:2, from $\text{C}_6\text{H}_4\text{O}_2$ + β -resorcylic acid, red needles without a definite m. p.; *quinhydrone*, 1:2, from $\text{C}_6\text{H}_4\text{O}_2$ + 3,4-(OH)- $\text{C}_6\text{H}_2\text{CO}_2\text{H}$, dark red crystals, m. $179-80^\circ$; *quinhydrone*, 1:1, from $\text{C}_6\text{H}_4\text{O}_2$ + orcinol, dark red, lustrous prisms, decomp. $83-4^\circ$. Both gallic acid and its Et ester yield with $\text{C}_6\text{H}_4\text{O}_2$ ordinary quinhydrone, $\text{C}_6\text{H}_4\text{O}_2\cdot\text{C}_6\text{H}_3\text{O}_2$, due to the oxidation of the former by the latter.

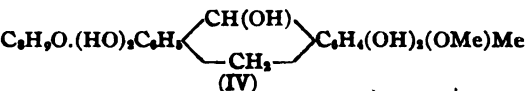
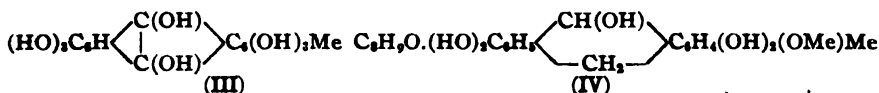
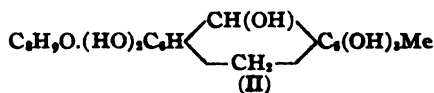
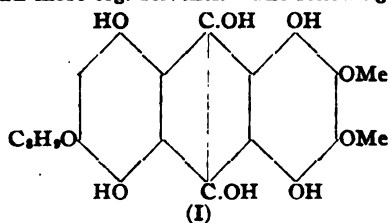
D. BREMER JONES.

Action of the three isomeric aminophenols on α -naphthoquinone. E. GROSSMANN. Vienna. *J. prakt. Chem.* 92, 370-90(1915).—2 mols. of α -C₁₀H₇O₂ (a) react with 1 mol. H₂NC₆H₄OH in such a way that 1 mol. of quinone forms, with 1 mol. of the latter, a monoanilide, while the 2nd mol. of quinone serves as an oxidizing agent: 2 α -C₁₀H₇O₂ + H₂NC₆H₄OH = C₁₀H₇O₂.HNC₆H₄OH + α -C₁₀H₆(OH)₂. *p*-Hydroxy-2-anilido- α -naphthoquinone (b), 2, α -C₁₀H₆O₂.HNC₆H₄OH, prepd. by boiling 2 mols. (a) + *p*-H₂NC₆H₄OH for several hrs. in alc., dark red needles from alc., or PhNO₂, m. 225°, gives azure-blue solns. with alkalis, and cherry-red with concd. acids. On reduction with SO₂, SnCl₂, and TiCl₃ it forms leuco compds. which in the air are oxidized back to the original dye. The above reaction also proceeds in H₂O, but very slowly. 2.781 g. (a) in 1 l. H₂O + 1 g. *p*-H₂NC₆H₄OH in 200 cc. hot H₂O became turbid after standing for several days in a dark place, and in 2 months 1.39 g. of the anilide was obtained. By boiling for several hrs. (a) and *p*-anisidine in alc., to which a little AcOH had been added, *p*-methoxyanilido- α -naphthoquinone was obtained, needles from alc., m. 158°, gives bluish violet solns. with caustic alkalis in alc., and gives the same reactions toward reducing agents and concd. acids as (b). *p*-Ethoxy derivative, similarly prepd., m. 264°, red lanceolate crystals from alc. Yield, 90%. The diacetyl derivative, 2, α -C₁₀H₆O₂.NAcC₆H₄OAc, was obtained by allowing (b) to stand for several hrs. in an excess of Ac₂O to which a few cc. of H₂SO₄ had been added, red microscopic needles, m. 170°. *p*-Ethoxy-2-acetanilido derivative, prepd. by treating the corresponding EtO deriv. with Ac₂O + concd. H₂SO₄, m. 175°, dark powder. By adding BzCl, with cooling, to (b) in C₆H₅N, allowing the mixt. to stand 6-8 hrs., and adding a few cc. of concd. H₂SO₄, the benzoyl derivative, α ,2-C₁₀H₆O₂.NBzC₆H₄OH, was obtained, red, stout prisms, m. 210°. *m*-Hydroxy-2-anilido- α -naphthoquinone (c), prepd. like (b), violet, thread-like needles, m. 242°. The following derivs. of (c) were prepd.: *methoxy derivative*, from (c) and *m*-anisidine in alc., long red needles, m. 172°; *ethoxy derivative*, from (c) and *m*-phenetidine, red needles from alc., m. 195°; *benzoyl derivative*, from (c) and BzCl + C₆H₅N, dark red needles, m. 208°. *o*-Hydroxyanilido- α -naphthoquinone, obtained from (a) and *o*-H₂NC₆H₄OH, m. 205°, dark violet crystal complex. When its alc. soln. is poured into a large vol. of H₂O and the alc. expelled by evapn., it seps. as brown flakes which m. 175°. *Methoxy derivative*, from (a) and *o*-anisidine, dark red needles, m. 146°. *Ethoxy derivative*, from (a) and *o*-phenetidine, bright red needles, m. 152°.

D. BRASSE JONES.

Lichens and their characteristic constituents. XIII. O. HESS. Feuerbach. *J. prakt. Chem.* 92, 425-66(1915); cf. C. A. 5, 2074.—This paper is partly a repetition of H.'s work during previous yrs. on the chem. constituents of various lichens, including comparisons of his results with those of other observers. A previous examn. (extrn. with Et₂O, then with Me₂CO, and washing the resulting exts. with dil. KHCO₃) of *Aspicilia calcarea* (L.) Kbr. yielded aspicilin, a chromogen, erythrin and C₃₀O₄Ca (cf. *J. prakt. Chem.* 62, 468(1900)). This lichen was reexamd. with special reference to its erythritol content. Besides the above constituents, 0.23% erythritol was obtained, m. 120°. *Evernia prunastri* L. obtained from birches, lindens, and beeches yielded atranorin and evernic acid, while that obtained from oaks gave also some usnic acid (a). The following derivs. of evernic acid were prepd.: *potassium salt* + 2 H₂O, cryst. powder; *sodium salt*, silky needles; *barium salt*, prisms; *calcium salt*, short needles from alc.; *cupric salt*, green, microscopic needles; *lead salt*, fine needles; *silver salt*, microscopic prisms; *diacetyl derivative*, cryst. powder, m. 144°, gives in alc. a pale brown soln. with FeCl₃. By heating for 30 min. out of contact with the air, 10 g. evernic acid, or 12 g. of its K salt, with 8 g. KOH in 250 cc. H₂O, and acidifying with HCl, evernicinic acid was obtained; *acetyl derivative*, short prisms from C₆H₆, m. 111°; *potassium salt*, yellow needles very explosive; *nitro derivative*, small orange needles from H₂O, becomes red 175°.

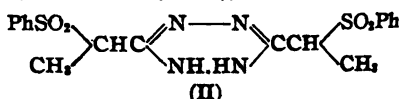
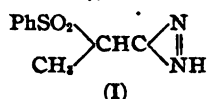
m. 195° ; *dinitro derivative* + H_2O , golden needles, m. 87° , but does not lose H_2O up to 110° . Physodylic acid, m. 196° , which together with atranorin and evernunic acid was obtained from *Evernia furfuracea*, is identical with isidic acid found in the same lichen by Zopf (*Chem. Zentr.* 14, 105 (1903)). *Parmelia caperata* (L.), obtained from 3 different sources, yielded the following constituents: (1) from linden trees, capraric acid (b), 3.4%, caperatic acid (c), 2%, and a little of (a); (2) from rocks from a mountain, (b) 2.6%, (c) 2% and (a); (3) from a stone wall, (b) 6%, (c) 2% and (a). No trace was detected of caperin or caperidin, which are easily obtained from lichens grown on oak trees. An examn. of *Solorina crocea* (L.) Ach. showed the following constituents: solorinic acid (I), microscopic leaves from 2 C_6H_6 + alc., m. 202° , gives a violet soln. with caustic alkalis, and red with concd. H_2SO_4 ; *benzoyl derivative*, by heating 1 mol. of (I) with 4 Bz_2O for 4 hrs. at $90-100^{\circ}$, brown needles from AcOH, m. 153° , gives a dark, brownish red color with $FeCl_3$ in alc.; solorinol (II), by reducing (I) with Zn dust + AcOH, yellow cryst. powder, m. 162° ; on reduction with HI (I) is converted into *solorol* $C_{18}H_{14}O_7$, microscopic leaves, m. 216° ; with $FeCl_3$ in AcOH it gives a black soln. which on diln. becomes violet; heated with Ac_2O + $AcONa$ for 3 hrs. at $90-100^{\circ}$ it forms a *heptaacetyl derivative*, yellow-brown needles, m. 215° . Oxidation of this in glacial HOAc soln. with CrO_3 gives *hexacetylsolorone*, $C_{18}H_4(C_2H_5O)_6O_8$, yellowish brown needles, m. 197° . By boiling the latter with dil. KOH, and pptg. with HCl *solorone* (III), $C_{18}H_{18}O_8$, was obtained, scarlet needles, m. 280° . From the same lichen were furthermore isolated *hydrosolorinol* (IV), microcryst. powder, bluish violet in transmitted, and black in reflected light, gives a violet soln. with alkalis and most org. solvents. The following structures are suggested:



Soloric acid (d), $C_{18}H_{18}O_7$, needles, m. 205° ; in alc. it gives acid reaction, and with $CaCl_2$ a bluish red soln., which disappears on further addition of $CaCl_2$. On heating for 6 hrs. with MeOH it yields *methyl β -orcinolcarboxylate*, lustrous needles, m. 143° ; in alc. with a little $FeCl_3$ it gives a blood-red soln. (d) is a homolog of gyrophoric acid. Extn. of *Cladonia macilenta* (Ehrh.) Hoffm. yielded coccellic 0.4%, thamnolic 0.1%, and rhodocladonic acids. *Cladonia tenuis*, Floerke, yielded fumarprotocetraric acid (e) and δ -(a). Several different varieties of *Cladonia fimbriata* were examd. which showed distinct differences in the products obtained by extn. with Et_2O , $CHCl_3$ and Me_2CO . *Cladonia crispata* (Ach.) var. *gracilescens* (Rabenhorst) gave squamatic acid and cladonin, while *Cladonia condensata* (Flörke) Zopf. yielded (e), δ -(a) and cornicularin (f). From *Cladonia papillaria* (Ehrh.) var. *molariformis* (Hoffm.) were obtained atranorin, protolichesterinic acid and cladonin. Results obtained previously by H. and other investigators on the following lichens were confirmed: *Cornicularia aculeata* var. *stuppea* Fw., and *acanthella* Ach., and *Pertusaria ocellata variolosa* Fw. D. BRÉSE JONES.

α -Arylsulfonated nitriles. J. TROGER AND WUNDERLICH. Tech. Hochschule Braunschweig. *Arch. Pharm.* 253, 214-32 (1915).—By the action of arylsulfonates

on ClCH_2CN , derivs. of the general type, $\text{RSO}_2\text{CH}_2\text{CN}$, are formed (cf. *J. prakt. Chem.* [2] 71, 201-35), the H atoms of the CH_2 being replaceable by Na and alkyls (cf. *ibid* 72, 323), as also by aldehyde and oxime groups (cf. *ibid* 78, 123). Furthermore, the CN readily unites with H_2S and NH_4OH (cf. *ibid* 71, 201, 236). In the present investigation, an attempt has been made to prep. the hitherto unknown mono-Me derivs. of arylsulfoneacetonitriles and to study their activity. These new Me derivs. occupy a position midway between arylsulfoneacetonitriles and their dialkyl derivs. As the starting point for these expts. MeCHClCN (from MeCH(OH)CN and PCl_5), b. $123-4^\circ$ ($122-3^\circ$ according to Henry, *Belg. Acad. Bull.* 35, 360), was employed. On heating this compd. 8 hrs. with PhSO_2Na in a closed tube at $130-40^\circ$, α -benzenesulfonepropionitrile, $\text{PhSO}_2\text{CHMeCN}$, was obtained, needle-like prisms, m. 72° , very easily sol. in cold Et_2O , sol. in boiling H_2O , insol. in cold dil. NaOH . Attempts to prep. the compd. from $\alpha\text{-MeCCl}_2\text{CN}$ and PhSO_2Na were unsuccessful. Comparative studies on $\text{PhSO}_2\text{CH}_2\text{CN}$ and $\text{PhSO}_2\text{CHMeCN}$ with respect to their behavior toward 0.1 N NaOH at H_2O bath temp. revealed a max. hydrolytic limit of about 68%, at which point PhSO_2Me and PhSO_2Et begin to split off. Hydrolysis of the nitriles carries them beyond the corresponding amides. α -Benzenesulfonepropionamide, stout needles, m. 150° . α -Benzenesulfone- α -methylethenylamidoxime, $\text{PhSO}_2\text{CHMeC(NH)}_2\text{N}$:NOH, needle-like prisms, m. 147° , and the compound, $\text{C}_8\text{H}_{10}\text{O}_2\text{N}_2\text{S}$ (I or II), needles, m. 79° , are formed



on treating the nitrile with NH_4OH . α -Benzenesulfonethiopropionamide, $\text{C}_8\text{H}_9\text{ONS}_2$, by treating the nitrile in alc. NH_3 with H_2S , needle-like prisms, m. 159° , sol. in cold dil. NaOH without decompn. α -*p*-Toluenesulfonepropionitrile, from MeCHClCOCN and $p\text{-MeC}_6\text{H}_4\text{SO}_2\text{Na}$, bright yellow warty cryst. aggregates, m. 66° . Propionamide, leaflets, m. 166° . α -Methylethenylamidoxime, needle-like prisms, m. $140-1^\circ$. Thiopropionamide, yellowish, needle-like prisms, m. 149° . α -*p*-Chlorobenzenesulfonepropionitrile, $\text{C}_8\text{H}_8\text{O}_2\text{NSCl}$, rhombic leaves, m. $101-2^\circ$, practically insol. in H_2O , slightly sol. in cold dil. caustic alkalies. Propionamide, needle-like prisms, m. 190° . α -Methylethenylamidoxime, needles, m. 141° . Thiopropionamide, needle-like prisms, m. $140-1^\circ$, easily sol. in cold dil. NaOH without decompn. α -*p*-Bromobenzenesulfonepropionitrile, $\text{C}_8\text{H}_7\text{O}_2\text{NSBr}$, leaflets, m. 98° . Propionamide, leaflets, m. 196.5° . α -Methylethenylamidoxime, needle-like prisms, m. 145° . Thiopropionamide, yellowish, needle-like prisms, m. 176° . α -*p*-Iodobenzenesulfonepropionitrile, needle-like prisms, m. 115° . Propionamide, needle-like prisms, m. 210° . α -Methylethenylamidoxime, needles, m. 167° . Thiopropionamide, yellowish, needle-like prisms, m. 182° . W. O. E.

Arylamides of thiocynoacetic acid and arylthiohydantoins. H. BRCKURTS AND G. FRERICHS. *Tech. Hochschule Braunschweig. Arch. Pharm.* 253, 233-65 (1915).—On treating chloroacetaryl amides (from ClCH_2COCl and arylamines) with KCNS there is formed in certain instances an isothiocyanoacetyl compd., $\text{SCNCH}_2\text{CONHR}$, which very soon changes into the normal thiocyanoacetyl compd., $\text{NCSCH}_2\text{CONHR}$. In most cases the latter form is the one obtained, the former being well-nigh impossible of isolation in a pure state. On heating the normal thiocyanoacetyl compds. with H_2O or AcOH ,

they finally pass into arylthiohydantoins, $\text{HN} \cdot \text{CS} \cdot \text{CH}_2 \cdot \text{CO} \cdot \text{NR}$. In the case of thiocyanoacet-*o*-nitranilide, -*o*-anisidide and -*p*-phenetidide, this change takes place very readily, while with thiocyanoacet-*m*- and -*p*-nitranilide the transformation is accomplished with considerable difficulty, conditions obtaining apparently on account of the varying solubilities of these compds. Thiocyanoacetyl compds. only very slightly sol.

in H_2O and convertible only with difficulty into thiohydantoin are changed into the latter much more readily in $AcOH$. Arylthiohydantoin are both bases and acids, yielding with HCl cryst. salts (decompd. by H_2O), the same also with $NaOH$, although in the latter case simple addition takes place, yielding compds. possibly of the con-

stitution, $H_2N(ONa)C.S.CH_2.CO.NR$, which with alkyl halides form alkylated arylthiohydantoin. After protracted heating of arylthiohydantoin with HCl , preferably in a tube, substitution of the NH group for O takes place, thus yielding aryl derivs. of

mustard oil glycolides, $CO.S.CH_2.CO.NR$. In naming substituted thiohydantoin, the notation $HN:\overset{\gamma}{C}.S.\overset{\alpha}{C}CH_2.\overset{\beta}{CO}.NH$ is used. The following compds. were isolated and

characterized: *Chloroacet-m-toluide*, $MeC_6H_4.NHCOCH_2Cl$, prisms from C_6H_6 , m. $90-1^\circ$. *Isothiocyanacet-m-toluidide*, $SCNCH_2.CONHC_6H_7$, reddish white leaflets (not quite pure), m. 99° , is changed by protracted boiling in soln. or long standing in dry condition into the normal *thiocyanacet-m-toluidide*, $NCSCH_2.CONHC_6H_7$, microscopic, faintly yellow, hexagonal, oblique prisms from dil. alc., m. 136° . β -*m-Tolylthiohydantoin*, $C_{10}H_{10}ON_2S$, microscopic, quadratic leaves from dil. alc., m. 161° , easily sol. in alc., Et_2O and $AcOH$, less so in hot H_2O . Na compd., $C_{10}H_{10}ON_2S.NaOH.4H_2O$, leaflets. γ -*Ethyl- β -m-tolylthiohydantoin*, $C_{12}H_{14}ON_2S$, microscopic hexagonal prisms from dil. alc., m. $106-7^\circ$. *m-Tolylmustard oil glycolide*, $C_{10}H_9O_2NS$, needles from dil. alc., m. $90-1^\circ$. *Chloroacetpseudocumidide*, $Me_2C_6H_2NHCOCH_2Cl$, needles from alc., m. 159° . *Thiocyanacetpseudocumidide*, $C_{12}H_{14}ON_2S$, yellowish white, cubical crystals, m. 105° . β -*Pseudocumylthiohydantoin*, $C_{12}H_{14}ON_2S$, yellowish prisms from $AcOH$, m. 210° . The *hydrochloride*, $C_{12}H_{14}ON_2S.HCl$, yellowish prisms. $C_{12}H_{14}ON_2S.NaOH.5H_2O$, needles. γ -*Ethyl- β -pseudocumylthiohydantoin*, $C_{14}H_{18}ON_2S$, faintly yellow needles, m. 138° . The corresponding glycolide could not be prepd. *Chloroacet-p-chloroanilide*, $C_6H_4ONCl_2$, needles, from alc., m. 169° . *Isothiocyanacet-p-chloroanilide* was detected qual. in the reacting soln., but passed on crystn. from alc. into the normal *thiocyanacet-p-chloroanilide*, microscopic needles, m. 126° . β -*p-Chlorophenylthiohydantoin*, needles from alc., m. 213° . The *hydrochloride*, $C_6H_4ON_2ClS.HCl$, forms elongated leaflets, the *sodium hydroxide compound*, $C_6H_4ON_2ClS.NaOH.5H_2O$, brown acicular needles. γ -*Ethyl- β -p-chlorophenylthiohydantoin*, microscopic needles from dil. alc., m. $106-7^\circ$. *p-Chlorophenylmustard oil glycolide*, needles from alc., m. 145° . *Chloroacet-m-chloroanilide*, thick leaves from C_6H_6 , m. 101° , more readily sol. than the *p*-deriv. *Thiocyanacet-m-chloroanilide*, microscopic quadratic needles from alc., m. $165-6^\circ$. β -*m-Chlorophenylthiohydantoin*, needle-like aggregates from alc., m. $180-1^\circ$. The *hydrochloride* forms small yellowish oblong crystals, the *sodium hydroxide compound* $C_6H_4N_2ClS.NaOH+4.5H_2O$, reddish brown cryst. powder. The γ -ethyl- β -m-chlorophenylthiohydantoin could not be obtained in a pure state. *m-Chlorophenylmustard oil glycolide*, yellow needles, m. $116-7^\circ$. *Chloroacet-o-nitroanilide*, bright yellow needles from alc., m. 88° . *Thiocyanacet-o-nitroanilide*, cryst. powder, m. 154° . β -*o-Nitrophenylthiohydantoin*, plates, m. 172° . The *sodium hydroxide compound* has 3 mols. H_2O crystn. and forms yellow needles. The corresponding glycolide could not be prepd. γ -*Ethyl- β -o-nitrophenylthiohydantoin*, thick, light brown oil. *Chloroacet-m-nitroanilide*, yellowish leaves from alc., m. 114° , less sol. than the *o*-deriv. *Thiocyanacet-m-nitroanilide*, yellow quadratic needles from alc., m. 180° , less sol. than the *o*-deriv. β -*m-Nitrophenylthiohydantoin*, bright yellow tufts of microscopic needles from hot H_2O , m. 199° , less sol. than the *o*-deriv. The salt, $C_6H_4O_2N_2S.NaOH.2H_2O$, yellowish brown microscopic cryst. powder. γ -*Ethyl- β -m-nitrophenylthiohydantoin*, very like the *o*-deriv. *Chloroacet-p-nitroanilide*, yellowish leaves from alc., m. 182° . *Thiocyano-*

acet-p-nitroanilide, bright yellow needles from alc., m. 174°. *β-p-Nitrophenylthiohydantoin*, bright yellow oblong microscopic leaves, m. 245°. The salt, $C_8H_7O_2N_2S.NaOH.4H_2O$, yellow needles. *γ-Ethyl-β-p-nitrophenylthiohydantoin*, yellow needles, m. 129°. The other *p*-derivs. are less sol. than the corresponding *o*-derivs. *Chloroacetnitrotoluidide*, 3,4-(O_2N)($CICH_2CONH$) C_6H_4Me , from *p*- $MeC_6H_4NHCOCH_2Cl$ and HNO_3 (1.41), or from nitrotoluidine and $CICH_2COCl$, yellow needles from alc., m. 119°. *Thiocyanoacetnitrotoluidide* (1:4:3), yellowish needles, m. 133°. *β-Nitrotolylthiohydantoin* (1:4:3), bright yellow microscopic cryst. powder, m. 185°. *γ-Ethyl-β-nitrotolylthiohydantoin*, thick, light brown oil, easily sol. in alc., Et_2O , $AcOH$ and dil. acids. *Chloroacetnitrotoluidide* (1:4:2), 2,4- O_2N ($CICH_2CONH$) C_6H_4Me , bright yellow prisms from alc., m. 129°. *Thiocyanoacetnitrotoluidide* (1:4:2), microscopic, quadratic leaves from alc., m. 184°. *β-Nitrotolylthiohydantoin* (1:4:2), small, 4-sided prisms from alc., m. 206-7°. The salt, $C_{10}H_9O_2N_2S.NaOH.2H_2O$, yellow, microscopic needles. *γ-Ethyl-β-nitrotolylthiohydantoin* (1:4:2), yellow, hexagonal, microscopic leaflets from alc., m. 142°. *Chloroacetnitrotoluidide* (1:2:5), 5,2- O_2N ($CICH_2CONH$) C_6H_4Me , bright yellow needles from alc., m. 122°. *Thiocyanoacetnitrotoluidide* (1:2:5), 4-sided, microscopic prisms from alc., m. 158°. *β-Nitrotolylthiohydantoin* (1:2:5), yellow, microscopic, rhombic leaves from alc., m. 172°. The salt, $C_{10}H_9O_2N_2S.NaOH.3H_2O$, yellow, microscopic, tufted needles. *γ-Ethyl-β-nitrotolylthiohydantoin* (1:2:5), yellow, microscopic, rhombic leaves, m. 127-8°. *Chloroacet-p-anisidide*, acicular prisms from C_6H_6 , m. 122°. *Isothiocyanoacet-p-anisidide*, leaflets, not obtainable in a pure state. *Thiocyanoacet-p-anisidide*, yellowish prisms, m. 110-1°. *β-p-Methoxyphenylthiohydantoin*, leaves soon changing to yellowish brown, m. 184°. The hydrochloride, $C_{10}H_{10}O_2N_2S.HCl$, yellowish leaflets. The sodium hydroxide salt has 4 mols. H_2O of crystn. *γ-Ethyl-β-p-methoxyphenylthiohydantoin*, prisms from dil. alc., m. 84-5°. *p-Methoxyphenylmustard oil glycolide*, needles from alc., m. 166°. *Chloroacet-o-anisidide*, fine needles from alc. or stout, rhombic tablets from the oily crude product on addition of alc. and concd. HCl in the cold, m. 51°. *Thiocyanoacet-o-anisidide*, prisms from alc., m. 72°. *β-o-Methoxyphenylthiohydantoin*, yellowish, 4-sided prisms from alc., m. 149°, crystals from $AcOH$ with 1 mol. $AcOH$, m. 110-1°. The hydrochloride, yellow prisms. The sodium hydroxide compound, needles. *γ-Ethyl-β-o-methylphenylthiohydantoin*, $C_{12}H_{14}O_2N_2S$, yellow, rhombic tablets from alc., m. 126-7°. *o-Methoxyphenylmustard oil glycolide*, yellow, rhombic tablets, m. 113-4°. *Thiocyanoacet-p-phenetide*, microscopic, 4-sided prisms from C_6H_6 , m. 130-1°. *β-p-Ethoxyphenylthiohydantoin* (d. Grothe, *ibid* 238, 612), needles from alc., m. 167°. The hydrochloride, yellowish needles. The sodium hydroxide compound, $C_{11}H_{12}O_2N_2S.NaOH.4H_2O$, yellowish white prisms. *γ-Ethyl-β-p-ethoxyphenylthiohydantoin*, $C_{13}H_{16}O_2N_2S$, yellowish brown, rhombic plates from alc., m. 94-5°. *p-Ethoxyphenylmustard oil glycolide*, yellowish needles from alc., m. 155-6°. W. O. E.

Nitro derivatives of alkylbenzidines. G. VAN ROMBURGH. *Proc. Akad. Wetenschappen* 18, 757-60(1915).—P. van Romburgh (*Rec. trav. chim.* 5, 240(1886)) showed that in the nitration of $PhNMe_2$ there are formed as by-products derivs. of tetranitrobenzidine (a), without detg. the positions of the NO_2 groups. G. van R. has studied the structure of these compds. and has prepd. a number of NO_2 derivs. of alkylbenzidines. He prepd. (a) in 35% yield by adding 30 g. $PhNMe_2$ to 900 cc. HNO_3 (d. 1.11) at 5° and allowing to stand overnight. Recrystd. from $PhOH$ it decomps. 272°. *Tetra-nitrodiphenyl diethyl ether* (b), long, transparent needles, m. 256-7°, was prepd. from fuming HNO_3 and [*p*- $EtOC_6H_4$] $_2$. Two g. (b) with 1 g. Me_2NH in 25 cc. $EtOH$ in a sealed tube at 120° gave [$(NO_2)_2C_6H_4OH$] $_2$. This, boiled with concd. HNO_3 , yielded picric acid, showing that the NO_2 groups in (b) must be in the positions 3,5,3',5'. No [$(NO_2)_2C_6H_4NMe_2$] $_2$ was formed. By treating (b) with $MeNH_2$, R. obtained 3,5,3',5'.

tetraamino dimethylbensidine, dark red crystals from PhOH, decomp. 282° . Similar alkyl derivs. were formed from (b) and EtNH_2 , PrNH_2 , iso-PrNH_2 , iso-BuNH_2 and $\text{C}_4\text{H}_9\text{NH}_2$. These will be described in a paper soon to be published in *Rec. trav. chim.* By reduction of the NO_2 compds. with Sn and HCl were prepd. *tetraaminotetramethylbensidine hydrochloride*, colorless needles, with 4 HCl and 2 H_2O , decomp. 251° ; *tetraaminodimethylbensidine hydrochloride*, colorless needles with 4 HCl and 1 H_2O . By diazotizing these NH_2 compds. and condensing with naphthylamino- and naphthol-sulfonic acids were obtained red to bluish violet dyes, some of which dye cotton without a mordant.

E. H.

Bixin. I. J. RINKES. *Chem. Weekblad* 12, 996-1000(1915).—For the prepn. of methylbixin annatto paste was used, from which the resin was previously extd. with acetone. Mono-K bixinate was then obtained from the resin-free paste. This compd. was transformed into methylbixin with the help of Me_2SO_4 , recrystd. from AcOEt and twice from acetone, dried at 100° *in vacuo* and kept over P_2O_5 . Calcd. C 77.09%; found C 77.15%, H 7.90%. Methylbixin in 15 parts of dry CHCl_3 was ozonized in 10 g. portions, until the deep red soln. showed a slightly yellow tinge. The CHCl_3 was removed *in vacuo* below 22° , the syrupy ozonide allowed to stand for 12 hrs. and heated at 90° for 2 hrs. The aq. soln. of the aldehydes was distd. off *in vacuo* under cooling with CO_2 . The distillate reduces Fehling's soln. A portion of it was treated with PhNHNH_2 in 50% AcOH , and allowed to stand for a day, after which a deposit of slightly yellow needles occurred. After recrystn. from alc. it m. 148° , which is the m. p. of methylloxalbisphenylhydrazone. The remainder was treated with $p\text{-O}_2\text{NC}_6\text{H}_4\text{NHNH}_2$ in 50% AcOH ; the largest part of the resulting phenylhydrazone was insol. in alc. The total quantity was boiled with alc. and the insol. part recrystd. from PhNO_2 in which it is readily sol. when heated, and from which it crystallizes in small needles, decomp. about 300° ; the temp. of decompn. of methylglyoxalbis- p -nitrophenylhydrazone being $302\text{--}304^{\circ}$. With alc. and NaOH a deep blue color was formed. From the mother liquid of the nitrophenylhydrazones a nicely crystd. compd. was deposited within a few days. This after 2 recrystns. from alc., m. 206° ; it produced a red color with alc. NaOH. This compd. appeared to be acetyl- p -nitrophenylhydrazine. Another quantity of the aldehyde mixt. made from methylbixin as previously described was treated with semicarbazide and allowed to stand overnight. The resulting cryst. mass only slightly dissolved in the usual solvents, and when decolorized with animal charcoal, m. $255\text{--}256^{\circ}$, the m. p. of methylglyoxalbissemicarbazone. Methylglyoxalbissemicarbazone, obtained through the ozonization of mesitylene m. 256° . From all these properties it appears that one of the decompn. products of methylbixin ozonide is methylglyoxal.

J. T. FLOHL.

Biochemical synthesis by the aid of α -glucosidase of the α -monoglucoside of isopropylene glycol. E. BOURQUELOT AND A. AUBRY. *J. pharm. chim.* 12, 283-9 (1915); *Compt. rend.* 161, 364-7(1915); cf. *C. A.* 9, 1309.—In a preliminary expt., 7 mixts., each containing 1 g. dextrose in 70 cc. H_2O , 10 cc. of yeast ext. (10 g. air-dry bottom yeast extd. for 24 hrs. with 100 cc. H_2O , filtered), 10 drops PhMe , and severally 10, 20, 30, 40, 50, 60 and 70 g. of $\text{MeCH(OH)CH}_2\text{OH}$ and sufficient H_2O to make 100 cc., were left at ordinary temp. for 95 days. The march of optical rotation showed growth of the synthetic action up to 40 g. per 100 cc.; but with 50 g., destruction of the enzyme was almost complete. This places the toxicity of this glycol between that of EtOH (36-40 g.) and $\text{CH}_2\text{(OH)CH}_2\text{OH}$ (70-75 g. per 100 cc.). To prep. the new glucoside, a mixt. of 93 g. dextrose, 150 cc. H_2O , 248 g. $\text{MeCH(OH)CH}_2\text{OH}$ (37 g. per 100 cc.), 195 cc. ext. of air-dried bottom yeast, and H_2O to make 665 cc., is kept at ordinary temp. for 127 days. On the 62nd day 45 cc. more of yeast ext. was added to replenish α -glucosidase eventually destroyed. The optical rotation increased by

8° 18'. Now boil the mixt., cool, add 3 vols. 95% EtOH to ppt. colloids, filter, recover the EtOH by distn., then the unchanged glycol by distn. at 115–120° in a partial vacuum, dissolve the nearly black ext. in 1000 cc. H₂O, destroy excess of dextrose, by the aid of fresh yeast, filter, defecate with Pb subacetate, remove Pb by H₂S and again distil under reduced pressure. The red-brown ext. (66 g.) was treated with boiling AcOEt which removed the rest of the glycol and small amts. of the glucoside. No crystals could be obtained. Again evapd. to firm consistency *in vacuo*, the residue was extd. with 14 times 500 cc. AcOEt. The solvents evapd. left only 8 g. It was purified by treatment with 50 cc. of abs. EtOH and 30 cc. Et₂O, and the degree of glucosidification in the evapd. ext. was detd. by hydrolysis with H₂SO₄ in H₂O soln. The amt. of dextrose found indicated a slightly impure *isopropylene glycol mono- α -D-glucoside*. By observing the march of optical rotation in 2 specimens when hydrolyzed by the α -glucosidase of yeast ext., two monoglucosides, corresponding to the 2 alc. functions of the glycol, appear to be formed; in one $[\alpha]_D > 143.5^\circ$, in the other $+134.7^\circ$. S. WALDBOTT.

Addendum (to the action of aldehydes on hydramines of the pyrrolidine and piperidine series). K. HESS. Univ. Freiburg i/B. *Ber.* 48, 2067–8 (1915); cf. *C. A.* 10, 467.—In the exptl. part of the former paper it was neglected to report how the HCHO formed when 1-(α -N-methylpiperidyl)ethan-2-al is warmed some time with alkali was identified. The soln. acidified with AcOH and treated with the calcd. amt. of PhNHNH₂, deposits after some time in ice leaflets, m. sharply 156.5°, of the hydrazone C₇H₁₂N₂. CHAS. A. ROUILLER.

Yohimbine. III. Composition of yohimbine and its relationships to yohimboic acid. Mesoyohimbine, a new yohimbe alkaloid. L. SPIEGEL. Univ. Berlin *Ber.* 48, 2077–83 (1915); cf. *Ibid* 38, 2825 (1905); Fournéau and Page, *C. A.* 8, 2704.—S. believes he has obtained definite proof that yohimbine (a) has the compn. C₂₁H₃₃O₂N₂, and, therefore, differs by 2 C atoms from yohimboic acid (b), C₂₀H₂₈O₄N₂; this proof consists in the discovery of a compd. intermediate between (a) and (b), *vis.*, *mesoyohimbine*, C₂₁H₃₃O₂N₂ (c). The (a) was obtained from the com. hydrochloride (Güstrow) by pptn. with NH₄OH and recrystd. from 50% alc. until it m. 234.5° constantly and no (c) could be detected in the mother liquors; analyses then showed 71.62–71.94% C, 7.42–7.73% H and 7.74% N. If a sample of (a) containing some (c) is crystd. from 50% alc. and the mother liquors are concd. on the H₂O bath to incipient crystn., the crystals obtained on cooling are less well defined and melt lower, and by repeated recrystn. from the least possible amt. of 50% alc. the (a) can be completely removed and (c) is finally obtained in spherical aggregates sepg. from C₆H₆ or abs. alc. in needles m. 247°, with 70.98–71.09% C, 7.48–7.69% H, 7.95% N, 8.41% MeO. Perfectly pure (a) can be partially converted into (c) by heating 1 g. of it 5 hrs. with 20 cc. alc. and 0.5 mol. KOH; all attempts, however, to prep. (c) from (b) or (a) from (c) by esterification have thus far failed. (c) in general behaves like (a) but is more difficultly sol. in abs. alc. and C₆H₆ and more easily sol. in aq. alc., dissolves almost without color in concd. H₂SO₄ and remains so for 24 hrs.; addition of a crystal of bichromate to the soln. produces a blue-green color. (c) is *d*-rotatory apparently to about the same degree as (a). Its hydrochloride seps. from H₂O in needles. Physiologically, (c) has an action similar to but weaker than that of (a). The presumed identity of yohimbine and quebrachine. *Ibid* 2084–7.—S. has found that Merck's "quebrachine" consists essentially of (a) mixed with a little (c). The description given by Fournéau and Page of their (a) and "quebrachine" differs in some respects, however, from that of the product obtained by Hesse from *Quebracho blanco* (*Ann.* 211, 265 (1882)). H.'s original prepn. was no longer available for direct comparison and S. attempted to prep. the substance from the bark according to H.'s directions but was unable to obtain either (a) or any substance which could with certainty be said to correspond to

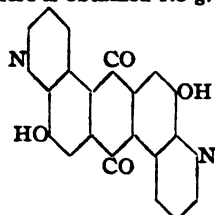
H.'s compd.; after repeated fractionation by pptn. and crystn. were obtained only a few crystals, apparently not quite pure, m. 201° , sol. almost without color in concd. H_2SO_4 , and giving with bichromate a transient blue color, while in alc. or dil. HCl , FeCl_3 gives a yellow color. S. concludes that in many barks of *Quebracho blanco* are present alkaloids of the (a) group and probably (a) itself (cf. also Ewins, *C. A.* 9, 606; Barger and Field, *C. A.* 9, 2888), but that it cannot be definitely stated that H.'s original product was identical with (a).
CHAS. A. ROULLER.

β -Binaphthol and β -hydroxy- α,β -naphthyl ether. O. HINSBERG. Freiburg i. B. *Ber.* 48, 2092-5(1915); cf. *C. A.* 9, 2064.—The compd. $\text{C}_{20}\text{H}_{14}\text{O}$, m. 197° , obtained as chief product of the treatment of dehydro- β naphthol sulfone with Zn, AcOH and HCl and supposed to be a binaphthol, has now been found to be β -hydroxy- α,β -naphthyl ether, $\text{HO}(\text{C}_{10}\text{H}_7\text{O})\text{C}_{10}\text{H}_7$ (a). In an attempt to synthesize it, α,β - $\text{C}_{10}\text{H}_7\text{Br}(\text{OH})$ was heated 15 min. at 230° with 2.5 parts Cu powder but gave β,β' -dinaphthol, m. 216° , also obtained as the chief product when 2 g. $\text{C}_{10}\text{H}_7\text{Br}(\text{OH})$ and 1.2 g. β -naphthol are warmed with 0.4 g. Na in dil. MeOH; if no β -naphthol is used the reaction takes an entirely different course, a light yellow product insol. in alkalies being formed. (a) does not react with ketone reagents; the alk. soln. with $\text{K}_3\text{Fe}(\text{CN})_6$ forms a yellow ppt. Analysis of the acetate previously described which m. 115° gave varying results, all of which, however, were low for a monoacetate; the compd. seems to retain varying amts. of solvent which are lost only slowly and incompletely on drying. *m*-Nitrobenzenesulfonate, needles from MeOH- CHCl_3 , m. 139° . *p*-Nitrobenzoate, light yellow needles from AcOH, m. 154° .
CHAS. A. ROULLER.

8-Hydroxyquinolinecarboxylic acids and their derivatives. Dihydroxyanthraquinone-3,7-di quinoline. ST. VON NIEMENTOWSKI AND ED. SUCHARDA. Lwów. *Ber.* 49, 12-24(1916).—8-Hydroxyquinoline-5-carboxylic acid (a) is obtained in 30 g. yield from 100 g. 4,3-HO(H_2N) $\text{C}_6\text{H}_3\text{CO}_2\text{Me}$ ("orthoform new"), 150 g. As_2O_3 , 300 g. glycerol and 300 g. concd. H_2SO_4 heated 3 hrs. at 140 – 50° . The cooled mass is dild. with an equal vol. of H_2O , the resulting sulfate filtered after 21 hrs., recrystd. 3 times from H_2O containing H_2SO_4 , treated in acid soln. with NH_3 until still just faintly acid and the free (a) pptd. with NaOAc; it is then treated with hot 10% NH_4OH until a satd. soln. is formed and the resulting cryst. NH_4 salt decompd. in hot H_2O with AcOH. It seps. from AcOH in yellowish microcrystals, m. 301° , decomp. a few degrees higher into CO_2 and 8-hydroxyquinoline (b); the same decompn. occurs on long boiling of the aq. neutral, alk. or acid soln.; the aq. soln. gives a green color with FeCl_3 but no color with FeSO_4 ; boiling dil. HNO_3 oxidizes it and concd. acid nitrates it at room temp. It is identical with the acid, m. 280° , obtained by Lippmann and Fleissner from (b) and CCl_4 (*Ber.* 19, 2467(1886)). Hydrochloride, needles with 1 H_2O from 20% HCl , m. 260° (foaming), partially hydrolyzes in H_2O . Sulfate, $(\text{C}_{10}\text{H}_7\text{O}_2\text{N})_2\text{H}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$, yellow microcrystals from 2.5% H_2SO_4 , m. 240° . Barium salt, needles with 2 H_2O ; excess of (a) boiled with an aq. suspension of $\text{Ba}(\text{OH})_2$ dissolves with yellow color in the form of the acid salt. Ammonium salt, loses NH_3 in the air. Ethyl ester, from 10 g. (a) in 150 g. concd. H_2SO_4 heated 4 hrs. on the H_2O bath with 30 cc. alc., needles from C_6H_6 , m. 125° . Heated 2 hrs. at 150° with 16 parts of concd. H_2SO_4 (a) yields a hydroxyquinolinesulfonic acid, needles from H_2O , m. 295 – 300° , probably identical with Claus' 8,5- $\text{C}_8\text{H}_4\text{N}(\text{OH})\text{SO}_3\text{H}$ (*J. prakt. Chem.* 55, 457(1897)); the mother liquors after some weeks deposit a substance m. 272 – 8° , possibly Claus and Posselt's *o*-hydroxyquinoline-disulfonic acid (*J. prakt. Chem.* 41, 32(1890)). With KMnO_4 in boiling dil. alk. soln. (a) gives quinolinic acid. 8-Hydroxyquinoline-6-carboxylic acid (c) is obtained in 73 g. yield from 100 g. 3,4-HO(H_2N) $\text{C}_6\text{H}_3\text{CO}_2\text{Me}$ ("orthoform"), 150 g. As_2O_3 , 300 g. glycerol and 300 g. H_2SO_4 heated 3 hrs. at 155 – 60° ; after dildn. with an equal vol. of H_2O and standing 12 hrs., the filtered soln. is pptd. with NaOH in fractions, the dried ppts. taken up

in the least possible amt. of dil. HCl and pptd. as the HCl salt with concd. HCl and the free (c) obtained from the salt by treatment in hot H₂O with NH₄OH and NaOAc and crystn. from AcOH; it m. 284°, dissolves in alkalis and mineral acids, gives a green color with FeCl₃ in H₂O but no color with FeSO₄, oxidized by boiling dil. HNO₃, converted into the mono- and di-NO₂ derivs. by concd. HNO₃ at room temp., can be sublimed or distd. over lime without change, oxidized by KMnO₄ to quinolinic acid. *Hydrochloride*, yellow-bronze crystals with metallic luster, m. 312°, sol. in H₂O without being hydrolyzed. *Sulfate*, yellow microcrystals with 1 H₂O, m. 307°. *Phosphate*, (C₁₀H₇O₂N)₃·H₃PO₄·0.5H₂O, gray-yellow microcryst. ppt., m. 285°. *Ammonium salt*, slowly decomps. at room temp., instantly at 120°. *Acid silver salt*, from a boiling aq. soln. of (c) and AgNO₃, light gray ppt.; *neutral salt*, from a boiling soln. of the NH₄ salt and AgNO₃, microcryst. gray-yellow ppt. *Barium salt*, gray cryst. ppt. *Ethyl ester*, needles from C₆H₆, m. 147°, sublimes in leaflets. When 50 g. (c) is heated 4 hrs. at 240° with 350 g. H₂SO₄ and 70 g. P₂O₅, poured into 2.5 l. H₂O, cooled, treated with NH₄OH until still just acid, filtered after 3 hrs., boiled with dil. HCl, then with H₂O, extd. with 8 l. of PhMe-xylene, the resulting crystals (3 g.) treated in 100 cc. of 25% H₂SO₄ with 50 cc. concd. HCl and the salt segg. on cooling is decompd. with boiling NH₄OH (the soln. being kept faintly acid), there is obtained 1.8 g. of what is doubtless

2,6-dihydroxyanthraquinone-3,7-diquinoline,



golden yellow

needles from AcOH, m. 386° (carbonization); 1 l. hot AcOH dissolves 0.55 g. and about 0.35 g. seps. on cooling; it is sol. in concd. H₂SO₄ with yellow color, difficultly sol. in dil. acids, the free base segg. on cooling; from 60% H₂SO₄ seps. the sulfate which at once hydrolyzes in H₂O; in alkalis and NH₃ the compd. is difficultly sol., the suspensions, however, changing to red, probably owing to salt formation. Treated in KOH with hyposulfite, it is reduced to the hydroxyanthranol, sol. with violet color and oxidized back to the quinone by atm. O; the red-violet vat dyes cotton a permanent orange; alc.-aq. suspensions of the compd. dye cotton mordanted with Al₂O₃ or Fe salts yellow.

CHAS. A. ROUILLER

Derivatives of methylenecamphor. HANS RUPE AND MARTIN ISELIN. *Ber.* 49, 25-50(1916).—Continuation of the study of the influence of constitution on rotatory power (*C. A.* 9, 2876). The alkyl derivs. of methylenecamphor (a) obtained by the action of alkyl halides on Na camphor, bromination of the product and elimination of HBr (Haller and March, *Compt. rend.* 142, 318(1906)) do not seem to be optically pure in all cases. A general method for the prepn. of aliphatic or aromatic derivs. of (a) consists in treating its chloride (b) with Grignard reagents. With aliphatic Mg compds. although the yields are quite good, the product is usually contaminated with unchanged chloride which, however, can easily be removed as hydroxymethylenecamphor (c) by boiling with alc. KOH; the yields increase with increasing mol. wt. With aromatic Mg compds., the products are usually obtained directly free from halogen. Refractometrically, the derivs. of (b) described in this paper show an av. sp. exaltation ΣE_D 0.76 and $\Sigma E_{D-\alpha}$ 24.5% which may be considered as characteristic of a disturbed ("gestörte") conjugation; the disturbance suffered by the conjugation of the 2 double bonds of the keto and methylene groups is produced by the camphor ring itself. (b), b.p. 113°, is obtained in 95% yield by slowly adding 1 mol. finely powdered (c) to 2 mol.

SOCl_2 , letting stand several hrs. and warming 0.5 hr. at 40° ; it soon becomes yellow, has a characteristic odor like that of *Asarum europaeum*, solidifies in ice to a camphor-like mass, $[\alpha]_D^{20}$ 180.28° (C_6H_6); its formation is an endothermic process; the calorific effect of the formation of 5.22 g. (b) from 5.0 g. (c) and 6.62 g. SOCl_2 is -118 cal. Methylmethylenecamphor (d), $\text{CO.C}_8\text{H}_{14}.\text{C}:\text{CHMe}$, is prepd. by passing into 32.4

g. Mg in 550 cc. Et_2O in ice-salt, with const. stirring, a current of dry MeBr for 16 hrs. at such a rate that the MeBr at once reacts and the Et_2O never boils vigorously; after standing overnight the mixt. is slowly dropped, with const. stirring, into 200 g. (b) in 200 g. Et_2O , stirred 1 hr. longer, allowed to stand several hrs., decompd. in the usual way with cold NH_4Cl , extd. with Et_2O , fractionated, the fraction b_{11} $109-10^\circ$ (125 g.) boiled 4 hrs. with 1 vol. EtOH and 1 vol. of 33% KOH in MeOH, poured into much H_2O , extd. with Et_2O and fractionated. It b_{12} $109-10^\circ$, solidifies to radiating crystals, m. $28-9^\circ$, has a camphor-like aromatic odor, $[\alpha]_{20}$ 136.37° , 178.58° , 219.31° , 308.49° , for C, D, E and F, resp., in C_6H_6 (Minguin and Haller, *Compt. rend.* 138, 578 (1904) give 113° for D in alc.). In the distn. of the crude product there remains a tarry residue, the greater part of which b_{11} $240-55^\circ$ and quickly solidifies; crystn. from alc. and from C_6H_6 -gasoline shows that it consists of a mixt. of 2 compds.: yellowish pointed needles, m. $280-1^\circ$, and white microcryst. powder, m. $183-4^\circ$. When (d) is heated *in vacuo* over Na, camphor sublimes and the residue, extd. with Et_2O , shaken with dil. H_2SO_4 , dried and distd., gives a yellow oil, b_{11} $238-50^\circ$, solidifies and seps. from alc. in felted needles, m. $169-70^\circ$. Ethylmethylenecamphor (e) (Haller, *Compt. rend.* 142, 1309 (1906)), obtained in 70.4 g. yield (crude product after 1 distn., with 1.88% Cl) from 15.1 g. Mg, 380 cc. Et_2O , 68 g. EtBr and 99.2 g. (b), b_{12} $121-2^\circ$, d_4^{20} 0.9448, $[\alpha]_{20}$ 131.39° , 172.95° , 212.96° , 301.48° without solvent, 130.72° , 171.26° , 210.60° , 296.48° in alc., 119.07° , 157.44° , 195.25° , 276.96° in C_6H_6 , for C, D, E and F, n 1.48707, 1.49042, 1.49902, 1.50624 and M 58.50, 58.84, 59.72, 60.45 for α , D, β and γ . The purification with alc. KOH involved a loss of almost 50%; the aq.-alc. residues from 61 g. crude product on neutralization, concn. and acidification yielded 5.2 g. (c). Attempts to purify 40 g. of the crude product by treating with 40 g. Al-Hg and, in the course of 4 hrs., 20 cc. H_2O , gave 3 g. of (e) still containing some Cl and a resin partially b_{12} $239-41^\circ$ as a viscous oil depositing in 6 months a few crystals sepg. After repeated crystns. as felted needles, m. $169-70^\circ$, having apparently the compn. $\text{C}_{20}\text{H}_{30}\text{O}$, also obtained in very small amt. when twice the calcd. amt. of Mg is used in the synthesis of (e) and when (c) is heated with Na (see above). Propylmethylenecamphor, obtained in 68.1 g. yield from 16.2 g. Mg, 300 cc. Et_2O , 77 g. PrBr and 100 g. (b), and freed from the last trace of Cl, after treatment with alc. KOH, by distn. over Na, b_{12} $131-2^\circ$, d_4^{20} 0.9380, $[\alpha]_{20}$ 124.51° , 161.95° , 200.07° , 285.83° without solvent, 112.57° , 149.32° , 185.40° , 264.75° in C_6H_6 , for C, D, E and F, n 1.48621, 1.48946, 1.49778, 1.50490 and M 63.13, 63.49, 64.41, 65.17 for α , D, β and γ . Isobutylmethylenecamphor (f), in 65 g. yield from 14.0 g. Mg, 250 cc. Et_2O , 68.4 g. iso-BuBr and 80 g. (b), b_{12} $136-8^\circ$, d_4^{20} 0.9275, $[\alpha]_{20}$ 118.67° , 156.69° , 193.40° , 275.90° without solvent, 109.55° , 145.04° , 179.05° , 254.12° in C_6H_6 for C, D, E and F, n 1.48419, 1.48772, 1.49594, 1.50295 and M 67.95, 68.37, 69.35, 70.18 for α , D, β and γ ; 3.5 portions of 10 g., each treated in 60 g. CCl_4 with O_3 for 10 hrs., then heated 2 hrs. with H_2O at 100° , gave 5.5 g. camphorquinone, camphoric acid and isovaleric acid. From 18.2 g. allyl bromide (b_{12} 71°), obtained in 59% yield from the alc. and HBr), 3 g. Mg, 100 cc. Et_2O and 20 g. (b) is obtained an oil which de-comps. around 130° under 14 mm., yielding a yellow acid oil rich in Cl, evolving heat when brought in contact with alc. KOH; after boiling several hrs., pouring into H_2O and extg. with Et_2O is obtained a hydrocarbon $\text{C}_{10}\text{H}_{14}$ or $\text{C}_{10}\text{H}_{12}$, mobile oil with a borneol odor, b_{12} $107-8^\circ$. Phenylmethylenecamphor, obtained in 25 g. yield from 10.1 g.

Mg, 65.4 g. PhBr, 200 cc. Et₂O and 66.1 g. (b), *b*₁₂ 195-7°, crystals from alc. or petr. ether, *m.* 98.5°, [α]_D²⁰ 322.48°, 426.55°, 530.40°, 741.87° for C, D, E and F in C₆H₆ (Haller, *Compt. rend.* 136, 578, 751 (1903), gives 425.1° for D in PhMe). *Benzylmethylenecamphor* (g), in 205 g. yield from 44.2 g. Mg, 235.2 g. PhCH₂Br, 1 l. Et₂O and 300 g. (b), *b*₀₋₂₁ 124-6°, *d*₄²⁰ 1.0250, [α]_D²⁰ 97.87°, 129.00°, 159.26°, 226.50° without solvent, 87.78°, 115.72°, 143.39°, 203.31° in C₆H₆, 98.29°, 129.83°, 160.40°, 227.02° in alc. for C, D, E and F, *n* 1.54472, 1.54948, 1.56157 and *M* 78.37, 78.94, 80.37 for α , D and β . In its prepn. is obtained 135 g. of a lower boiling fraction containing Cl; 100 g. of this boiled with alc. KOH yields 26 g. of an oil which, after distn. over Na, *b*₁₄ 143-4.5° and has the compn. C₁₅H₁₄O; the alk. residues yield an amt. of (c) corresponding to 40.5 g. unchanged (b). Ozonization of 33 g. (g) yields 7 g. camphorquinone, 7 g. unchanged (g), 0.6 g. BzOH, 4 g. camphoric acid and 0.7 g. PhCH₂CO₂H; 8 g. of the latter ozonized 14 hrs. in CCl₄-CHCl₃ gave much HCO₂H and only 1 g. unchanged acid, which explains why so little is obtained in the ozonization of (g). *Phenethylmethylenecamphor*, in 58.2 g. yield from 10.1 g. Mg, 77.0 g. PhCH₂CH₂Br, 300 cc. Et₂O and 66 g. (b), *b*₁₂₋₁₃ 208-10°, *b*₀₋₂₁ 152-4°, *d*₄²⁰ 1.0094, [α]_D²⁰ 96.61°, 127.99°, 157.97°, 225.20° without solvent, 89.32°, 117.70°, 145.52°, 206.96° in C₆H₆ for C, D, E and F, *n* 1.53575, 1.54035, 1.55149 and *M* 82.81, 83.41, 84.83 for α , D and β . *Phenylpropylmethylenecamphor*, in 39 g. yield from 7.6 g. Mg, 62.2 g. PhCH₂CH₂CH₂Br, 250 cc. Et₂O and 49.6 g. (b), *b*₁₅ 221-3°, *d*₄²⁰ 0.9990, [α]_D²⁰ 87.94°, 113.33°, 139.92°, 198.76° without solvent, 82.01°, 108.03°, 133.26°, 188.59° in C₆H₆ for C, D, E and F, *n* 1.53300, 1.53735, 1.54824, 1.55814 and *M* 87.68, 88.27, 89.76, 91.10 for α , D, β and γ . *Cyclohexylmethylenecamphor*, in 50 g. yield from 80.0 g. C₆H₁₁Br, 14.0 g. Mg, 250 cc. Et₂O and 80.0 g. (b), *b*₁₁ 171-3°, flat prisms from gasoline, *m.* 46-8° (Haller, *Compt. rend.* 142, 317 (1906), gives 49°), [α]_D²⁰ 97.46°, 128.13°, 157.36°, 216.08° in C₆H₆ for C, D, E and F. α -*Naphthylmethylenecamphor*, *b*₁₂₋₁₃ 253-4°, long prisms from alc., *m.* 98-9.5°, [α]_D²⁰ 263.17°, 353.62°, 443.94°, 634.54° in C₆H₆ for C, D, E and F. From 12 g. *p*-IC₆H₄Ph, 50 cc. C₆H₆, 30 cc. Et₂O, 1.8 g. Mg activated with I and 6.5 g. (b) are obtained much Ph₂(*p*-PhC₆H₄)₂, the mixt. of compds. *m.* 183-4° and 280-1° (see under (d) above), and a small amt. of a substance, possibly the diphenylmethylenecamphor sought, sepg. from alc. in fatty scales, *m.* 138-43°. When Mg in Et₂O is treated with (b) the thick red ppt. formed quickly protects the Mg from further attack by the (b), in spite of vigorous stirring; if C₆H₆ is previously added to the Et₂O, energetic reaction takes place but it is difficult to isolate a pure substance from the tarry product, only a small amt. of a compd. C₁₀H₁₄O crystg. from alc. and *m.* 254-6° being obtained. When, however, 12.2 g. Mg strongly activated with I in 150 cc. Et₂O is slowly treated with 100 g. (b) in 150 cc. C₆H₆ and gently boiled 20 hrs. with vigorous stirring, the mixt. of compds. *m.* 183-4° and 280-1° (see above) is formed. *Isoamylcamphor*, from 50 g. (f) in 5 vols. MeOH treated with 520 g. of 3% Na-Hg in small portions, the soln. being kept neutral to phenolph. with 50% AcOH, *b*₁₄ 140°, *d*₄²⁰ 0.9197, [α]_D²⁰ 50.19°, 66.78°, 82.57°, 120.17° without solvent, 31.29°, 42.34°, 53.40°, 79.14° in C₆H₆ for C, D, E and F, *n* 1.46769, 1.47015, 1.47612, 1.4810 and *M* 67.12, 67.42, 68.15, 68.77 for α , D, β and γ . *Phenethylcamphor*, in 27 g. yield from 50 g. (g) similarly reduced, *b*₁₆ 201-2°, pointed prisms from dil. alc., *m.* 60-1°, [α]_D²⁰ 16.56°, 22.82°, 29.22°, 45.19° in C₆H₆ for C, D, E and F. *Phenylpropylcamphor*, *b*₁₅ 208-10°, *d*₄²⁰ 1.0008, [α]_D²⁰ 39.19°, 52.37°, 64.75°, 93.51° in C₆H₆ for C, D, E and F, *n* 1.52510, 1.52883, 1.52842 and *M* 82.75, 83.25, 84.51 for α , D and β .

CHAS. A. ROULLER.

Action of sulfur on indene, hydrindene and cyclopentadiene. I. WALTER FRIEDMANN. *Ber.* 49, 50-3 (1916); cf. Scheibler, *C. A.* 10, 340.—When 100 g. indene and 28 g. S are heated until reaction begins, then, after the boiling ceases, 2-3 hrs. at 180-5°, then 15 min. with a little PhMe, allowed to stand overnight and filtered, there is ob-

tained a dark brown powder which, after washing with PhMe and CS₂ and pressing on clay, assumes a yellow-green color; it is difficultly sol. in all solvents and by heating 15 min. on the H₂O bath 3-4 times with an insufficient amt. of C₆H₆ can be sepd. into 2 compds.; from the 1st exts. sep. yellow to yellow-brown leaflets of a *diindenethiophene*, C₆H₄.C—C.C₆H₄

$\begin{array}{c} | \quad || \quad || \quad | \\ \text{CH}_2-\text{C.S.C.CH}_2 \end{array}$, m. 290-2°, strongly fluorescent in C₆H₆, sol. in concd. H₂SO₄ with

intense emerald-green color, forms with C(NO₂)₄ a yellow-red addition product, reacts with Me₃SO₄, gives with cold concd. HNO₃ a *dinitro derivative*, red-violet crystals from PhNO₂, melts with decompn. The later C₆H₆ exts. of the reaction product deposit a flocculent substance which, combined with the portion not dissolved by the C₆H₆ and crystd. from cumene, yields pale yellow needles, m. 322-4°, of the compn. C₂₆H₂₄S. Hydrindene heated in a sealed tube with S gives in good yield a compound (C₈H₈)₂S, m. 290-2°. Dicyclopentadiene gives a compound C₁₀H₁₂S. CHAS. A. ROUILLER.

Dyes of the methylene blue group. I. Preparation of methylene blue as a lecture experiment. F. KEHRMANN, with R. SPEITEL. Univ. Lausanne. *Ber.* 49, 53-4 (1916); cf. *C. A.* 9, 1334.—1-2 g. thiodiphenylamine dissolved in so much warm AcOH that nothing seps. on cooling is treated with 5% Br in AcOH, with cooling and shaking, until the originally dark olive-green ppt. of the semiquinoid bromide becomes brown-red and cryst. (1-2 min.); it is immediately drained off, washed with a little Et₂O, suspended in 50 cc. of 96% alc. and at once treated with 5% alc. NHMe₃ until the soln. permanently smells of it; the brown-red perbromide quickly disappears, the soln. becomes dark green, then blue, and the dye soon begins to sep. in metallic green needles in almost quant. yield. The whole operation requires only about 10 min. The green intermediate product is dimethylaminophenazthionium bromide. C. A. R.

Catalytic hydrogenation of organic compounds with non-noble metals at room temperature. C. KELBER. Heilbronn. *Ber.* 49, 55-63 (1916).—The catalytic action of the reduced Ni metals is greatly increased if the compds. to be heated (best the basic carbonates) are first deposited on a suitable carrier (infusorial earth, Florida clay, the various com. hydrosilicates of Al and Mg, blood charcoal, the decolorizing charcoal of the ferrocyanide manufacture, linden charcoal, etc.). The reduction is best effected in aq. or aq.-alc. soln.; in alc., C₆H₆, Me₂CO, Et₂O and AcOEt it is slower; addition of a little H₂O, especially with Et₂O and AcOEt, greatly accelerates it; in AcOH it is rapid with Ni reduced at 310°; CHCl₃ is not suitable. To get an approx. comparison of the catalytic action of reduced non-noble metals with that of colloidal Pd, the detonating gas catalysis was carried out; the K. and Schwarz Pd prepn. (*C. A.* 6, 2757) was used; 0.2 g. of this (= 0.0344 g. Pd) showed an activity which at first was less than that of 0.5 g. Ni (a) (from the basic carbonate) reduced on 4.5 g. of an inorg. carrier in H at 450°, although it gradually increased as compared with the activity of the Ni and finally surpassed it. A Ni prepd. at 310° or 450° without a carrier gave a negative result. In the reduction of 0.75 g. PhCH:CHCO₂H in 50% alc., however, prepn. (a) and 3.0 g. Ni reduced at 310° without a carrier were about equally effective; 3.0 g. Ni reduced at 450° has about the same effect as 0.5 g. reduced at 310°, while 0.5 g. reduced at 450° without a carrier is enormously less effective than prepn. (a); in an aq. alc. soln. of PhCH:CHCO₂Na the Ni reduced at 310° has the same effect as an equal wt. of Ni reduced at 450° on a carrier. Co may be used instead of Ni, but the reduction is slower. Other substances reduced in this way were PhC:CCO₂Na, quinine-HCl, (PhC:C)₂, Na cottonoleate. Details of the various expts. (amts. of H absorbed in different time intervals) are given. CHAS. A. ROUILLER.

Phosphine sulfides and phosphine selenides. WILHELM STRECKER AND CHARLOTTE GROSSMANN. Marburg. *Ber.* 49, 63-87 (1916); cf. Sauvage, *Compt. rend.* 139,

674(1904).—Organo-Mg compds. act on PSCl_2 as on POCl_3 ; the reaction is smoother and more nearly homogeneous with aromatic than with aliphatic derivs. As the resulting phosphine sulfides are identical with those obtained by the action of S on phosphines and the P is undoubtedly pentavalent in these compds., and the reaction with the Grignard reagents takes place at low temps. and can be applied to much more sensitive compds. than PSCl_2 without rearrangement, it may be assumed that the P is also pentavalent in PSCl_2 , which therefore must have the structure $\text{S}:\text{PCl}_2$ and not Cl_2PSCl as assumed by some. The present work also disproves Vassilyev's belief that PSCl_2 is a eutectic mixt. of 1 part P_2S_5 and 3 parts PCl_5 (C. A. 5, 617), for neither of these compds. gives the above derivs. From 2.4 g. Mg and 15.7 g. PhBr in a little cold Et_2O slowly treated with 5.6 g. PSCl_2 , decompd. with H_2SO_4 and extd. with Et_2O is obtained PSPh_3 , needles, m. 161° (Michaelis and v. Soden, *Ann.* 229, 307(1885), give 157.5°). With PhCH_2MgCl , the reaction product decompd. with H_2SO_4 and treated with Et_2O deposits a white powder of $\text{PS}(\text{CH}_2\text{Ph})_3$, needles from CHCl_3 , m. 274° , while the Et_2O ext. yields *dibenzylhydroxyphosphine sulfide*, $\text{PS}(\text{CH}_2\text{Ph})_2\text{OH}$, leaflets from CHCl_3 , m. 171° , sol. in NaOH and in boiling soda, repptd. by HCl. From 2.4 g. Mg, 9.5 g. EtBr and 2 g. PSCl_2 is obtained *diethylhydroxyphosphine sulfide*, leaflets from ligroin, m. 76° . All attempts to prep. PSeCl_2 by methods analogous to those used in making PSCl_2 (addition of Se to PCl_5 , replacement of the O in POCl_3 by Se, reaction between PCl_5 and P_2Se_5) failed. It was hoped to attain the desired object by means of the reactions $\text{PhOPCl}_2 + \text{Se} \rightarrow \text{PhOPSeCl}_2 + \text{PCl}_5 \rightarrow \text{PSeCl}_2$, for when PhOPCl_2 is heated 0.5 hr. with S in sealed tubes at $220\text{--}30^\circ$ it gives PhOPSCl_2 ; from $(\text{PhO})_2\text{PCl}$ in an open dish at 200° is obtained $(\text{PhO})_2\text{PSCl}$, needles from alc., m. 63° , yielding with $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$ a *hydrazide*, $\text{PS}(\text{OPh})_2\text{N}_2\text{H}_4$, crystals from ligroin, m. $62\text{--}3^\circ$; $(\text{PhO})_2\text{PS}$, from $(\text{PhO})_2\text{P}$ and S at $180\text{--}90^\circ$, is unchanged by heating with excess of Hg. When, however, finely powdered Se is heated 2 hrs. in sealed tubes at 250° with PhOPCl_2 and the resulting red-brown liquid is distd. *in vacuo*, much PCl_5 first passes over, then a little unchanged PhOPCl_2 and finally *diphenoxychlorophosphine selenide* (a), together with a little *triphenoxyphosphine selenide* (b), but not a trace of PhOPSeCl_2 . This is due to the fact that PhOPCl_2 decomp. at a temp. below that at which Se is added, partly into $(\text{PhO})_2\text{PCl}$ and partly into $(\text{PhO})_2\text{P}$, together with PCl_5 . (a), b_{11} about 200° (slight decompn.), needles from MeOH, m. $59\text{--}9.5^\circ$, slowly turns pink in light and air, is obtained by heating 12.6 g. $(\text{PhO})_2\text{PCl}$ and 5 g. Se until the liquid becomes clear and slightly brown (about 260°) and keeping at this temp. for 10 min.; heated a long time at 180° , it decomp. into (b), Se and PCl_5 ; rubbed with PCl_5 , it liquefies and then solidifies to a solid which decomp. with deposition of Se when it is attempted to cryst. it from alc. or Et_2O ; C_6H_6 dissolves it slightly with yellow color but decompn. again occurs on concn., so that the reaction apparently has led to the formation of Se_2Cl_2 ; with PCl_5 in C_6H_6 is formed a brown-yellow mass, perhaps $\text{SeCl}_2\cdot\text{PCl}_5$. *Diphenoxiaminophosphine selenide*, from (a) in a little alc. slowly treated with concd. NH_4OH until the odor of the latter persists, cryst. scales from CCl_4 , m. 78° . *Hydrazino compound*, from (a) rubbed with $\text{N}_2\text{H}_4\cdot\text{H}_2\text{O}$, needles from ligroin, m. 68° , reduces warm alk. Cu solns. (b) obtained by heating $(\text{PhO})_2\text{P}$ with excess of Se at 240° , needles from MeOH, m. $73\text{--}4^\circ$. The observation that the addition of Se takes place most easily with $(\text{PhO})_2\text{P}$ and becomes more difficult with increasing amts. of Cl made it seem possible that it was the strongly negative Cl, satg. so much of the P valence, which hindered the addition. Accordingly, the action of Se on the corresponding Br compds. was investigated. By the action of PBr₃ on PhOH and fractionation of the product *in vacuo* are obtained *phenoxydibromophosphine* (c), yellowish, mobile, refractive oil, b_{11} $130\text{--}2^\circ$, decomp. in the air, easily forms PBr₃ and $(\text{PhO})_2\text{P}$ on heating, and *diphenoxybromophosphine* (d), b_{11} $189\text{--}92^\circ$, somewhat

more stable towards air and H_2O than (c). Heated 15 min. at $150-60^\circ$ with 1 atom S, (c) gives PBr_3 and *phenoxydibromophosphine sulfide*, yellowish liquid soon becoming turbid, b_{11} $156-7^\circ$, slowly decompd. by H_2O . With Se no addition occurs. *Diphenoxybromophosphine sulfide*, from (d) and S cautiously heated to 160° , b_{11} about 200° (decompn.), needles from alc., m. 72.5° . *Selenide*, from (d) heated with Se until the liquid is clear and begins to turn brown (about 190°), crystals from ligroin, m. $64-5^\circ$, quite unstable. Replacement of the Cl by the more weakly negative Br, therefore, facilitates the addition of Se. When the halogen atoms are replaced by indifferent org. residues, Se is easily added (Pistschimuka, C. A. 6, 989); the influence of positive residues substituted for the halogen atoms could not be detd. for NH_3 and N_2H_4 , completely destroy the halogen compds. and org. bases yield the corresponding chlorides and oils containing N which on distn. give $PhOH$ and other products of deep-seated decompn. No addition of Te could be obtained in any case, so that the additive power of P for S, Se and Te decreases with increasing atomic wt. This is confirmed by the fact that (b) heated with S gives $(PhO)_2PS$ while the reverse reaction cannot be effected even with a large excess of Se. The fact that sulfones can be converted into selenides by fusing with Se (Krafft and Vorster, Ber. 26, 2813(1893)) is only an apparent contradiction and is due to the volatility of the replaced SO_2 group; the SO group cannot be so replaced. Substituents in the org. residues of the phosphines have no marked influence on the additive power of the P. From *p*-cresol and PCl_3 are obtained *p*-cresoxydichlorophosphine (e), b_{11} 118° , fumes in the air, decompd. by H_2O ; *di-p*-cresoxychlorophosphine (f), b_{11} $206-8^\circ$; and *tri-p*-cresoxyphosphine (g), b_{11} 285° (deposition of P). With 1 atom S at 220° , (e) gives *p*-cresoxydichlorophosphine sulfide, b_{11} $135-6^\circ$, attacked only very slowly by H_2O and even cold dil. NaOH. No selenide can be obtained. *Di-p*-cresoxychlorophosphine sulfide, from (f) and S at 180° , crystals from alc., m. $54-5^\circ$, probably identical with the product obtained by Autenrieth and Hildebrand from $PSCl_3$ and alk. MeC_6H_4OH (Ber. 31, 1108(1898)); *hydrazide*, crystals from alc., m. 141° . *Selenide*, from (f) heated with excess of Se at 200° until the soln. becomes brown, b_{11} 235° , needles from dil. alc., m. $48-9^\circ$; *hydrazide*, needles, m. $106-8^\circ$. *Tri-p*-cresoxyphosphine sulfide, from (g) and S at $140-50^\circ$, needles from alc., m. $93-4^\circ$, cannot be desulfurized by heating with Hg. *Selenide*, from (g) with excess of Se at 170° , needles from alc., m. $111-2^\circ$. *o*-Cresoxydichlorophosphine, b_{11} 116° ; *sulfide*, obtained at 230° , b_{11} $130-1^\circ$. *Di-o*-cresoxychlorophosphine, b_{11} $195-6^\circ$; *sulfide*, obtained at 205° , b. 212° (probably under 11 mm.—ABSTR.), slowly decompd. by boiling H_2O , yields a *hydrazide*, needles from alc., m. $89-91^\circ$; *selenide*, obtained at 220° , oil still containing much Se, b_{11} $224-7^\circ$, and giving a *hydrazide*, crystals from alc. and C_6H_6 , m. $98-9^\circ$. *Tri-o*-cresoxyphosphine, b_{11} 248° (slight decompn.), quite stable towards H_2O , alc. and even aq. NaOH; *sulfide*, obtained at $200-10^\circ$, b_{11} $280-90^\circ$, needles from alc., m. $45-6^\circ$; *selenide*, obtained at 240° , needles from alc., m. $50-1^\circ$. Mol. amts. of PCl_3 and *p*- ClC_6H_4OH at 150° give almost exclusively $(ClC_6H_4O)_2P$, m. 48° (Michaelis, Ber. 31, 1053(1898)), but by using a large excess of PCl_3 at 100° there are also obtained *p*-chlorophenoxydichlorophosphine, b_{11} $128-30^\circ$, and *di-p*-chlorophenoxychlorophosphine, b_{11} $225-7^\circ$. *p*-Chlorophenoxydichlorophosphine sulfide, obtained at 230° , b. $143-5^\circ$ (probably under 11 mm.—ABSTR.). *Di-p*-chlorophenoxychlorophosphine sulfide, obtained at $210-5^\circ$, b_{11} $243-5^\circ$, crystals from alc., m. $43-4^\circ$; the product described by Autenrieth and Hildebrand as m. 92° was probably not this compd. *Selenide*, obtained at 275° , b_{11} $245-55^\circ$, m. $59-61^\circ$. *Tri-p*-chlorophenoxyphosphine sulfide, needles from alc., m. $85-6^\circ$ (A. and H. describe a compd. m. $113-4^\circ$ to which they assign this structure), unchanged by hot NaOH, also obtained by heating the selenide (Michaelis) with S. *Tri-p*-nitrophenoxyphosphine, from PCl_3 and 3 mols. $O_2NC_6H_4OH$ 2 days at 90° , needles from AcOH, m. $170-1^\circ$, decomp. violently a few degrees above its m. p.

CHAS. A. ROULLER.

Partial acylation of polyvalent alcohols and sugars. II. EMIL FISCHER AND CHARLOTTE RUND. Univ. Berlin. *Ber.* 49, 88-105 (1916); cf. *C. A.* 9, 1183.—From finely powdered erythritol (a) shaken until dissolved with 6 parts Me_2CO containing 25% H_2O and 1% HCl , allowed to stand 17 hrs., freed from HCl with excess of Ag_2CO_3 , concd. *in vacuo* (most of the diacetone-erythritol distils over), boiled up with petr. ether to remove the last traces of the diacetone compd., extd. with Et_2O , concd. and treated with petr. ether there is obtained, in 50-5% yield of the (a) used (30-3% of unchanged (a) remains in the part insol. in Et_2O), monoacetone-erythritol (b), oil solidifying to leaflets, m. $75-6^\circ$, distils at a higher temp., tastes bitter but not so unpleasantly as the diacetone compd. With aq. instead of dry Me_2CO , mannitol (c) yields relatively more of the mono- and di- and less of the triacetone compds. (cf. *Ber.* 28, 1168 (1895)) but the mixt. is difficult to sep. In this connection was obtained a new β -diacetone-mannitol (d), m. about 85° higher than Irvine and Patterson's compd. (*C. A.* 8, 2341): 100 g. mannitol is shaken 3 hrs. with 2 kg. dry Me_2CO and 40 cc. HCl (d. 1.19), neutralized with PbCO_3 , drained, treated with a little Ag_2CO_3 , evapd. *in vacuo*, dissolved in 70 cc. hot alc., filtered, treated with much H_2O , filtered from the triacetone compd. (about 90 g.), evapd. *in vacuo* after adding Ag_2CO_3 , dissolved in warm H_2O (a further quantity of the triacetone compd. remains), the mother liquors evapd. again in the same way, the residue dissolved in 90 cc. hot C_6H_6 , filtered, treated with petr. ether to permanent turbidity and cooled to -20° ; the fine needles segg. (about 40 g.) are at once drained, pressed, dissolved in a little H_2O and cooled to 0° , whereupon there sep. fine needles which are again treated in the same way 1-2 times, finally giving 2-3 g. of (d) in long needles, m. $123-4^\circ$, $[\alpha]_D^{20} < -0.5^\circ$ in H_2O . It has been found that diacetoneglucose (e) can be prepd. much more easily from β - than from α -glucose: finely powdered β -glucose is shaken 36 hrs. with 20 parts dry Me_2CO containing 1% HCl , neutralized with PbCO_3 , filtered, evapd. with a little Ag_2CO_3 *in vacuo* not above 50° , extd. with 15-20 parts of ligroin (b. $110-20^\circ$) on the H_2O bath and cooled to 0° ; yield, 50%; this crude product in 25 parts cold H_2O with considerable concd. NaOH yields an oil quickly solidifying which, dissolved in AcOEt , evapd. *in vacuo* and crystd. from ligroin (b. 90°), gives 75% of pure (e), m. $110-1^\circ$ (cor.), $[\alpha]_D^{19} = -18.45^\circ$ in H_2O ; 50 g. heated 1.5-2.0 hrs. at 50° with 0.4 g. HCl in 800 cc. H_2O , shaken with Ag_2CO_3 , evapd. *in vacuo* not above 50° and extd. with AcOEt gives 80% of its wt. of monoacetone-glucose (f), m. $161-2.5^\circ$ (cor.), $[\alpha]_D^{22} = -11.82^\circ$ in H_2O . Dibenzoylacetone-erythritol, from 5 g. (b) heated 6 hrs. at 70° with 9.5 g. BzCl and 9 g. quinoline, microscopic prisms from MeOH , m. 70° , can be distd. in small amts.; a mixt. of aq. HCl and AcOH quickly attacks it, probably splitting off Me_2CO and giving as chief product dibenzoylerythritol which, however, is a thick oil, certainly different from the cryst. compd. obtained with the tri-Bz deriv. in the benzylation of erythritol in $\text{C}_6\text{H}_5\text{N}$ (*Ann.* 301, 101 (1898)). Di-*p*-bromobenzoylacetone-erythritol, obtained in the same way in 80-90% yield, microscopic needles from C_6H_6 -petr. ether, m. $147-8^\circ$ (cor.), gives with aq. HCl - AcOH a non-crystallizable oil, while 3 g. allowed to stand 48 hrs. in 66 cc. AcOH containing about 3 g. HCl gas yields 1.8 g. of α -diacetyldi-*p*-bromobenzoylerythritol (g), m. $83-6^\circ$ (possibly the compd. was not homogeneous). Diacetylacetone-erythritol, from 5 g. (b) allowed to stand 24 hrs. in 12.6 g. Ac_2O and 12.5 g. $\text{C}_6\text{H}_5\text{N}$, mobile bitter oil, b.p. $115-20^\circ$, probably not homogeneous, for when 5 g. is shaken with 50 cc. of 0.5 *N* HCl until dissolved (about 10 min.) and allowed to stand 1 hr. it yields almost quant. an oil, b.p. $158-65^\circ$ (bath temp.), having the compn. of diacetylerythritol, but on long standing (1 week) it partially solidifies to crystals segg. from Et_2O -petr. ether in long slender prisms or shorter forms, m. $89-91^\circ$, of the same compn., having a faintly bitter taste and forming an aq. soln. neutral to litmus; heated 6 hrs. at 65° with 2.5 parts *p*- $\text{BrC}_6\text{H}_4\text{COCl}$ and 2.8 parts quinoline they yield β -diacetyldi-*p*-bromobenzoylerythritol.

crystals from C_6H_6 , m. $150-2^\circ$, isomeric with (g) above. *Tribenzoylacetoneglucose*, in 82.5% yield from 5 g. (f) heated 7 hrs. at 65° with 11.2 g. $BzCl$ and 11 g. quinoline, m. $119-20^\circ$ (cor.), decomps. to a great extent at higher temps., does not reduce Fehling soln. in dil. alc., $[\alpha]_D^{23} -91.95^\circ$ in CCl_4 ; 3 g. in 36 cc. $AcOH$ allowed to stand 0.5 hr. with 18 cc. HCl (d. 1.19), decompd. with ice, extd. with Et_2O , shaken with concd. $KHCO_3$, washed with H_2O , and evapd. *in vacuo* gives *tribenzoylglucose* (h) as an oil solidifying in the cold, sol. in warm CCl_4 and sepg. on cooling in needles or prisms with 1 mol. CCl_4 , sinters from 65° , foams 80° , with loss of the CCl_4 , $[\alpha]_D^{20} -75.24^\circ$, -76.12° , -77° , -85° , -91.7° in 3, 5, 8, 38 min., 20 hrs., resp., after soln. in alc.; the crystals with $KOAc$ in alc. and $H_2NCONHNH_2.HCl$ in H_2O yield a substance having approx. the compn. of the expected semihydrazone (C and N about 1 and 0.5%, resp., too low). (h) could not be obtained cryst. from any other solvent. *p-Bromobenzoyldiacetoneglucose*, in 85% yield from 10 g. (e), 9 g. BrC_6H_4COCl and 12 g. quinoline 6 hrs. at 70° , long, often lancet-shaped needles from alc.- H_2O , sinters 78° , m. $79-80^\circ$, does not reduce Fehling soln. in dil. alc. soln., $[\alpha]_D^{19} -49.24^\circ$; 4 g. in 40 cc. $AcOEt$ and 20 cc. HCl (d. 1.19) 1.5 hrs. at 30° gives *p-bromobenzoylglucose* (i), amorphous, also obtained by heating 1 g. of the diacetone compd. with 10 cc. of a mixt. of 9 parts of 50% $AcOH$ and 1 part HCl (d. 1.19) up to 55° until soln. results and keeping 50 min. at 50° ; it has an extraordinarily bitter taste and strongly reduces Fehling soln., gives an oil on warming with $PhNHNH_2.HCl$ and $NaOAc$ in H_2O , is partially reconverted into the diacetone compd. by Me_2CO and HCl ; at 100° it slowly becomes faintly yellow-brown and after 75 min. is mostly converted into a substance very difficultly sol. in hot H_2O , in which it melts to an oil, only faintly reduces Fehling soln. If the operation is carried out in a high vacuum the mass also swells up and when so prepd. apparently contains 1 mol. less of H_2O . (i) in $MeOH$ shows $[\alpha]_D^{19} 26.8^\circ$, 27.4° , 28.8° , 44° in 14, 31, 64 min., 14 days after soln.

CHAS. A. ROULLER.

An occurrence of indole and skatole. EDMUND O. VON LIPPMANN. *Ber.* 49, 106-7(1916).—In the desaccharification of beet molasses by the Sr or Ba process the vapors evolved from the molasses on long boiling with excess of the alk. earth have a foul, at times almost unbearable fecal odor. While investigating the possibility of utilizing the NH_3 in these vapors v. L. from certain condensates isolated indole, from others skatole and from still others a mixt. of these 2 compds. Among other substances, v. L. has isolated from the juice of etiolated sprouts growing from stacked beets what he believes to be *L-phenylalanine*, $C_9H_{11}O_2N$, stars, m. 264° (decompn.), $[\alpha]_D^{20} -35.3^\circ$ in H_2O ; *L-tryptophan*, $C_{11}H_{13}O_2N_2$, leaflets, m. 287° , $[\alpha]_D^{20} -32.8^\circ$ in H_2O , showing *d*-rotation in HCl and alk. soln.; and in the phosphotungstic ppts. a small amt. of a base, $C_{14}H_{19}O_2N_2$, leaflets, m. 256° , $[\alpha]_D^{20} 96^\circ$, yielding well-crystd. compds. with mineral acids and giving with boiling alkalis NMe_3 and indole among other products; it would seem to be Grashoff and van Romburgh's heptaphorine (*Chem. Zentr.* 1911, I, 1548).

CHAS. A. ROULLER.

Hydroxymethylenebutanone and a new method of formation of hydroxymethylene compounds. OTTO DIEHL and KONRAD ILBERG. *Ber.* 49, 158-64(1916).—From 11.4 g. freshly distd. $AcC(:N_2)Me$ (C. A. 9, 1180) and 10 g. of 35% aq. $HCHO$, cooled so the temp. does not rise above 60° , allowed to stand 3 days and distd. under 14 mm. there is obtained around 90° about 5 g. of a distillate quickly solidifying to crystals imbedded in a strongly smelling liquid from which they are best sepd. by slow sublimation, giving 2-3 g. of pure *hydroxymethylenebutanone* (a), $AcC(:CHOH)Me$. (a) is better obtained by slowly treating a suspension of dry, alc.-free $NaOEt$ (from 32 g. Na) in 1 l. cold Et_2O with 100 g. $AcEt$ and 102 g. acid-free HCO_2Et in 100 cc. cold Et_2O , allowing to stand some time at 0° , draining the stiff yellowish magma, washing with Et_2O , removing the adherent mother liquors by long-continued pressing, treating

the dried residue (150 g.) in a little ice H_2O with cold dil. H_2SO_4 , extg. with Et_2O , drying carefully and slowly distg.; the distillate partially solidifies on cooling and the filtrate from the solid yields a further crop of (a) on distn. *in vacuo*; slow sublimation of the crude product gives 15–20 g. pure (a), leaflets of a characteristic sweetish and rancid odor, m. 73° , b. $145-7^\circ$ (some decompn.), quite volatile, quickly disappearing when spread on clay; in a sealed tube it remains unchanged for some weeks but gradually turns yellow, then dirty red, and on opening under H_2O the tube sucks in 0.2 of its vol. of H_2O , showing that O had been absorbed. With a few drops of $FeCl_3$, dil. aq. solns. assume an intense $KMnO_4$ -red color; $NH_3 \cdot AgNO_3$ is not reduced even on heating and Fehling soln. only on warming and very slowly. *Copper salt*, from (a) in H_2O and $Cu(OAc)_2$, dark green prisms from alc., m. $157-8^\circ$, decomp. suddenly above the m. p. with evolution of acid-smelling vapors. (a) treated in Et_2O with HCl gas or heated 1 min. at 100° with 37% HCl gives a *hydrochloride*, $C_8H_8O_2 \cdot HCl$, iridescent sharp-angled tables from warm H_2O or $AcOEt$, turns brown about 90° , decomp. about 107° , quite as volatile as (a), reconverted into (a) by boiling H_2O or cold dil. alkalies. From 2.5 g. (a) in luke-warm H_2O treated with 1.25 g. $N_2H_4 \cdot H_2O$ is obtained 1.5 g. of 4,5-dimethylpyrazole. *Anil* of (a), in 2.9 g. yield from 2 g. (a) in 4 cc. warm $MeOH$ and 1.9 g. $PhNH_2$, needles from $AcOEt$, m. $125-6^\circ$. When 30 g. BzH in 105 cc. of 37% HCl is slowly treated with 15 g. (a), allowed to stand 10 days and cautiously crystd. from C_6H_6 , there is obtained 12 g. of a *dibenzalbutanone hydrochloride*, $PhCH:CHCOC(:CHPh) \cdot Me \cdot HCl$ or possibly $AcC(:CHPh)CH:CHPh \cdot HCl$, leaflets, sinters about 150° , m. $158-9^\circ$. *Hydrobromide*, similarly obtained with HBr , prisms, m. $149-51^\circ$. Attempts to obtain the free butanone from these salts have thus far failed. C. A. R.

Degradation of scopoline. ERNST SCHMIDT. Marburg. *Ber.* 49, 164–8 (1916).—S. accuses Hess and Suchier (*C. A.* 10, 770) of invading his field and shows, by references to his papers, that he had already proved that scopoline belongs to the piperidine series. CHAS. A. ROULLER.

Products of the decomposition of aluminium phenolates by heat. RICHARD MÖHLAU. Dresden. *Ber.* 49, 168–71 (1916).—A more exact study has shown that the compds. $C_{12}H_{10}O$ (a), obtained in small amt. together with Al_2O_3 , C_6H_6 hydrocarbons, phenols and phenol ethers by heating Al phenolates (Gladstone and Tribe, *J. Chem. Soc.* 1886, 25, and earlier papers) are xanthenes and that the decompn. may be represented by some such scheme as $2(PhO)_3Al \longrightarrow 2Al_2O_3 + 10C + 2H + CH_4 + C_6H_6 + 3PhOH + 2Ph_2O + (a)$. The formation of (a) may probably be explained by the assumption that, as the result of pyrogenic synthesis, CH_4 and $PhOH$ form *o*- MeC_6H_4OH which condenses with another mol. of $PhOH$ to (*o*- HOC_6H_4) $_2CH_2$ which then goes over into (a). The compd. $C_{12}H_{14}O$, m. 186° , obtained by G. and T. from (*p*- MeC_6H_4O) $_2Al_3$ is doubtless 2,7-dimethylxanthene, and the compd., m. 200° , obtained from the thymolate, is 3,6-dimethylxanthene, for propylene is formed at the same time, showing that the connecting CH_2 has entered the position occupied by the displaced iso-Pr group. Finally, the compd. $C_{12}H_{14}O$ obtained from the *o*-cresylate is 4,5-dimethylxanthene. Of the 3 "pyrocresols" obtained in the distn. products of crude carboxylic acid (Zmerzlikar, Sr., *Z. angew. Chem.* 1893, 468; Schwarz, *Ber.* 15, 2201 (1882); 16, 2141 (1883)), the α -compd., m. 195° , which has been identified as 3,6-dimethylxanthene (Zmerzlikar, Jr., *C. A.* 5, 1770), is doubtless identical with G. and T.'s (b). CHAS. A. ROULLER.

Nitrosoarylhydroxylamines. I. The influence of nucleus substitution on groups forming inner complex salts. OSKAR BAUDISCH. Univ. Zurich. *Ber.* 49, 172–80 (1916).—The property of $PhN(NO)OH$ of forming inner complex salts only with Fe, Cu, Ti and Zr is not changed by the introduction into the C_6H_5 nucleus of Cl, Br, NO_2 , Me or MeO; the introduction of acid groups only makes the inner metallic com-

plex salts more stable but has no apparent influence on the secondary valence union of other metals. When, however, groups like $\text{MeC}_6\text{H}_4\text{SO}_3$, HO , $\text{MeC}_6\text{H}_4\text{SO}_3\text{NH}$, $\text{MeC}_6\text{H}_4\text{SO}_3\text{NMe}$, Me_3N , OHC , are introduced in the *o*- or *m*-positions, the power of forming complex salts is extended to almost all the other metals. Almost all inner complex salts still have residual affinities available and are capable of combining with new mols.; qual. expts. have shown that the complex salts of the nitrosoaryhydroxylamines can combine with acids, bases, neutral salts and gases, the ability to combine varying with the nature of the metal and with the entrance and variation of substituting side chains. B. discusses the probable physiological importance of these facts, taking as an example the observation of Unna that of the various hydroxyanthracene, -anthranol and -anthraquinone derivs. only those hydroxyanthranol compds. with an HO group in the *p*-position to the C:O group have an extraordinarily powerful anti-psoriatic effect. II. Inner metallic complex salts of *o*-nitrosohydroxylaminophenyl *p*-toluenesulfonate. OSKAR BAUDISCH, H. GUREWITSCH AND S. ROTHSCILD. *Ibid* 180-90.—The NH_4 salt (*C. A.* 6, 2600) was the starting point for the prepn. of the following salts. The pure salt is very easily sol. in the purest distd. H_2O but if the latter contains only traces of inorganic salts the soln. becomes turbid; clear solns. in distd. H_2O give with ordinary H_2O a thick ppt., the salts imparting hardness to H_2O being thereby quant. pptd. All the salts below, of the general structure $\text{MeC}_6\text{H}_4\text{SO}_3\text{C}_6\text{H}_4\text{N}(\text{O}):\text{NOM}$ (M = metal + valence), are strikingly easily sol. in org. solvents, the Cu salt alone being an exception; in H_2O they are all practically insol.; all are able to combine with new mols., as shown by the change in color or soly. when brought together with acids, bases or neutral salts. The Co salt is difficultly, the Ni salt easily sol. in cold PhMe, but the difference is not sufficient to permit of a quant. sepn. of the 2 metals. The Co salt in Me_2CO , however, gives with aq. KCN a dark brown ppt. sol. in dil. HCl with light yellow color, while the Ni salt is merely decolorized by KCN but forms no ppt. *Cobalt salt*, from cold aq. solns. of the NH_4 salt and 0.6 part $\text{Co}(\text{NO}_3)_2$, obtained as a faintly pink cryst. powder after several pptns. from CHCl_3 with ligroin, sol. in CHCl_3 with faint yellow-red color; HCl gas turns the soln. momentarily blue and gives a ppt.; NO after a time produces a turbidity; the C_6H_6 soln. has the same color as the CHCl_3 soln., HCl decolorizing it and producing a white ppt.; slightly warm PhMe gives a blood-red soln. changing to green on heating, while further heating produces decompn. and sepn. of a brown-yellow ppt.; Me_2CO gives a faintly yellow soln. turned green by NO; on long standing the green soln. again becomes yellow; HCl likewise produces a green color, H_2S a black ppt., KOH produces no change, KNO_3 gives a milk-white ppt. The AcOEt soln. is reddish yellow, HCl turning it blue, then green. NH_4OH gives a faintly yellow, $\text{C}_6\text{H}_5\text{N}$ a deep red soln.; in the latter on heating there is partial decompn. and deposition of a brown-yellow ppt. Warm dil. HCl gives a blue-green soln.; prolonged heating produces decompn. with sepn. of an oil. The following salts were prepd. in the same way: *nickel*, green crystals; *ferric*, yellow; *chromic*, gray; *uranyl*, intensely yellow; *plumbic*, white; *bismuth*, faintly yellow; *mercuric*, white, becoming yellow in 2-3 days, then yellow-green; *cerium*, yellow; *lanthanum*, white needles with Ag luster from AcOEt -petr. ether; *thorium*, white; *aluminium*, *cadmium*; *cupric*, green-blue. For details as to the behavior of the salts towards various solvents and reagents, cf. the original. III. Inner metallic complex salts. OSKAR BAUDISCH, A. E. PISTOR AND B. SILBERBLATT. *Ibid* 191-202.—*o*-Nitrophenyl *o*-toluenesulfonate, from 7 g. $\text{o-O}_2\text{NC}_6\text{H}_4\text{OH}$ and 2 g. NaOEt in 400 cc. alc. heated on the H_2O bath with 10 g. $\text{MeC}_6\text{H}_4\text{SO}_2\text{Cl}$ until the red color changes to yellow (about 1 hr.), leaflets from alc., m. $131-4^\circ$; 5 g. suspended in 700 cc. alc. treated with frequent shaking with NH_3 , heated some time on the H_2O bath, then treated with H_2S in ice-salt until the soln. is completely filled with $(\text{NH}_4)_2\text{S}$ crystals (3-4 hrs.),

allowed to stand 24 hrs. in the ice chest, filtered, poured into 5-6 l. of ice-cold distd. H_2O and allowed to stand 2 days or more in the ice chest, gives the *o*-hydroxylamino ester, silvery needles, m. 64° ; treated in C_6H_6 or Et_2O with excess of NH_3 , then, with continuous stirring, with about the calcd. amt. of $AmNO_2$ and allowed to stand 15-20 min., it gives the ammonium salt of the nitrosohydroxylamino ester, $MeC_6H_4SO_3C_6H_4N(NO)ONH_4$, needles from alc., m. $118-22^\circ$ (decompn.), slowly turns brown in the air, easily sol. in distd. H_2O with faintly yellow color, the soln. giving a voluminous ppt. with tap H_2O . From the NH_4 salt were prepd. the following salts: cupric, gray-blue flocks; plumbic, white needles from C_6H_6 ; cobalt; nickel, greenish white; neodymium, voluminous light blue flocks; lanthanum, snow-white, turns superficially brown in the air; praseodymium, white with a greenish yellow tinge; erbium, yttrium, thorium, magnesium, all white. *p*-Toluenesulfonyl-*m*-nitroaniline (a), obtained in 10-2 g. yield from 6.9 g. $O_2NC_6H_4NH_2$, 9.5 g. $MeC_6H_4SO_3Cl$ and 2.5 g. $NaOAc$ heated 3 hrs. on the H_2O bath in 800 cc. H_2O , needles from $EtOH-H_2O$, m. 139° , converted by NH_3 and H_2S in 96% alc. into the aminophenylhydroxylamine, leaflets, which with NH_3 and $AmNO_2$ in $CHCl_3$ gives the ammonium salt of *p*-toluenesulfonyl-*m*-aminonitrosophenylhydroxylamine, m. 165° (decompn.); acidified in cold H_2O in the presence of Et_2O with HPO_4 , it gives the free hydroxylamine, scales from Et_2O , m. $109-11^\circ$, quickly decomps. in the air. From the NH_4 salt are obtained the following salts: Ferric, red-brown; cupric, light blue; cobalt, light pink; nickel, light green. *p*-Toluenesulfonyl-*N*-methyl-*m*-nitroaniline, from 5 g. (a) in a little 20% $NaOH$ shaken with 10 g. Me_2SO_4 , again treated with 5 cc. $NaOH$ and 3 g. Me_2SO_4 and heated at $40-50^\circ$ until alkali no longer produced a yellow color, treated with 20 cc. $NaOH$ and heated on the H_2O bath to destroy the excess of Me_2SO_4 , slender needles from alc., m. 111° . Aminophenylhydroxylamine, needles from C_6H_6 , m. 119° . Ammonium salt of the aminonitrosophenylhydroxylamine, snow-white crystals from $EtOH-Et_2O$, decomps. $134-48^\circ$, very unstable in the air and light. Metallic salts: plumbic, white; nickel, very faintly greenish yellow crystals from C_6H_6 , decomps. 135° ; cobalt, reddish gray; chromic, light yellow, yttrium, snow-white; aluminium, white. IV. Inner metallic complex salts. OSKAR BAUDISCH AND HERMANN ROM. *Ibid* 203-10.—*m*-Dimethylaminophenylhydroxylamine, from $m-O_2NC_6H_4NMe_2$ in alc., m. $107-8^\circ$, gradually darkens, reduces cold Fehling soln. and NH_3-AgNO_3 , colors the skin brown-black, produces sneezing, gives with NH_3 and $AmNO_2$ in Et_2O the ammonium salt of *m*-dimethylaminonitrosophenylhydroxylamine, fine silvery needles, becomes brown and insol. in H_2O in 1-2 hrs.; if it is dissolved in hot alc. and allowed to evap., red-violet needles of a peculiar odor sep.; they appear brown when rubbed, are insol. in H_2O but sol. in dil. HCl with red color; with $FeCl_3$ like the silvery NH_4 salt, they give in HCl an intense red color. Cupric salt, canary-green ppt., sol. in acids with dark red color. Ferric salt, dark brown ppt. becoming light brown on drying, sol. in Et_2O with red color, purified by pptn. from $CHCl_3$ with ligroin or petr. ether; it thereby becomes brown-black with a violet tinge. Thorium salt, light green crystals from $CHCl_3$, m. 151° , becomes yellow on heating. Neodymium salt, yellow. Cobalt salt, flesh-colored, decomps. about 110° . Praseodymium salt, white, decomps. 145° . Neodymium salt, yellow-green. Lanthanum salt, light yellow. For details of the prepn. and behavior towards various solvents of these salts, cf. the original.

CHAS. A. ROYLER.

The Wagner-Saytzeff reaction in olefin aldehydes. C. J. ENKLAAR. The Hague. *Ber.* 49, 211-3 (1916).—Allylisoallylcarbinol (C. A. 7, 1704) has now been obtained pure (yield, 48.7% boiling within 3° , 16.5% boiling within 1°) from 336.6 g. allyl bromide, b. $69.3-9.7^\circ$, and 21.2 g. crotonaldehyde, b. $102.2-2.5^\circ$, in an equal vol. of Et_2O slowly added to 19.7 g. Zn wool in a flask filled with CO_2 , gently heated to start the reaction; when the whole of the mixt. has been added, with cooling, in the course

of several hrs., it is heated 0.5 hr. to boiling, poured into H_2O , acidified with dil. H_2SO_4 , extd. with Et_2O , washed with $NaHCO_3$ and H_2O , dried with $CaCl_2$ and fractionated under 24 mm. in CO_2 . The carbinol b_{788} $156-6.7^\circ$ (decomp. into H_2O and higher boiling products), $d_4^{14.8}$ 0.8668, n 1.45193, 1.45527, 1.46294, 1.46959 for α , D, β and γ , resp., M 34.892, 35.116, 0.729, 1.157 for α , D, $\beta - \alpha$ and $\gamma - \alpha$. Tiglic aldehyde and methylethylacrolein also yield alcs. under these conditions. C. A. ROULLER.

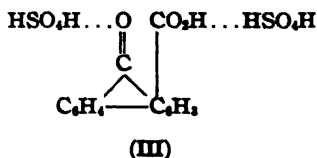
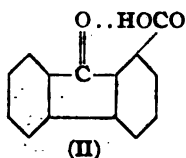
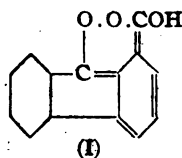
The isomerism of the benzil- α -carboxylic acids and their derivatives. A. HANTZSCH AND A. SCHWIETE. *Ber.* 49, 213-26(1916); cf. C. A. 9, 2252.—The acids, salts and esters exist in chromoisomeric series: yellow keto forms, $ArCOCOC_6H_4CO_2R$ ($R = H$, alkyls, metals), and colorless hydroxylactone forms, $O.CO.C_6H_4.C(OR)COAr$.

The corresponding acid chlorides are not chromoisomeric, both forms being colorless. Of the 3 possible series of the di- CO_2H derivs., only 2, the diketoid and the dilactoid, have thus far been obtained. The constitutions of the isomeric series were detd. both optically and chemically; the yellow series give absorption curves very similar to those of benzil, just as the curves for the ketoid esters of $o-BzC_6H_4CO_2H$, the corresponding salts and the free acid are similar to that for $BzPh$, while the colorless esters show absorptions very like those of the lactoid esters of $BzC_6H_4CO_2H$. Of the 2 forms of chlorides, 1 reacts like a true acid chloride with H_2O and alcs., while the other is so indifferent that it can be recrystd. from hot alc. The yellow salts, as derivs. of true keto acids, are stable in alk. soln. The yellow esters are much more easily hydrolyzed than the colorless esters. The presence or absence of color, however, is not sufficient to characterize any given form as ketonic or lactoid; thus, both forms of chlorides are colorless; the colorless lactoid di- CO_2H acid and its esters dissolve in concd. H_2SO_4 with yellow color, the yellow ketoid esters without color; the latter solns. gradually become yellow, owing to the conversion of the ketoid ester into the lactoid acid. Of the di- CO_2H acid, only the colorless form has thus far been obtained, but indirect evidence of the existence of chromoisomerism is furnished by the fact that colorless and yellow salts are known and that the colorless alkali salts when heated at about 130° become yellow without melting and on cooling remain yellow for quite a long time. The acids and salts, being electrolytes, yield mixts. of both forms, equil. being reached from either side with immeasurable velocity; the equil. always lies far towards the side of the yellow ketoid forms; in the case of the salts, only the ketoid form exists in soln., the solns. being optically identical with those of the ketoid esters and not changed by excess of alkali, but this cannot be said with equal certainty of the free acids. Nothing can be added to Graebe's description of the 2 forms of $o-BzCOC_6H_4CO_2H$ (*Ber.* 23, 1344(1890)) except that it cannot be concluded from mol. wt. detns. that both have the same mol. wt., for solns. of the colorless acid (even in $CHCl_3$ at -40°) at once become yellow and optically identical with those of the yellow acid. All the alkali and alk. earth salts are yellow but, with the exception of the Ca salt which melts in its H_2O of crystn. when heated, are obtained as syrups gradually solidifying to glass-like masses. Only the cryst. silver salt is colorless but dissolves with yellow color in warm H_2O and MeCN. Lactoid chloride, from the acid heated about 8 hrs. with excess of $SOCl_2$ at 80° until the soln. is almost colorless, m. 128° . True acid chloride, from the acid in CS_2 heated with excess of PCl_5 , crystals from C_6H_6 or $CHCl_3$, m. $61-3^\circ$, decomp. into anthraquinone when distd. *in vacuo*, converted by long heating in $CHCl_3$ into its isomer. Ketoid methyl ester, m. 117° . The colorless esters could not be obtained, even the lactoid chloride and Na alcoholates in alc. or indifferent solvents and the colorless Ag salt alone or in MeCN with alkyl halides giving the yellow esters. ($o-HO_2CC_6H_4CO$) $_2$, from diphthalylactonic acid (Reissert, C. A. 7, 2578) and $KMnO_4$, m. 273° . Lithium salt, colorless but becomes intensely yellow at 130° . The colorless

ammonium salt gives the acid on heating. All methods of prepn. of the chlorides yield mixts. of both forms, the lactoid predominating; the latter partially seps. in rhombic crystals, m. $250-3^{\circ}$, when the acid is heated with excess of SOCl_2 10 hrs. at 130° ; the remainder is obtained by evapg. the SOCl_2 , digesting with cold C_6H_6 and recrystg. the residue from hot C_6H_6 ; it is identical with the product obtained from diphthaly and PCl_5 (Ador, *Ann.* 168, 236) and can be boiled for hrs. with alc. without change. The ketoid chloride, obtained from the cold C_6H_6 ext. above, m. $194-6^{\circ}$, is always obtained only in small amt., even with P chlorides. The yellow esters can be obtained from the Ag salt with alkyl halides, the ketoid chloride with alcs. and also from a suspension of the lactoid chloride in hot MeOH slowly treated with dil. NaOMe until it just dissolves with yellow color. The colorless esters are obtained from the acid with alcs. and HCl (cf. Juillard, *Ann.* 242, 229; Hönigsberger, *Ibid* 311, 266); contrary to the conclusions of J. and H., however, they are di-, not monoalkyl, esters; heated several hrs. in alc. at about 200° , in the presence of a trace of HCl, they are converted into the ketoid esters. Mol. wt. of the yellow di-Et ester in alc. 337; of the colorless ester in AcOH 330, 345.

CHAS. A. ROUILLER.

Optical anomalies of fluorenone- and allochrysoketone-1-carboxylic acids. A. HANTZSCH. *Ber.* 49, 226-32 (1916); cf. Stobbe, *C. A.* 9, 1772; Schaarschmidt, *C. A.* 10, 341.—The fact that fluorenone-1-carboxylic acid (a) is cinnabar-red and allochrysoketone-1-carboxylic acid (b) Bordeaux-red, while the salts and esters of both are only gold- to orange-yellow seems contradictory to H.'s observation that org. acids and their esters do not differ materially in their absorption and that the corresponding alkali salts may often be more strongly but never, as in the above cases, more faintly colored. In the belief that this anomaly might be due to chromoisomerism similar to that described in the preceding abstr., all the methods there used to prep. the isomeric esters, chlorides and salts were applied to (a) and (b) but without success. Since the yellow solns. of (a) and (b) are similar to the yellow solns. of $\text{BzCOC}_6\text{H}_4\text{CO}_2\text{H}$ and the acids are therefore certainly ketoid, the lactoid forms, if they existed, should be colorless or at least much lighter. The dark (a) and (b) can therefore not be the hydroxylactone forms and must be constitutionally changed forms of the true ketonic acids. Since these 2 acids are the only ones also characterized by a firmly fixed adjacency of the C:O to the CO_2H group, their abnormal color probably depends on some intramol. reaction between these 2 groups. Since the hydroxylactone form is excluded and a superoxide-



like ring (I) is improbable, there only remains the inner oxonium salt structure (II). This explains all the optical anomalies of (a) and (b). (a) has the same cinnabar-red color as the external oxonium salt, fluorenone nitrate, $\text{C}_6\text{H}_4\text{C}_6\text{H}_4\text{C}:\text{O}:\text{O}:\text{HNO}_3$ (Meyer,

C. A. 4, 1142), and just as the latter is resolved into its components by solvents, so (a) in sufficiently dil. alc. solns. assumes the yellow color and the absorption of the true ketoid ester. This also explains why fluorenone-4-carboxylic acid, isomeric with (a), is optically normal, being yellow; the C:O and CO_2H groups are sepd. so far intramol. that they cannot form the inner oxonium salt. Moreover, this view is in harmony with the fact that the color of (a) and (b) in soln. depends enormously on the solvent, being normal (*i. e.*, almost identical with that of the ketoid esters) in indifferent solvents like alc. and CHCl_3 , but increasing and approaching that of the solid acids with

increasing acidity in the solvent; thus, in AcOH they are already considerably darker than in alc. while in $\text{CCl}_4\text{CO}_2\text{H}$ they are cinnabar-red and Bordeaux-red, resp. In other words, in indifferent solvents the solid, dark oxonium salts are almost completely "hydrolyzed" to the true open ketoid forms, but in strong acid media they exist as inner oxonium salts or oxonium salts of the medium. One point remains to be explained: in concd. H_2SO_4 (a) and (b) dissolve with colors even deeper than those of the solid acids (Bordeaux-red and deep brown-violet, resp.). This may be due to the fact that even in the solid form the acids do not exist wholly in the oxonium salt form but consist of solid solns. of the salts in the yellow ketoid form and are only completely converted into the oxonium salts when dissolved in concd. H_2SO_4 , or it may be that a dioxonium sulfate (III) is formed. This is rendered probable by the fact that compds. like AcOH and BzOH form oxonium sulfates in concd. H_2SO_4 and show much stronger absorption in this than in other solvents.

CHAS. A. ROULLER.

Alleged isomerism of formanilide. A. HANTZSCH. *Ber.* 49, 232-3 (1916).—Of the 2 supposed isomers of HCONHPh , m. 46° , obtained by Orlov by heating glycerol monoformate (a) with PhNH_2 (*J. Russ. Phys. Chem. Soc.* 37, 439), the liquid product is impure $\text{HO}_2\text{CCONHPh}$ and that m. 245° is $(\text{CONHPh})_2$. They are obtained only when the crude (a) (prepd. by heating glycerol with (CO_2H) , up to 180°) is used; pure (a), b.p. 165° , does not react with PhNH_2 under the conditions given by O. C. A. R.

Chromoisomerism of the phenol aldehyde salts. A. HANTZSCH. *Ber.* 49, 234-6 (1916); cf. C. A. 9, 3234.—Reply to Pauly (C. A. 10, 478). C. A. R.

Rearrangement of iso into tertiary butyl bromide. A. MICHAEL, E. SCHARF AND K. VOIGT. *J. Am. Chem. Soc.* 38, 653-75 (1916).—As previously shown (C. A. 7, 784) the isomerization of iso-BuBr (a) into Me_3CBr (b) depends to a remarkable degree on the purity of the (a), very small amts. of certain substances being capable of retarding it almost completely at temps. at which the pure product changes rapidly. The present work was undertaken to det. the conditions for prepg. a purer (a) and study its rearrangement quant. but the purer (a) is so extraordinarily unstable and sensitive to positive and negative catalysts that it has not been possible to obtain more nearly const. results than in the earlier work. The purest (a) is obtained by heating very pure iso-BuOH and HBr at 65° , the alc. being purified by fractionation and conversion into the boric ester and the HBr prepd. from electrolytic H and very pure Br. It cannot be distd. once without forming HBr or rearranging to some extent into (b); the latter change even takes place slowly in a brown desiccator at room temp. It often becomes brown at 108° , can be heated only a short time at 142° and totally decomp. at 260° . Dissociation could not be detected in the gaseous state at 142° in a Meyer app.; at 184° the amt. of gas obtained at once corresponded to the normal vapor density, then for the next 20 min. gas was slowly evolved until about 50% of the (a) was dissociated, but that rearrangement occurs intramol. in the gaseous state is shown by the fact that (b) is formed even at 100° . Asbestos, glass wool, sand, etc. (cf. Konowalow, *Ber.* 18, 2808 (1885)), produce no dissociation at 142° ; even powdered "Geraete" glass, which considerably affects the rearrangement in the liquid state (see below), has no influence in the gaseous state. The earlier observations on the action of negative catalysts on the liquid have been confirmed with the purer (a); small amts. of diisobutene, iso-BuOH and Me_3COH greatly decrease the rearrangement and the limit of the reaction. Ground surfaces (glass or quartz) also act as negative catalysts in the liquid state, the isomerization being more retarded in quartz than in glass. The retardation is probably due to the formation of minute amts. of by-products. With the pure (a) the limit of (b) formation was found to be 69.1-75.5% at 142° , 67.6-73.2% at 184° and 19.8-20.2% at 108° . In Jena "Geraete" glass the rearrangement is almost

3 times as fast as in Jena hard and ordinary soft glass, the glass either acting directly as a catalyst or through the formation of another compd. by the action of the (a) on it; if the latter assumption is correct, the amt. of new compd. formed must be infinitesimal, for no solid residue is obtained on boiling the powdered glass a long time with (a) and evapg. the liquid. The main difference between the "Geraete" glass and the other kinds of glass used is that it contains ZnO, and it was found that about 0.0001% ZnBr₂, as a matter of fact, almost doubles the rearrangement, whereas 0.0004% only increases it about 25% and causes the formation of small amts. of colored by-products, while with appreciable amts. of the salt the product is dark and contains no (b). No Zn could be detected in HBr with which "Geraete" glass had been digested some hrs. Vessels of this glass are less active on 2nd use but show no change on further employment. HgCl₂ (0.02%) and HCl (0.3%) are also strong positive catalysts, while CaBr₂, Al₂O₃, and traces of H₂O are inert. The small amt. of air which the (a) can absorb exerts a positive catalytic influence; this may account for the earlier observation that the increase in surface in proportion to the mass of (a) increases the velocity of rearrangement. M., S. and V. believe the above facts show conclusively that the rearrangement occurs directly through intramol. shifting of the atoms and not by dissociation into isobutene and HCl and subsequent addition (Brunel, C. A. 6, 344, and earlier workers). That the rearrangement takes place more readily in the liquid than in the gaseous state may be due to the fact that in the liquid state the change occurs not in sep. mols. but in aggregates of them ("polymols.") whose total energy may be greater than that of the gaseous mols. CHAS. A. ROUILLER.

Certain derivatives of tetrabromo-*o*-quinone. C. LORING JACKSON AND SYDNEY A. BIGGS. *J. Am. Chem. Soc.* 38, 676-85 (1916).—From 10 g. tetrabromo-*o*-quinone in 60 cc. C₆H₆ shaken with 28 g. K₂SO₄ in 100 cc. H₂O at 10°, quickly filtered and allowed to stand overnight is obtained *dipotassium dibromopyrocatecholdisulfonate* (a), C₆Br₂(OH)₂(SO₃K)₂, needles, gives with Pb(OAc)₂ in H₂O a white ppt., reduces AgNO₃ on standing, gives a deep blue color with FeCl₃, turns dark brown with hot KOH and after 2 hrs. boiling is converted into K euthiochronate. *Barium salt*, from the Pb salt decompd. with dil. H₂SO₄ and shaken with BaCO₃, crystals with 3H₂O. *Calcium salt*, crystals with 4 H₂O. The free acid could not be isolated; the soln. obtained from the Pb salt treated with insufficient H₂SO₄ turned red even when evapd. at room temp. either spontaneously or with a blast of air; H₂S, even on long standing, decompd. the Pb salt only slightly. When 5 g. of the powdered (a), in a dish cooled with ice, is moistened with concd. HNO₃, a red color is produced; after letting stand in ice until the mass is thick and pasty it is ground with a pestle and as soon as red fumes begin to be evolved copiously the reaction is stopped by adding alc. and the mass is washed with alc. There is thus obtained what J. and B. believe to be *dipotassium dibromo-*o*-quinonedisulfonate* (b), contaminated with KNO₃ which could not be removed, as H₂O is the only solvent for the compd. but decomps. it even in the cold. Most of the 5 g. of (a) dissolves in 5 cc. cold H₂O and on standing overnight deposits 0.8 g. tri-K euthiochronate; 0.7 g. more is obtained on evapg. to 2.5 cc. Allowed to stand 6 months with MeOH, EtOH and PhCH₂OH, only in the case of MeOH did (a) form a white crust on its surface; this may have been the α -addition product sought (cf. *Am. Chem. J.* 31, 89 (1904)) but not enough was obtained for identification. In the hope of obtaining (b) free from KNO₃, (a) was oxidized electrolytically, but although (b) was formed, as shown by the red color of the soln., by the time the (a) was completely oxidized the (b) had also been destroyed, and a small amt. of CBr₃COCHBr₃ was formed (0.15-0.3 g. from 5 g. (a)). In the prepn. of (a) there is also formed a minute amt. of a substance sepg. in plates, forming an insol. Ba salt and giving no color with FeCl₃ or HNO₃. If the reaction is carried out at 50° instead of in the cold, it becomes the

chief product (35 g. from 50 g. tetrabromo-*o*-quinone). (For a time, although the conditions were apparently identical, this compd. could not be obtained by the methods which were formerly successful, but later on it again became possible to obtain it at will.) After drying at 130° (whereby it loses 5 H₂O) its compn. corresponds to C₄(SO₃K)₂O₂H₂ (or some multiple of this), which would make it the *o*-thiocronate with 1 mol. H₂O. It is white, however, while the *p*-thiocronate is yellow and *o*-quinones are in general more highly colored than the *p*-compds., and moreover it can be boiled without change with concd. KOH, is not attacked by HCl below 150° and does not reduce Ag solns.; these properties agree with what would be expected of the *α*-water

addition compound $\left[\begin{array}{c} \text{KO}_2\text{SC}:\text{C}(\text{SO}_2\text{K})\cdot\text{C}(\text{OH})\text{---} \\ | \qquad \qquad | \\ \text{KO}_2\text{SC}:\text{C}(\text{SO}_2\text{K})\cdot\text{C}(\text{SO}_2\text{K})\text{OH} \end{array} \right]_2\text{O}$, with 1 mol. H₂O. Un-

like PhNH₂, *sec*-amines did not give well-defined derivs. with tetrabromo-*o*-quinone, PhNHMe yielding only a tar, while NHMe₂ yielded black crystals, decomp. 115–25°, probably of the compn. C₄Br₄O₂(NMe₂)₂, decomp. in soln. with formation of a red product and evolution of NHMe₂, and on standing dry *in vacuo* form a tar. Similar, somewhat less stable and less sol. crystals are obtained from tetrachloro-*o*-quinone.

CHAS. A. ROUILLER.

Additive compounds formed from *trans*-dichlorodiethylenediaminecobaltic chloride (PRICE) 6. Recovery of glutamic acid and betaine from extracts of the residue from the recovery of sugar from molasses (ANDRLIK) 28. Equilibrium between mucic acid and its lactones (TAYLOR) 2.

11. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

FRANK P. UNDERHILL.

Cephalin. III. Cephalin of the egg yolk, kidney and liver. P. A. LEVENE AND C. J. WEST. Rockefeller Inst. *J. Biol. Chem.* 24, 111–6(1916); cf. *C. A.* 8, 713; 10, 615.—The cephalin prepd. from egg yolk, kidney or liver appears to be identical with that of the brain.

I. GREENWALD.

Is autolysis an autocatalytic phenomenon? MAX MORSE. Univ. Nebraska College of Med. *J. Biol. Chem.* 24, 163–7(1916).—The curve of the development of acid in an autolyzing mixt. parallels the curve of the rate of autolysis. Since acid is known to accelerate autolysis, it is concluded that autolysis is autocatalytic.

I. GREENWALD.

Presence and variation in the uterus of the rat of fat and of a type of cells which produce an internal secretion. PIERRE-M. BESSE AND D. CHRISTIDES. Univ. Geneva. *Arch. Med. Exper.* 26, 573–87(1915).

JOHN T. MYERS.

Action of blood serum in producing sub-normal temperature. GUIDO GUERRINI. Milan. *Pathologica* 5, 701–4; *Zentr. Biochem. Biophys.* 18, 199(1915).—Homogenous and homoplastic sera have the effect of producing sub-normal temp. when intravenously injected into rabbits in large doses; this action is more persistent and more pronounced with homoplastic than with homogenous serum. This effect depends upon the presence of a substance which is not identical with complement and which is destroyed at 60° but suffers no injury by contact with fresh tissue at 37°.

H. S. PAINE.

Cycle of the elements in nature. W. E. CROSS. *Rev. industrial agr. Tucuman* 6, 50-9(1915).—C. discusses especially the cycles of C, N, S, P and Mg in plant and animal life and the energy changes which are involved therein. H. S. PAINE.

On putrefaction processes. F. BORDAS AND S. BRUÈRE. *Compt. rend.* 160, 847-9(1915).—Expts. with pig embryos and with the fluid of fermenting cellulose show that the decompn. of org. substances may be aided by the addition of suitable bacteria and especially accelerated by the maintenance of a moderate temp. (25°). At a lower temp. (13°) the action of the microorganisms is completed in 14 days.

W. A. PERLZWEIG.

Earth odor. HUGO KÜHL. *Naturwissenschaften* 4, 102(1916).—A review of the work of Rullmann (*Dissert.* 1895, 598; *Centr. Bakt. Parasitenk., Abt. II* 2, 116, 701 (1896); 5, 212, 713(1899)), Salzmann (*Dissert. Königsberg i Pr.* (1902)) and others.

L. W. RIGGS.

Influence of certain substances on the activity of invertase. EDWARD G. GRIFFIN AND J. M. NELSON. *J. Am. Chem. Soc.* 38, 722-30(1916).—The inhibiting influence of glass beads on the activity of invertase is probably due to the soly. of the glass and the consequent decrease in the H-ion concn., rather than to the surface of the beads, as claimed by Beard and Cramer (*C. A.* 9, 3068; *Nature* 95, 561(1915)); in expts. in Non-sol bottles containing 0, 25, 50 and 100 g. glass beads, pH was found to be 5.9, 6.5, 7.3 and 8.5 and the change in rotation produced in 24 hrs. 0.34°, 0.11°, 0.06° and 0.02°, while in solns. in which the H-ion concn. was kept const. by means of a buffer soln. glass beads had no effect at 20° or 37°. The supposed inhibiting effects of serum, egg albumen and charcoal (Erikson, *C. A.* 5, 3291) are also due to changes in the H-ion concn. Large amts. of charcoal and Al(OH)₃ will absorb invertase (cf. Michaelis and Ehrenreich, *C. A.* 3, 920), but in small amts. they seem to have no influence on the activity of the enzyme.

CHAS. A. ROULLER.

Further researches on pure pepsin. W. E. RINGER. *Proc. Akad. Wetenschappen* 18, 738-51(1915); cf. *C. A.* 10, 482.—Pure pepsin was prepd. by Pekelharing's method from the gastric juice of a dog. By prolonged dialyzation, precipitation by (NH₄)₂SO₄ dissolving in H₂C₂O₄ and again dialyzing for a long time, R. succeeded in obtaining a Cl-free pepsin. The Cl present in common pepsin is ascribed to HCl held back, combined or adsorbed. This pepsin has no isoelectric point and in acid soln. appears to be anodal. Pepsin binds albumoses and proteins but not amino acids. Since the pepsin combines chiefly with H ions in HCl soln., pepsin must be a compd. of a highly complicated protein and the enzyme. With continual addition of acid to protein soln. the swelling is made to pass through a max. The optimum of digestion lies at the reaction which concurs with a max. swelling. A study was made with HCl, H₂CO₃, lactic acid, citric acid, H₃PO₄ and H₂SO₄. In concd. AcOH soln., pepsin is inactive. Max. swelling does not occur at the same H ion concn. with different acids, but if the acid is highly hydrophilous, it will prevail even in slight concn. Salts with strongly hydrophilous ions retard the action of pepsin; Na salts in lactic acid soln. at 15° showed citrate < acetate < Cl < ClO₄ < NO₃ < CNS < SO₄. The retardation of pepsin activity and influence upon swelling proceed collaterally. The max. swelling of dissolved protein shifts according to the formation of other substances.

R. L. S.

Activity of enzymes in emulsin other than β -glucosidase, in the biochemical synthesis of alcohol β -glucosides. E. BOURQUELOT AND A. AUBRY. *J. pharm. chim.* 12, 305-14(1915).—In emulsin, the enzymes β -glucosidase, lactase, β -galactosidase, gentiobiase (*C. A.* 8, 3063) and cellulase (*C. A.* 4, 1870, 1994) have thus far been more or less well defined. In an alc. soln. of dextrose only the 1st, 4th and 5th of these enzymes can act simultaneously, forming, resp., β -glucose, β -galactobiose and β -cellobiose. As the amt. of glucoside formed is

of the bioses increases with concn. of dextrose, *i. e.*, with decreasing H_2O , the influence of increasing amts. of H_2O on the yield of glucoside must be detd. Preliminary expts. are recorded to show the downward march of optical rotation to equil. when emulsin (1 g.) is added to 8 aq. solns. of dextrose in amts. decreasing from 70 to 10 g. per 100 cc. at ordinary temp. For dextrose, $[\alpha]_D$ is $+52.5^\circ$, for gentiobiose $+10.2^\circ$, cellobiose $+34^\circ$. The results tabulated and plotted in a curve show that opt. rotation diminishes both at low and at high concns., by much greater amts. when concn. is high than when low; but equil. is reached far more slowly in high than in low concns. (70 days in 70 g. per 100 cc., 14 days in 10 g. per 100). From the loss of opt. rotation, the hypothetical amts. of gentiobiose formed are calcd. for each soln.; of cellobiose only for the soln. of 70 g. in 100. With solns. 30 g. and 50 g. in 100, isolation of the bioses was attempted after equil. by fermenting off dextrose and detg. the opt. rotation, reduction and dry wt. of residue. The results point to the formation of one or several other unknown polyoses. It is finally shown that the above diminution of opt. rotation in samples 10 g. and 15 g. per 100 is not in the least affected by the presence of a neutral liquid, *e. g.*, Me_2CO . Thus the activity of hexobiases is not influenced by $EtOH$, and is independent of that of β -glucosidase except that the latter may take away dextrose for its own synthetic action. In 1 expt. with glycol, excess of dextrose and emulsin, gentiobiose crystallized first. Cf. *C. A.* 10, 771. S. WALDBOTT.

Uric acid in the organism. M. ISRAELSON. *Pharmazevlizeski J.* 19, 189; *J. pharm. chim.* 12, 363-5 (1915).—Distinction is made between *exogenous* uric acid, due to decompn. of nitrogenous food, and *endogenous*, due to the breakdown of the nucleoproteins of the cells, the latter being the real cause of uricemia. S. WALDBOTT.

The influence of temperature and poisons upon enzyme action, fermentation and growth. OTTO RAHN. Univ. Ill. *Biochem. Z.* 72, 351-77 (1916).—The temperature coeff. of growth is not const. but gradually decreases to zero with increase of temp. Enzymes in soln. are unstable. The velocity of decompn. has a very high temp. coeff. The decompn. is not caused by the activity of the enzyme, for the enzyme is really protected by the substrate. The action of the enzyme upon the substrate has a normal temp. coefficient. The same amt. of enzyme causes, at higher temps., a more rapid change; yet the reaction velocity is not const. for the amt. of enzyme decreases. With increasing temp. the 2 processes oppose one another; the decompn. of enzyme is more rapid than the increased enzyme action. Thus the reaction velocity gradually becomes zero. There is no const. "optimal temp." of enzyme action; the optimal temp. decreases with the time and approaches asymptotically the lowest temp. Enzyme reactions are incomplete processes. At low temps. they can be nearly complete. The end point of enzymic reactions decreases with increasing temp. The temp. coeff. of enzyme destruction must be larger than that of enzyme action. The fermentation enzymes are decompd. inside as well as outside of the cell. The living cell forms, under normal conditions, new enzyme in amt. sufficient to replace the loss by decompn. The normal living cell therefore works with a const. amt. of enzyme and thus the fermentation velocity is const. Since the temp. coeff. is very great for enzyme decompn., there comes a point with increasing temp. at which the enzyme formation cannot replace the destruction. Because of this the fermentation velocity gradually becomes zero. The higher the temp. the more quickly this occurs. In fermentation by living cells there is a true const. optimal temp., which is the highest temp. at which the processes of enzyme formation and decompn. are equal. The same considerations hold for growth. We suppose a growth-producing agent, which is unstable and is replaced by the cells. Therefore there is a const. optimal temp. of growth. Poisons influence enzyme action as well as decompn., the latter more than the former. The result is that the strongest enzyme activity shifts, with the time, from the largest concn. of

poison to the smallest. With fermentation, using slight stimulations, there can be a permanent acceleration without injury to the organism. The same is true for growth.

C. J. West.

Retarding influence of the light from a quartz lamp upon coagulation of the blood. WALTHER HAUSMANN AND ERNST MAYERHOFFER. Vienna. *Biochem. Z.* 72, 379-83 (1916).—Plasma, prepd. from blood treated with concd. NaCl soln., when exposed to light from the quartz mercury lamp, is not coagulated by the further addition of distd. H₂O, while the untreated control coagulates a few min. after such addition. Through the light treatment one is able noticeably to retard the coagulation of NaCl plasma by H₂O. The plasma prepd. from blood by the addition of K oxalate coagulates much more slowly after the addition of CaCl₂ when subjected to the action of light from the quartz mercury light. From this follows the necessity of carefully adjusting the action of ultraviolet light upon patients.

C. J. West.

Enzymes. X. Enzymic synthesis of disaccharides. WALTHER LÖB. Berlin. *Biochem. Z.* 72, 392-415 (1916).—600 g. sugar beet gave 260 cc. juice, with a rotation of 0.28° (10 cc. dild. to 1 l.) corresponding to a sucrose content of 21.1%. The juice contains an enzyme which decomposes small amts. of urea, a catalase, peroxidase and an invertase. This invertase is not capable of synthesizing disaccharides. Similarly, the invertases of yeast, the pancreas and the kephir grain are not capable of synthesizing disaccharides from hexoses.

C. J. West.

Micella are not necessary for the explanation of uncomplicated swelling. J. R. KATZ. Univ. Amsterdam. *Z. physiol. Chem.* 96, 255-87 (1916).—Earlier work has shown that in the case of swelling of crystals, the phenomenon can be explained very well without the use of the supposition of micella. The simple theory that swelling depends upon the formation of a solid soln. of water in the *quellbar* compds. is sufficient to explain all observed facts. This theory is now extended to amorphous substances. The principal difficulty heretofore has been the secondary complications. To avoid these one must observe the following precautions: The compds. investigated must be homogeneous, must not be a mixt. of several substances (as are most proteins and polysaccharides), must not change color upon addition or loss of H₂O, must not be capable of irreversible change, or must be investigated after these changes have occurred, must not have a porous structure and must not show hysteresis. The vapor tension curves of all substances investigated (casein, cellulose, Ca₃(PO₄)₂, gum arabic, peptone, serum albumin, cerebrin and gelatin) have similar forms and are the same as those found for cryst. substances. Study also was made of the heat evolved during swelling, of the contraction of vol. and of the relation of these to one another. The facts are fully covered by the theory of a solid soln. of water in the *quellbar* compds. and in the older theory *micella* can be replaced by *molecules*.

C. J. West.

Phylloerythrin. Bilipurpurin. HANS FISCHER. Univ. Munchen. *Z. physiol. Chem.* 96, 292-5 (1916).—The prepn. of Lobisch and Fischer (*Monatsh.* 1903, 159) analyzes better for C₂₈H₃₆N₄O₆ than for C₂₈H₃₄O₄N₄, the formula earlier proposed. A Cu salt was prepd. from a C₂₈H₃₄N₄-AcOH soln., which analyzed for C₂₈H₃₄N₄CuO₄ thus indicating the presence of 0.5 mol. C₂₈H₃₄N₄. While this may be isolated from the feces of sheep the yield is so small that the work was discontinued. During the course of the work F. isolated a yellow pigment, C₂₈H₃₄O₂, glistening plates, m. 192-3°.

C. J. West.

B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

A further study of the diagnostic value of the colloidal gold reaction, together with a method for the preparation of the reagent. S. R. MILLER, N. D. BRUSH, J. S. HAMMERS AND L. D. FELTON. Johns Hopkins Hosp. *Bull. Johns Hopkins Hosp.* 26,

391-406(1915).—Great care and minute attention to detail is necessary in the prepn. of colloidal Au solns. which will be sufficiently sensitive for use in colloidal Au reactions with spinal fluids. Reference must be made to the original article for the technic of the method and for the detailed record of the examn. of 300 spinal fluids. The reaction has given the most consistent and valuable results in cases of general paresis. The sources of error are few and easily recognized and the reaction requires a minimal amt. of fluid and a technic of extreme simplicity but its entire value is dependent upon the use of a reagent suitably prepared and standardized. A. P. LOTHROP.

A colorimetric method for the determination of the hydrogen ion concentration of biological fluids, with special reference to the adjustment of bacteriological culture media. S. H. HURWITZ, K. F. MEYER AND Z. OSTENBERG. Univ. California Med. School. *Bull. Johns Hopkins Hosp.* 27, 16-24(1916).—A method is described for the detn. of the H-ion concn. in biological fluids which is not interfered with by the turbidity of the fluid or the presence of pigments. "The medium tested serves as a background for the standard test color to which it imparts its own characteristic quality of color, thus making the color of the fluid to be tested directly comparable with the standard test solns." Phenolsulfonephthalein is used as the indicator and the comparisons are made in special tubes in a comparator, for a description of which reference must be made to the original. The method is of great value in the adjustment of the H-ion concn. of media for organisms which are most sensitive to the reaction of their culture fluids. A. P. LOTHROP.

The application of reactions employed in organic chemistry in photomicrochemical investigations. C. VAN WISSELINGH. *Folia microbiologica. Holland. Beitr. zur gesamt. Mikrobiol.* 3, Heft 3, 34 pp.(1915); *Chem. Zentr.* 1915, II, 98.—Several methods for testing for chitin are proposed. The material is first heated to 160° in a sealed tube with concd. KOH, whereby chitin is changed to chitosan. The latter gives a violet coloration with I and dil. H₂SO₄. The H₂O-sol. salts of chitosan are easily pptd. by the alkaloidal reagents. Methods for the elimination of interfering plant materials are discussed. W. A. PERLZWEIG.

The test for hydrochloric acid in medicine. Answer to O. Krummacher. JOHANNES CHRISTIANSEN. *Z. Biol.* 65, 513-5(1915).—Polemic with O. Krummacher (*C. A.* 8, 2405) concerning the use of indicators. A uniform technic is claimed to be necessary if the values obtained through the use of any indicator are to represent definite concns. of H ion. W. A. PERLZWEIG.

Exogenous precipitations in histological staining. RAPHAEL E. LIESGANG. *Z. wiss. Mikroskop.* 31, 466-71(1915).—Various staining and pptg. reagents diffuse through colloidal material at a very slow rate or do not diffuse at all. The results obtained under such conditions lead to erroneous conclusions. Pptn. may occur not in the tissue under investigation but in the surrounding fluid or only at the surface. A revision of methods is advized. W. A. PERLZWEIG.

A stain for tubercle bacilli. EMANUEL KLEIN. *N. Y. Med. J.* 103, 217-8(1916).—A mixt. of 1 part of a 3% soln. of crystal violet in EtOH and 3 parts of a 1% aq. soln. of (NH₄)₂CO₃ is applied to the smear, heated to steaming and allowed to cool. The steaming and cooling is repeated twice. The excess stain is poured off and the smear is washed in tap water and decolorized by alternate applications of 10% HNO₃ and 95% EtOH. The prepn. is counterstained for 3 min. with a soln. of Bismark brown prepd. by adding an alc. soln. of the dye to water until the color equals that of tincture of I. A. H. RAHE.

A possible source of error in colorimeter observations. J. H. LONG. *J. Am. Chem. Soc.* 38, 716-8(1916).—The prisms in Duboscq colorimeters seem to be fastened

in their brass sockets by means of a wax which is too soft and may allow the prisms to drop a little in our summer climate or if the instruments are placed near radiators, etc. That such a dropping has actually occurred has been noticed by L. in several cases. The colorimeters should be frequently checked by bringing the ends of the prisms in contact with the bottoms of the cells and noting whether or not the readings are zero.

CHAS. A. ROULLER.

The electrometrical measurement of the true reaction of the blood. JOSE MA DE CORRAL. Univ. Valladolid. *Biochem. Z.* 72, 1-25(1915).—The various methods of measuring H^+ concn. are discussed. C. uses a modified form of Hasselbalch's method. The venous blood of 12-month-old heifers, measured with a natural CO_2 tension, after being coagulated in various ways and either in the dild. or undild. states, at temps. from 14 to 20°, gives an av. value of p_H 7.59 or $[H^+] 0.26 \times 10^{-7}$. The OH^- concn. would vary according to the temp. Using the difference found by Michaelis and Davidoff (with human blood) for a temp. interval of 18 to 37.5°, the value of p_H at 37.5° for heifer blood is calcd. to be 7.59—0.21 or 7.38, corresponding to $[H^+] 0.42 \times 10^{-7}$, which agrees very well with those found by Hasselbalch and Lundsgaard. The individual variations found were very small, and were attributed to errors of measurement. Venous blood of 3 normal men, measured in its natural CO_2 tension and at about 14°, gave an av. value of p_H 7.59 or $[H^+] 0.26 \times 10^{-7}$, which agrees well with the work of Michaelis and Davidoff. Rabbit blood gave practically the same figures. Thus in 3 classes of animals investigated, the H^+ concn. of the blood is practically identical. Individual variations are so small that they must be explained as errors in the method rather than as real variations. The interesting observation of Michaelis and Davidoff that diln. of the blood with CO_2 -free 0.85% NaCl soln. does not change the H^+ concn. is confirmed.

C. J. WEST.

Determination of amino acids in the urine. IVAR BANG. Univ. Lund. *Biochem. Z.* 72, 101-3(1915).—The formol titration of amino acids in urine is facilitated by shaking the urine with blood charcoal. To prevent absorption of the amino acids 20% alcohol is added to the urine. The proteins are absorbed by the charcoal in the presence of the alc. The behavior of the albumoses is not known. C. J. WEST.

Biological test for proteinogenetic amines in organ extracts and body fluids. M. GUGGENHEIM AND WILH. LÖFFLER. Basel. *Biochem. Z.* 72, 303-24(1916).—A large number of proteinogenetic amines and related compds. was tested for their effect on the isolated guinea-pig intestine. Using 100 cc. Ringer soln. as a medium of suspension the following minimal active doses were found: β -Imidazoleethylamine 0.000025 g., *p*-hydroxyphenylethylamine 0.001 g., phenylethylamine hydrochloride 0.001 g., isoamylamine hydrochloride 0.005 g., indoleethylamine hydrochloride 0.002 g., suprarine 0.00001 g., methylguanidine nitrate 0.01 g., choline hydrobromide 0.01 g., acetylcholine hydrobromide 0.000001 g., neurine hydrobromide 0.001 g. In doses of from 0.1 to 0.01 g. the following were active: alkali salts of higher fatty acids, oxalic acid, citric acid; in doses from 0.05 to 0.01 g., indole, phenol, cresol, guaiacol, Na_2HPO_4 . The following were inactive in doses of 0.1 g.: aliphatic amino acids, silk peptone, protein solns., dihydroxyphenylalanine, histidine, tryptophan, *p*-hydroxyphenylacetic acid, homogentisic acid, methylamine, ethylamine, trimethylamine, cadaverine, putrescine, guanidine, alkali salts of the lower fatty acids, glucose and lecithin.

C. J. WEST.

New method for the separation of ethanolamine (colamine) from the products of the hydrolysis of phosphatides. H. THIERFELDER AND OTTO SCHULZE. Univ. Tübingen. *Z. physiol. Chem.* 96, 296-308(1916).—Colamine may be extd. with Et_2O if a concd. aq. soln. is treated with a little CaO to remove the last traces of H_2O ; 96-98% are recovered. Choline is not removed and may be extd. by alc. Colamine

may be identified as the picrolonate. In a sample of lecithin investigated there is, besides choline and colamine, another base, a part of whose N is amino-N.

C. J. Wzsr.

C. BACTERIOLOGY.

ERNEST D. CLARK.

Improved technic for staining tubercle bacilli. D. CERQUEIRA. *Brasil medico* 29, No. 31(1915); *J. Am. Med. Assoc.* 66, 231.—The specimen is stained as usual with fuchsin, heating 1 min., decolorizing with 0.2 N HNO₃ and rinsing with running H₂O. Without drying it is then treated with tincture of I for 1 min. and rinsed, then immersed in strong NH₄OH for a few sec., rinsed with a 2 per 1000 soln. of Na₂S₂O₃ and dried slowly. The bacilli show up pale pink and the granulations bluish violet. Various advantages of this technic are enumerated.

L. W. RIGGS.

Typhus bacilli in blood of dog after inoculation in the gall bladder. LANGE AND ROOS. *Arb. kais. Gesundh.* 50, 57-95(1915).—Details are given of a large number of expts. with 66 dogs and the results collected in 11 tables. The following summary is presented: By injection of typhus bacilli into the gall bladder a very rapid distribution in the blood stream takes place so that after 1-2 min. the bacilli may be found in the blood of the ear veins. This distribution takes place directly at the puncture or its immediate neighborhood, through the capillaries of the gall bladder. By proper technical manipulation this distribution may be accelerated or retarded. Other parts of the body even though well supplied with capillaries do not permit so rapid a distribution of the bacilli. Generally 30 min. after the injection the bacilli are not found in the ear veins and are always absent after 60 min., being destroyed by the bactericidal action of the blood, and in part held by the capillaries of the inner organs. The gall appears to favor the distribution of bacilli injected into the gall bladder, but retards distribution in case of subcutaneous injection. By direct injection into the liver immediate distribution takes place. Infected animals inoculated through the gall bladder become bacilli carriers, whether the rapid distribution has taken place in the blood or not. If the gall bladder is extirpated or obliterated 6 min. after injection, the dog does not become a typhus bacilli carrier. If a typhus colony after remaining 15 min. in the animal body is removed to agar and at periods of 2-3 days transplanted from agar to agar about 15 times, even after 48 days the agglutinability of the culture persists. Typhus bacilli were found in the urine of a dog 20 min. after injection into the liver.

L. W. RIGGS.

Method of sterilizing sputum before examination. D. M. GRISWOLD. Detroit. *J. Lab. Clin. Med.* 1, 189-90(1915); *J. Am. Med. Assoc.* 66, 459.—In a series of 200 sputa examd. in the usual way and then the bottles autoclaved before sending to the dump, the following results were obtained: (1) All sputa found positive in the usual way were found positive after autoclaving. (2) Among 150 sputa found negative in the usual way, 3 showed tubercle bacilli after autoclaving. The staining characteristics were not altered.

L. W. RIGGS.

Mechanism of protection against bacterial infection. CARROLL G. BULL. Rockefeller Inst. *Proc. Nat. Acad. Sci.* 1, 545-6(1915).—The animal body is believed to rid itself of bacteria by the action of certain constituents of the blood serum (amboceptor and complement) which dissolve the bacteria (lysis), or the bacteria are englobed by white corpuscles which digest them (phagocytosis). When bacteria are introduced into and later disappear from the blood, they are not eliminated by the organs of excretion, but are destroyed by the organs themselves. The problem at issue relates to the manner of destruction. When an immune serum is introduced into the blood of a rabbit suffering from pneumococcus septicemia, an immediate agglutination of the bacteria takes place. The larger the dose of the serum, within limits, the larger

the size of the bacteria clumps that are formed. The clumps are almost immediately removed from the blood by the spleen, liver and bone marrow. If the clumps are large they cannot be ingested by phagocytes; hence they multiply and soon reinvade the blood; if small they are digested by the phagocytes; the animal dies on the one and recovers on the other hand. Hence small doses of the serum causing smaller clumps may be the more effective. No extra-phagocytic dissolution of the pneumococci seems to occur. A similar mechanism operates in rabbits inoculated with cultures of the typhoid bacillus, notwithstanding the fact that typhoid bacilli are subject to serum lysis. Certain cultures of disease-producing bacteria are not, others are, pathogenic for animals; the former when injected into the circulation of a rabbit are clumped and removed; the latter under similar conditions are not. Serum lysis has been inferred, rather than demonstrated. It has been observed in shed blood but not in the living body.

L. W. RIGGS.

Improved substitute for iodized catgut sutures. C. H. WARSON. Brooklyn. *Surg. Gynecol. Obst.* 22, No. 1(1916); *J. Am. Med. Assoc.* 66, 385.—W. claims that K_2HgI_4 in alc. soln. in a diln. of 1 to 1000 has more than 10 times the germicidal efficiency of the 1 to 100 soln. of I in alc. The impregnation of catgut sutures with K_2HgI_4 by increasing the tensile strength of the gut, offers a distinct advantage over the similar use of I. Sutures impregnated with K_2HgI_4 and placed in sealed tubes with $CHCl_3$ show no deterioration on boiling the tubes, while iodized sutures are ruined by such treatment.

L. W. RIGGS.

Cellulose digestion. W. ELLENBERGER, A. SCHEUNERT, W. GRÜMMER AND A. HOPFFE. Dresden. *Z. physiol. Chem.* 96, 236-54(1915).—There is described a new microorganism which belongs to the group of *Aspergillus* and which rapidly destroys cellulose, without the presence of any other C compd. The fungus grows upon solid or liquid media. As C sources, mannitol and cellulose were used. The mineral soln. used was: H_2O 1,000 cc., $(NH_4)_2SO_4$ 2 g., K_2HPO_4 1 g., $MgSO_4$ 0.5 g., $NaCl$ 2 g. During 50 days the fungus transformed 1.43% (2.94 mg.) N into protein. While N sources are not absolutely necessary for its existence, it grows more rapidly and forms more active spores in the above N-containing medium. The fungus is aerobic and works best at 36-44°. It is quite widely distributed (in human feces, and those of various animals, in cheese, in the stomach, cecum and colon of the horse, swine and ruminants, in straw and in the pouch and second stomach contents of ruminants, etc.). It is inactive in the presence of HCl . Alc. is a very suitable source of C for the fungus. The free enzyme of the fungus is also capable of dissolving cellulose. During 50 days 59% of 2 g. cellulose were dissolved. Among the products of soln. found after 40 days were: HNO_3 , reducing carbohydrates, substances giving the Molisch test substances colored yellow by alkali and substances giving iodoform.

C. J. WEST.

D. BOTANY.

CARL L. ALSBERG.

The poisoning of livestock while feeding on plants of the sorghum group. C. K. FRANCIS. Okla. Agr. Expt. Sta., *Information Circ.* No. 38, 4 pp.(1916).—Analysis showed the presence of cyanides in sorghum in the following amts. (calcd. as KCN): Dried mature kafir, frost-bitten, 0.0240%; dried young cane, stunted and wilted, 0.0300%; fresh kafir leaves, normal plant 40 in. high, 0.0018%; fresh kafir leaves, mature, frost-bitten plant, 0.0037%; fresh Sudan grass, fall seeding, 10 in. high, 0.0035%; fresh Sudan grass, second growth, 15 in. high, 0.0042%; 17 in. high, 0.0021%; 30 in. high, 0.0042%. Stunted plants, showing the need of rain, are especially dangerous.

P. M. GIESY.

The mode of action of the oxidases. HERBERT H. BUNZELL. U. S. Dept. Agr. *J. Biol. Chem.* 24, 91-110(1916).—The inhibition of the action of plant oxidases upon

the aromatic substances usually employed to demonstrate their presence or measure their activity is due to exhaustion of the oxidase mechanism. Other influences, such as temp., shaking, inhibition due to reagents or to the products of the reaction, lack of oxidizable material or of O_2 , were shown to have very little effect. I. GREENWALD.

The relative oxidase activity of different organs of the same plant. HERBERT H. BUNZELL. U. S. Dept. Agric. *J. Biol. Chem.* 24, 103-10(1916).—The relative activity of plant exts. upon a series of chromogens may be expressed in a curve developed by plotting the value for the activity upon each of the chromogens upon a different radius of a circle. Such curves are very similar for different parts of the same species of plants but are markedly different in different species. The onion appears to possess no oxidase whatever. I. GREENWALD.

Contribution to the microchemistry of hydroxymethylanthraquinone and an anthraglucoside-splitting enzyme in rhubarb. R. WASICKY. *Ber. botan. Ges.* 33, 37-45(1915).—There are at least two enzymes in rhubarb plants, an oxidase, and an anthraglucosidase. The latter acts specifically on anthraglucoside, splitting it. In Rhea and Canaigre preparations the activity of the enzyme results in the formation of beautiful crystals, since the free anthraquinones are insol. in dilute glycerol. On amygdalin the enzyme has little or no action. In the plant its task is to split anthraglucoside, which must be regarded as a reserve substance. At the same time it probably plays an important part in the synthesis of anthraglucosides. The anthraquinones which are active in the drug are formed only in the course of the development of the plant as the result of certain preliminary steps, and here also oxidation, with the help of oxidases, plays a part. These chemical processes are not yet complete when the harvest season has been reached; they continue during the drying period. B. HOROWITZ.

Excitation of protoplasmic streaming (Protoplasmaströmung) by means of various rays. H. NOTHMANN-ZUCKERKANDL. *Ber. botan. Ges.* 33, 301-13(1915).—N.-Z. succeeded, by intensive exposure to light, in bringing about plasma-streaming in the leaves of uninjured *Elodea* sprouts. This was obtained within the region of the visible rays, as well as in the regions of the infra-red and ultra-violet. The action which excites plasma-streaming increases with the wave length of light. B. H.

Physico-chemical researches in botany. HELENE NOTHMANN-ZUCKERKANDL. *Intern. Z. Biol.* 2, 94-106(1915).—A review of the physico-chemical researches on germination, factors in swelling, metabolic processes and enzyme action.

W. A. PERLZWEIG.

Biologic action of sunlight. M. DELAROQUETTE. *Bull. acad. med.* 74, No. 45 (1915); *J. Am. Med. Assoc.* 66, 65.—The author's study of plants kept in greenhouses with colored glass have convinced him that the favorable action of sunlight on tissues is not due exclusively to colored nor even mainly to the chemical rays. Plants thrived in yellow light but not in blue light. Luminous rays are active, the yellow being most active of all. L. W. RIGGS.

Chemical changes occurring during the ripening of the wild goose plum. J. S. MCHARGUE. *J. Am. Chem. Soc.* 38, 718-22(1916).—In the last stages of maturation, the plum passes rather rapidly through 3 stages of ripening; as it approaches maturity it changes from green to slightly yellowish and at this stage is sharply acid and somewhat astringent. In the course of 2-3 days it becomes bright pink and quite juicy and sweet, very often splitting at this stage. In about 48 hours more it becomes dark red and loses some of its juiciness and sweetness. Analysis of the fruit at the 3 stages of ripening gave the following values, resp.: Acidity in cc. of 0.1 N NaOH per g. plum, 3.13, 2.69, 2.40; reducing sugar in %, 5.91, 6.45, 9.16; cane sugar in %, 0.41, 3.62, 0.37. CHAS. A. ROULLER.

Physiological observations on alkaloids, latex and oxidase in *Papaver somniferum*. R. H. TRUE AND W. W. STOCKBERGER. *Am. J. Botany* 3, 1-11 (1916).—It appears from work done on the opium poppy, *Papaver somniferum*, that the oxidase reaction is most active in the upper parts of the plant, especially in the floral structure, capsules and actively growing parts. The peroxidase reaction shows less variation in its intensity in the different parts of the plants. The intensity of the oxidase reaction roughly parallels the distribution of the latex which in itself is most active. The oxidase seems to be inactivated during the course of its action. A like exhaustion or inactivation of the supposed enzyme was seen in the case of the oxidase of the Irish potato. These observations would indicate that the oxidase reaction is not due to a catalyzing agent, therefore is not due to an enzyme. With exception of the root the intensity of the oxidase reaction runs roughly parallel with the alkaloid content. In the root, the alkaloid content is relatively higher than the intensity of the oxidase reaction. Alkaloids seem not to exist as such in the poppy plant, but appear as products of the action of the oxidases on constituents present in the latex reacting in the presence of O. The alkaloids of *Atropa belladonna* differ from those of the poppy in that they are found to exist in structures dried without contact with free O and seem to exist ready formed in the plant. J. J. SKINNER.

The availability of nutrient salts. A. G. MCCALL. *J. Am. Soc. Agron.* 8, 47-50 (1916).—The work of Shive (*C. A.* 9, 2396) on the growth of plants in a 3-salt nutrient soln. has been repeated with the salts in sand culture. In soln. cultures the best growth of wheat occurred when the 3 salts were used in the following vol.-mol. partial concns.: KH_2PO_4 0.0180 M, $\text{Ca}(\text{NO}_3)_2$ 0.0052 M, MgSO_4 0.0150 M, while the best soln. in the sand culture had vol.-mol. partial concns. of KH_2PO_4 0.0072 M, $\text{Ca}(\text{NO}_3)_2$ 0.0182 M, and MgSO_4 0.00550 M. A comparison of results of the series grown in H_2O and the other in sand culture furnishes evidence for the following conclusions: The concn. of the nonadsorbed soln. in the sand is markedly lower than that of the soln. which was added. The absorbed salts are either nonavailable or are greatly retarded in their participation in the growth process of the plant. For this particular concn. the ratio of Mg to Ca ions in the optimum nutrient soln. is materially changed by the adsorption process. J. J. SKINNER.

Determination of cell sap concentration by the freezing point method. G. J. BOUYOUKOS AND M. M. MCCOOL. *J. Am. Soc. Agron.* 8, 50 (1916).—The f. p. method for detg. the concn. of the soil soln. (*Tech. Bull.* 24, Mich. Agr. Expt. Sta.) is used in detg. cell sap concn. The lowering of the f. p. of cell sap is detd. by working with crushed plant tissue and not with extd. cell sap. The concn. of the cell sap is greater when detd. directly in the plant than when detd. in the extd. cell sap. J. J. SKINNER.

Chemico-physiological contribution. TH. BOKORNY. *Arch. ges. Physiol.* 163, 27-70 (1915).—A study is made of the utilization of various org. compds. by *spirogyra*. MeOH, as a rule, is utilized by green plants. Yeast cannot utilize it if it is the only source of C, but when used in connection with sugars, MeOH causes an increase in the dry wt. 0.05% solns. of AcH do not cause the formation of starch in *spirogyra*. 0.001% solns. of HCHO give positive results (even in the dark, after 8 days). Negative results were obtained with glyoxal, BzH, $\alpha\text{-HOC}_6\text{H}_5$, CHCl₃, acetone, and ether. EtOAc alone gave a negative result, but tained by the addition of 0.025% K_2HPO_4 to 0.05% solns. tained also with milk sugar, raffinose and galactose, but neg. with *l*-arabinose, rhamnose, erythritol, xylose, sorbitol, mu. tartaric acid, levulose, hydroquinone, pyrocatechol, resorcinol acid gave a positive result.

E. NUTRITION.

PHILIP B. HAWK.

NORMAL.

The influence of pituitary feeding upon growth and sexual development. An experimental study. EML. GOETSCH. Harvard Med. School. *Bull. Johns Hopkins Hosp.* 27, 29-50(1916).—Ext. of the anterior lobe of the pituitary gland, when fed to young rats, has a stimulating effect upon growth and upon sexual development and activity in both the male and female. Posterior-lobe ext. has a retarding influence but the whole-gland ext. has a stimulating effect when fed over a short period of time (25-40 days). Ovarian ext. (corpus luteum) has a stimulating effect upon the female but a retarding influence upon the male sexual development. A. P. LOTHROP.

Carbon metabolism and physio-pathological significance of the carbon of the urine. REALE. Naples. *Arch. ital. biol.* 1914, 244; *Zentr. Biochem. Biophys.* 18, 157(1915).—By distributing the urinary C into various fractions R. detected a sensitive fraction which was readily attacked by nascent O, being thereby distinguished from the other fractions (which were only oxidized by complete combustion of the urine). This labile portion of the urinary C was considerably increased in healthy individuals by ingestion of carbohydrates (bread, sugar, etc.); excretion of this portion was not influenced by fats and nitrogenous substances. Intermediate decompn. products of sugar accumulate in the urine when ingestion of carbohydrates is increased above the normal. These products are oxidized by H_2O_2 and may be accurately measured by combustion and detn. of the resulting CO_2 . H. S. PAINE.

Sodium chloride metabolism in healthy individuals. L. BORELLI AND P. GIRARDI. Turin. *Giorn. accad. med. Torino* 76, 67-83; *Zentr. Biochem. Biophys.* 18, 159-60 (1915).—A certain equil. is reached in the course of 3-4 days when the organism is subjected to an especially steady diet with any desired content of H_2O and NaCl; this equil. is never absolute but always shows greater or less variations. The organism tolerates for a long period the excretion of urine of widely varying d. The d. of the urine indicates little regarding the content of NaCl, inasmuch as the d. is not only dependent upon the latter but also upon the content of other urinary elements which are excreted with NaCl. There is a close connection between the amt. of urine, NaCl content and urinary d. The d. of the urine and its NaCl content increase when the organism reacts to high NaCl ingestion and the amt. of urine remains unchanged; when the latter increases slightly the d. remains unchanged and the NaCl content increases. When the amt. of urine shows a pronounced increase the d. decreases and the NaCl content either remains unchanged or decreases. There is a coeff. of max. NaCl excretion which corresponds to high NaCl ingestion; this coeff. varies from one individual to another and is subject to considerable variations when smaller amts. of NaCl are ingested. There is a greater or less tendency toward retention, or inversely toward hyperelimination, of NaCl according to the value of this individual coeff. High NaCl ingestion and moderate ingestion of liquids lead to slight diuresis, while high ingestion of both NaCl and H_2O is followed by retention of both substances. A single ingestion of a large amt. of H_2O does not promote NaCl excretion; the latter is, however, favored by repeated H_2O ingestion. After a diet which is deficient in Cl there is a tendency toward increased retention as compared with cases in which NaCl is present in excess (even though slight). H. S. PAINE.

Influence of diet, and especially of carbohydrates, on urine secretion in infants. A. NIEMANN. Berlin. *Jahrb. Kinderheilk.* 32, 21-45(1915); *Zentr. Biochem. Biophys.* 18, 261-2(1915).—Ingestion of carbohydrates (rye flour and lactose) was followed by a remarkable decrease in the amt. of urine secreted by infants. H. S. PAINE.

Testing of liver function in children and infants by means of levulose. ERICH SCHEDE. Giessen. *Jahrb. Kinderheilk.* 32, 45-65(1915); *Zentr. Biochem. Biophys.* 18, 269(1915).—The limit of tolerance of infants is very high for levulose, *i. e.*, about 4 g. per kg. body wt.; this tolerance diminishes with increase in age. H. S. P.

Metabolism, especially of inorganic material, during infancy. IV. Comparative studies of metabolism of wet-nurse's milk and albuminous milk with especial reference to sulfur economy. AMALIE PRISER. Berlin-Rummelsburg. *Jahrb. Kinderheilk.* 81, 437-54(1915); *Zentr. Biochem. Biophys.* 18, 154-5(1915).—Absolute N excretion in the feces was greater in the case of ingestion of wet-nurse's milk than in the case of albuminous milk nutrition; the relative value of N excretion in the feces in the latter instance was, however, scarcely $\frac{1}{2}$ that in the former case. Urinary excretion showed increased N retention in the case of albuminous milk nutrition; the retained N was probably not deposited in the form of stable albumin. Ca metabolism showed a decrease in the Ca balance in 2 instances after transition to an albuminous milk diet; these cases later became rachitic. Ca retention increased in 1 instance. An improvement of the P balance was usually observed after an albuminous milk diet; this is explained in large part by the unusual increase in N retention. No difference in the distribution of P excretion between urine and feces was observed between the 2 kinds of nutrition. SO_3 excretion in the feces was unusually high in the case of albuminous milk nutrition. Transfer of SO_3 and P_2O_5 elimination from urine to feces is regarded as a measure of protection against possible surfeiting of the organism with inorganic acids; this accounts for the relative innocuousness of albuminous milk as a const. diet.

H. S. PAINE.

Observations of the iodine reaction in the feces of infants and its clinical significance. F. STRINA. Venice. *Riv. clin. pediatr.* 12, 321; *Zentr. Biochem. Biophys.* 18, 121(1915).—The I reaction depends upon the property of various organisms to become stained by I under certain conditions. One cc. of Lugol soln. is mixed on a watch glass with a small amt. of feces according to the procedure of Rodella and after 2-3 hrs. the sediment is examd. microscopically. S. tested in this manner numerous samples of infants' feces; most of the positive results were obtained in the case of artificially nourished infants. Positive results were less numerous with infants which had received a mixed diet and least numerous of all in the case of breast-fed infants. Negative results were changed to positive and *vice versa* when the diet was changed. In general, the method may be employed for obtaining at least an approx. idea of the state of gastrointestinal function and the adaptation of the organism to various diets.

H. S. PAINE.

Physiology of the effect of climate. VI. Energy changes of school children from the laboring classes in a large city. VII. Influence of sojourn in a forest health resort on the metabolism and growth of school children. FRANZ MÜLLER. Berlin. *Veröffentl. Zentralstelle Balneol.* 2, 277-310(1915); *Zentr. Biochem. Biophys.* 18, 107(1915).—The total metabolic change (calcd. from the food ingested) of school children leading (to a great extent) an indoor life amounted to 0.3 g. N and 74 cal. per kg. per day (= 1770 cal. per sq. m. of body surface). The net metabolic change per day, after deducting losses by urine, feces and digestive work, amounted to 1445 cal. per sq. m. The metabolism of the child per kg. decreases with increasing body wt.; there is also a tendency toward decrease of metabolic change per unit of body surface. Metabolic change per sq. m. of body surface is about 7% greater in boys than in girls. Total as well as net metabolic change is greater in spring than in summer and the beginning of autumn. The energy consumption of 7-14 yr. old children increased by approx. 10% on changing from largely indoor environment in a large city to a forest health resort; it amounted to 84 cal. per kg. or 67 cal. per kg. (= 1500

cals. per sq. m. of body surface) after deduction of all losses. Metabolic change was greatest in May and lowest in September. Increase in wt. was, however, greatest in September (45 g. per day) and lowest in summer (19 g. per day). VIII. Influence of sojourn by the North Sea on the metabolism of school children of the laboring classes. C. HÄBERLIN AND FRANZ MÜLLER. *Veröffentl. Zentralstelle Balneol.* 2, 311-6(1915); *Zentr. Biochem. Biophys.* 18, 107 (1915).—H. and M. studied the metabolism of 116 children who were on a sojourn by the North Sea. The av. daily ingestion of food amounted to an equiv. of 19.192 g. N and 3707.5 cals. The net metabolic change per sq. m. of body surface was 2400-2950 cals. which is an unusually high value when compared with corresponding values for these children in the homes of their parents and during sojourn in a forest health resort. Increased consumption of heat during play is not sufficient to explain this increased metabolism; the increased demand upon the combustion processes of the youthful organism during sojourn by the North Sea is attributed to purely climatic influences.

H. S. PAINE.

Specific effects of rations on the development of swine. E. B. FORBES, *et al.* Ohio Agr. Expt. Sta., *Bull.* 283, 111-52(1915).—The results are recorded of expts. to det. the capacities of pigs to grow on equiv. amts. of proteins from diff. sources.

R. C. ROARK.

The metabolism of organic and inorganic compounds of phosphorus. E. B. FORBES, *et al.* Ohio Agr. Expt. Sta., *Tech. Bull.* 6, 3-80(1915).—As a result of expts. carried out with swine it is concluded that the amt. of P which an animal will tolerate when added to the ration in readily sol. form, is definitely limited at an amt. much less than will be acceptable in its natural relationships in foods. From the great difficulty experienced in the feeding of yeast nucleic acid and of commercial phytin as well as the related compound from wheat bran, it is concluded that the isolation of such compounds from natural products alters at least their therapeutic effects in such manner that it becomes impossible to state, from investigations of this sort, on pure compounds, what may be their nutritive values in their natural relationships in common foods. That the particular organic compounds used in this investigation (nucleic acid, phytin and glycerophosphates) have nutritive values for growing swine superior to the inorganic compounds used (orthophosphates and hypophosphites) was not shown. No fundamental differences in the nutritive values of the P compds. studied were established. Cf. C. A. 9, 1072.

R. C. ROARK.

Physiology of nutrition of farm animals, especially oxen. WILHELM KLEIN. Berlin. *Biochem. Z.* 72, 169-252(1915).

C. J. WEST.

The relation between the diet, and the nitrogen and chlorine content of the sweat. ELMER BERRY. Berlin. *Biochem. Z.* 72, 285-302(1915).—More urine is excreted during work than during rest. This was independent of the diet and the amt. of sweat. The sp. wt. of the work-urine is lower than that of the rest-urine. The work-urine is not as acid, and has a lighter color. The N excretion is nearly proportional to the time, without regard to work or rest. The rest-urine had a greater content of N, but the larger vol. excreted during work made the total N excretion the same. The excretion of Cl is greatly increased during work. The amt. of N and Cl excreted in the sweat is practically independent of the diet. From 2 to 5.5% of the N is excreted in the sweat and from 13 to 30% of the Cl.

C. J. WEST.

ABNORMAL.

Further study of some etiological factors of malocclusion. MILO HELLMAN. New York City. *Dental Cosmos* 58, 189-201(1916).—Malocclusion of the teeth is intimately related to conditions that interfere with normal breast-feeding. A close relation exists between malocclusion and certain anomalies of the denture, malformation of the enamel, anomalies in size and form of the teeth, irregularities in the shedding

of the deciduous teeth and in the eruption of the permanent teeth. These anomalies of the denture may be produced by experimental disturbances of the ductless glands. Hence the internal secretions are an exceedingly important factor in the etiology of malocclusion.

JOSEPH S. HEPBURN.

Some additional observations concerning the treatment of diabetes. CLARENCE BARTLETT. Phila. *Hahnemannian Monthly* 51, 1-11(1916).—The patient is fed a standard diet to obtain a sugar-free urine. The sugar tolerance is then detd. by feeding bread, gradually increasing the amt. until sugar again appears in the urine. The daily ration of carbohydrate is limited to 2/3 of this max. amt. Should acidosis intervene, an exclusive carbohydrate diet is given, and large doses, up to 3 or 4 ounces daily, of NaHCO_3 are administered. With unsatisfactory tolerance or acidosis, oatmeal, potato, or rice diet, or "green day" ration is used, to increase tolerance. At times, in severe cases, the limited protein diet is given. The Allen treatment is of value but is not a cure-all. Cases of glucosuria accompanying diseases of the gall-bladder and pyloric carcinoma are described.

JOSEPH S. HEPBURN.

Diet free of lipoids. SERAFINO DEZANI. Turin. *Biochim. terap. sper.* 4, 475-86(1914); *Zentr. Biochem. Biophys.* 18, 155-6(1915).—Results obtained by D. in expts. on the nutrition of mice with a diet free from lipoids are contradictory to the observations of Stepp; none of the animals in D.'s expts. died. The fatal results observed by S. in the case of mice which received a diet free of lipoids are attributed, not to the lack of ability of white mice to produce lipoids, but to the fact that the mice became weary of the diet and finally refused food, consequently dying of starvation. These animals tolerated a lipid-free diet for a long period and showed normal development when the diet was varied in a suitable manner.

H. S. PAINE.

Experimental polyneuritis, especially in fowls, in comparison with human beri-beri. R. TASAWA. *Z. exp. Path. Ther.* 17, 27-46(1915).—Polemical. T. does not regard the lack of vitamins in the diet as the direct cause of beri-beri. W. A. PERLZWEIG.

The Allen treatment in diabetes mellitus. SAMUEL H. PALEY. *N. Y. Med. J.* 103, 159-61(1916).—In 5 cases of moderately severe diabetes, treated by Allen's method, the patients were maintained in metabolic equil. and the urine kept free from sugar. In these cases, whiskey, in amts. up to 12 oz. in 48 hrs., was given in place of tea or coffee during the starvation period.

A. H. RAHE.

F. PHYSIOLOGY.

ANDREW HUNTER.

The chemistry of the skin. ARNOLD SEYMOUR-JONES. *J. Am. Leather Chem. Assoc.* 11, 41-60(1916).—A review of the anatomy of the skin, and the hydrolytic products of its albuminoids.

H. I. MATTILL.

Formation of uric acid in man. J. P. CHROM. *Nord. Med. Arkiv* 48, Aft. 11, 1-19(1915); *Zentr. Biochem. Biophys.* 18, 157(1915).—In the excretion of uric acid by the organism the former becomes combined in such a manner that it is not oxidizable. This is due to the fact that certain C_6H_4 substitution products intervene in the chem. transformation and either become paired with H_2SO_4 or initiate a process similar to that involved in the formation of H_2SO_4 esters. This non-oxidizable uric acid compd may undergo cleavage owing to the action of acids in the organism; when this occurs the uric acid is oxidized. Cf. *C. A.* 9, 811.

H. S. PAINE.

Indican. ORESTE CANTELLI. Bologna. *Soc. med. chir. Bologna*, session July 9, 1914; *Zentr. Biochem. Biophys.* 18, 169-70(1915).—Expts. with dogs which had undergone section and ligation of the excretory duct of the pancreas showed that the amount of indican increases in an initial period in proportion to the degree of derangement of gastric function and then decreases to the normal value on restoration of this

function. There is not always a parallelism between decrease in indican and decrease in indole in the feces; decrease in amt. of indican is due rather to destruction of indole than to the action of HCl in inhibiting putrefaction. Excretion of indican is more pronounced in the periods between meal times than is the case immediately after ingestion of food.

H. S. PAINE.

The biology of phagocytosis. The importance of oxygen for the phagocytes. H. J. HAMBURGER. *Intern. Z. Biol.* 2, 227-44(1915).—Phagocytes kept in a fluid medium deprived of O by means of N or H lose perceptibly in their phagocytic activity. If the deprivation of O lasts for 4-5 hrs., then phagocytosis is abolished entirely. It was shown previously by Verworn and H. that cells lose their ability to utilize O under CHCl_3 narcosis. This, together with the present paper, explains the inhibition of phagocytosis by the addition of small amts. of CHCl_3 . Cf. *C. A.* 10, 775.

W. A. PERLZWEIG.

Researches on phagocytosis. H. J. HAMBURGER. Groningen. *Brit. Med J.* 1916, I, 37-41.—A study of the effects of various substances on phagocytosis. The addition of 0.005% CaCl_2 to white cells suspended in serum or NaCl soln. caused an increase of 22% in phagocytic power. Expts. involving subcutaneous implantation of capillary tubes in rabbits showed that the injection of 0.06 g. of CaCl_2 per rectum caused an increase in chemotaxis. The action of Ca seems to be specific, since neither Ba, Sr nor Mg caused ameboid movement. In leucocytes suspended in NaCl soln. CHI_3 , in a dilm. of 1:5,000,000, promoted leucocytosis. Other fat solvents (CHCl_3 , EtOH, C_6H_6) induced phagocytic action at low concns., but paralysis occurred when larger amts. were used. Small quantities of these solvents dissolve the outer layer of the cell, weaken it, and increase its plasticity. Treatment with N, CO_2 and KCN also increases phagocytosis. A comparison is drawn between the induced phagocytosis and the effect of O withdrawal as regards the excitement stage of CHCl_3 narcosis. Cf. preceding abstr.

A. H. RAHE.

Occurrence and physiological significance of fat in the muscle fibers of the normal myocardium and atrio-ventricular system: interstitial granules (mitochondria) and phospholipins in cardiac muscle. H. HAYS BULLARD. Univ. Pittsburgh. *Am. J. Anat.* 19, 1-36(1916).—The cardiac muscle fibers of mammals, both fetal and adult, normally contain a variable nutritive reserve in the form of droplets of fat. In inanition the normal visible fat of cardiac muscle is gradually decreased. When fatty foods are given, a pronounced increase is seen as soon as digestion is complete. The phospholipin (lecithin and related compds.) of cardiac muscle is found in the true interstitial granules and it is not markedly decreased in inanition nor increased when fats are given in the food. Neutral fat droplets in cardiac muscle do not arise from true interstitial granules.

C. J. WESS.

Further observations on the action of the blood serum after intravenous injection of cane sugar. F. RÖHMANN. Breslau. *Biochem. Z.* 72, 26-100(1915); cf. Kumagai, *C. A.* 8, 1306.—The effect of the intravenous injection of cane sugar into dogs is not as const. as the results of Kumagai would lead one to expect. Out of 4 dogs, 1 did not show the presence of invertin after 5, 12, 21, or 23 days. Other differences were that amylase was seldom present, and the change of levulose and dextrose as well as the formation of milk sugar was not observed with certainty. The work with rabbits indicated three classes: (1) those in which sugar injection did not produce invertin in the blood, (2) those in which invertin was present, (3) those in which invertin was present, and in addition, the blood was capable of forming galactose and milk sugar from cane sugar and levulose, and contained an amylase. This indicates the presence of 2 enzymes; one, *stereokinase*, is capable of changing *d*-fructose into *d*-galactose. The presence of galactose was confirmed by the isolation of the hydrazone with di-

phenylmethane dimethyldihydrazine, and by the oxidation with HNO_3 to mucic acid. The other enzyme, *lactase*, is capable of synthesizing lactose from *d*-galactose and *d*-glucose. The urine contains galactose and lactose after the intravenous injection of cane sugar and levulose. These were isolated as osazones. In certain cases the changes seemed to take place without the presence of the enzymes. Expts. with galactose were negative. The serum of an animal treated with cane sugar may react upon a 2nd animal in 3 ways: the ferment-containing serum, after being transferred, is, at first, nearly as active as the original serum. It then gradually decreases in activity. By the transference there may be an activation, and serum which did not seem to contain enzymes may become active. In some cases the inactive serum is not activated. A dog, after removal of the pancreas, was injected with an active serum of a dog which had received cane sugar. The blood and urine contained lactose. The importance of stereokinase is emphasized, and the possibility of such enzymes, capable of acting upon proteins and their decompn. products, discussed.

C. J. WAST.

The residual nitrogen of the blood. I. IVAR BANG. Univ. Lund. *Biochem. Z.* 72, 104-18(1915).—The normal content and physiological limits of variation of the content of amino acids, urea and "rest" N of the blood in man and animals are given in the following figures: *Residual N*, man, 19-36, mean 23 mg.; ox, 15-31, mean 24 mg.; horse, 20-23 mg.; sheep, 25 mg.; rabbit, 24-47, mean 33 mg.; swine, 19-27 mg.; dog, 34-38 mg.; cat, 24-43 mg. *Amino N*, man, 3-22, mean 12 mg.; ox, 4-19, mean 12 mg.; horse, 10-12 mg.; sheep, 9-12 mg.; rabbit, 7-23, mean 17 mg.; swine, 10-13 mg.; dog, 8-10 mg.; cat, 10-24 mg. *Urea N*, man, 6-20, mean 15 mg.; ox, 10-16, mean 12 mg.; horse, 9-12 mg.; sheep, 13-17 mg.; rabbit, 8-33, mean 16 mg.; swine, 9-17 mg.; dog, 17-27 mg.; cat, 17-20 mg. The ratio of amino acid N to urea N varies from 3.7:1 to 1:6, so that one cannot definitely know the amino acid or urea content from the "rest" N figures. Figures are also given for the partition of the "rest" N between the blood corpuscles and the plasma. In 11 of the 19 expts. the plasma and corpuscles have the same "rest" N content. In the remaining expts. the corpuscles contain more. In 16 of 19 expts. the urea N is equally divided between the corpuscles and plasma. In the other 3 the corpuscles contain somewhat more urea than the plasma. In 7 cases the corpuscles contained more amino acid N than the plasma. In 5 cases the plasma contained only a trace of amino acid N. In 10 cases the contents of the two are the same and in only 2 cases does the serum contain more amino acid N than the corpuscles. II. *Ibid* 119-28.—The "rest" N is greatly increased during starvation, the principal increase being due to the urea N; the amino acid N remains practically unchanged. The increased urea N is probably due to the small amt. of urine voided. If water is given during the starvation period, the urea N is normal. This expt. also indicates that the urea content of the blood of the same individual cannot be considered a constant, but that it will vary according to the concn. of the urine. The possible relation of this to nephritis is discussed. It is possible that the urea retention might be avoided by administration of water. The feeding of proteins produces a marked increase of the "rest" N, again consisting principally of urea N. This reaches a max. in from 6 to 9 hrs., and after 24 hrs. it is normal. An amt. of protein corresponding to 150 g. amino acid is so completely changed into urea by the liver that an increase of the amino acid content of the blood could not be detected. This is true of the dog and of man. With an ordinary diet there is no noticeable increase of blood urea or amino acid N. In rabbits no increase of blood urea was found. III. *Ibid* 129-38.—The introduction of amino acids (glycocoll) into the stomach leads, within an hour, to an increased amino acid N content of the blood. This resorption is slower than is the case with sugar. After the introduction of amino acids in starved rabbits the increase in the blood content is considerably higher (about double) than in well-

nourished animals. When 5 g. glycocholl (930 mg. N) are injected, the increase in the blood is 117 mg. or 0.52% glycocholl. During the next 24 hrs., 360 mg. glycocholl N are excreted in the urine, showing that the greater part is taken up by the liver and tissues. There is no increase in the blood urea content, which indicates that nearly $\frac{2}{3}$ of the injected glycocholl is fixed by the tissues. Similar results were obtained by the injection of alanine. Expts. with a dog showed a greater utilization of injected glycocholl than in the rabbit. The utilization in man seems to correspond more closely to that in the rabbit. IV. *Ibid* 139-45.—A study was also made of the behavior of urea in the organism. Urea is very poisonous, especially to starving animals. A few minutes after the administration of urea there is a considerable rise in the blood urea content, which increases for about an hour, reaching a max. (0.2% urea) at that time. Little difference was found between normal and fasting animals. Injections intravenously and by stomach show that a large part of the urea disappears very rapidly from the blood. This must be held by the tissues as a complex compd. and not merely as a soln. in the water of the tissues. While the large amt. of urea has disappeared from the blood after several hrs., yet there is a certain hypercarbamidemia, which, compared with the original urea content, is considerable. This indicates that the action of the kidneys is a secretion process and not a filtration. *Per os* administration of urea shows that the toxic effect is due to the NH_3 formed from the urea (5-6 mg. as compared with a normal of about 1 mg.). Similar toxic effects were observed after administration of NH_4 salts. V. *Ibid* 146-68.—*Sublimate nephritis*. Fifteen mg. sublimate, in a normal animal, produces marked retention of urea (352 mg. on the 5th day), with a corresponding decrease of the urine voided. Albuminuria was present on the 2nd and 3rd days. With fasting animals a similar result is obtained with 5 mg. sublimate. This effect is very much diminished by giving water to the animal. The sublimate has a certain threshold value, which is necessary to produce intoxication. This value may be reached by either decreasing the amt. of H_2O which passes through the kidney (starvation) or by increasing the amt. of sublimate given. *Chromate nephritis*. Different animals react very differently towards chromate. Sixty mg. produce a strong intoxication, a marked albuminuria and considerable urea retention. Here also the condition of nutrition plays an important part, probably due to the influence of the water content of the blood. *Tartrate nephritis*. Similar results were found. *Phosphorus poisoning*. P poisoning is accompanied by an increase in the amino acid N content of the blood on and after the 3rd day and a slight increase in the urea N content. The NH_3 content was 3.6 mg. per 100 cc. blood. C. J. WEST.

Expedition of Prof. Pannwitz to Teneriffe in 1910. IV. The nitrogen excretions in dry, high climates. A. DURIG, C. NEUBERG AND N. ZUNZ. *Biochem. Z.* 72, 253-84 (1915).—As compared with similar results obtained in Berlin, the excretion of N was 2.5 to 3 times as large in Teneriffe. The values for Cl were not increased. This may be due to the dry climate rather than to the high altitude.

Green coloration in human milk after feeding liver. E. I. *Biochem. Z.* 72, 378 (1916).—A green coloration of human milk is very common after feeding calf or ox livers; it disappears in about 16 hrs. This is due to the bile pigments from the liver.

Physiology of glands. XXIV. The function of the spleen. The co-ordination of the liver and spleen. LEON ASHER AND GUSTAV EBNÖTHER. *Biochem. Z.* 72, 416-55 (1916); cf. C. A. 10, 777.—In the decompn. of hemoglobin by splenic exts. there is formed an intermediate decompn. product which does not undergo the reactions of hemin; yet the hemoglobin is not so far decompd. that the Fe is in unmasked form. These results indicate that a function of the spleen seems to be to furnish a substance to the liver which serves as an activator. C. J. WEST.

Hematoporphyrin from urine and bones. O. SCHUMM. Hamburg-Eppendorf. *Z. physiol. Chem.* 96, 183-203(1915).—The hematoporphyrin isolated from the urine is spectrographically different from Nencki hematoporphyrin, and therefore probably has a different chem. constitution. The hematoporphyrin obtained from brownish red animal bones seems to be identical, spectrographically, with that isolated from the urine. The absorption bands of various samples are given. C. J. WEST.

Researches on the perfused heart. W. BURRIDGE. Oxford. *Quart. J. Med.* 9, 43-56(1915).—In every heart examd. it was found possible by appropriately employing K salts to demonstrate the presence of a certain capital stock of contractile material. No evidence of this capital stock may be given on attempted excitation by induced shocks. For brevity this capital stock is called *C*. *C* varies from heart to heart but is const. under ordinary conditions in any particular heart. Although the majority of drugs may cause great variations in spontaneous activity they do not alter the value of *C*. Two types of cardiac failure were observed in the frog. In (a) *C* was unchanged; in (b) *C* was diminished as shown by subsequent treatment with K. Digitalis can restore the amplitude of the contractions toward this original value in cases of type (a) only. Cases of type (a) result from an alteration in the relation of the heart to the Ca salts perfusing it. There are 2 subdivisions in type (a), (1) due to a decreased Ca tension in the perfusing soln. and (2) due to a change in the reactivity of the heart to the Ca in the perfusing soln., which remains normal. The conclusion is reached that the mechanism for maintaining and utilizing the cardiac reserve is as follows: The heart has a certain capital stock of contractile material, the activity of which is evoked by the Ca of the blood. Under ordinary circumstances the relation between the heart and the blood Ca is such that when the Ca evokes the activity of a certain proportion of the whole by altering the magnitude of the response of the heart to Ca a greater or less proportion of that whole is rendered active. During sympathetic stimulation a given tension of Ca can evoke the activity of a greater proportion of the whole cardiac contractile material than was the case previously. In clinical cardiac failure the response of the heart to such amts. of Ca as are present in blood is insufficient to maintain an adequate circulation. Digitalis is a drug which enables a given amt. of Ca to evoke the activity of a greater proportion of the contractile material than is the case in its absence. Cf. *C. A.* 9, 1934. JOHN T. MYERS.

The physiology of the parathyroid glands. W. F. KOCH. Detroit. *J. Lab. Clin. Med.* 1, 299-315(1916).—From the urine of parathyroidectomized dogs were isolated toxic substances which were identified as methylcyanamide and its polymer, trimethylmelamine. These produce symptoms in dogs resembling those of parathyroidectomy, as also does synthetic methylcyanamide. Hence it is concluded that this substance is formed in the animal body, and accumulates to a toxic concn. after removal of the parathyroids. H. G. W.

G. PATHOLOGY.

H. GIDEON WELLS.

The fixation of toxins by leucocytes. KOBZARENKO. *Ann. inst. Pasteur* 29, 190-211(1915).—The leucocytes of the horse possess the property of neutralizing diphtheria toxin. This is not dependent upon the physico-chem. properties of their protoplasm but on their vital activity. These leucocytes are capable neither of absorbing nor of neutralizing tetanus toxin. The leucocytes of the rabbit include 15-20% of macrophages, possessing this property, but the effect produced is not very marked.

GEO. T. CALDWELL.

The effect of antiplatelet serum on blood platelets and the experimental production of purpura hemorrhagica. R. I. LEE AND O. H. ROBERTSON. Boston. *J. Med. Res.* 33, 323-36(1916).—An antiserum for blood platelets of the guinea pig had a

strong agglutinating and lytic action on guinea-pig platelets. This reaction was obtained only in the presence of complement. Injection of antiplatelet serum into guinea pigs produced a condition typical in practically every way of the acute form of purpura hemorrhagica in man. Histological examn. of the hemorrhagic areas gave no information concerning the manner in which the hemorrhages were produced. The antiplatelet serum had no apparent local action. The serum of guinea pigs suffering from severe purpura had no effect on platelets either *in vivo* or *in vitro*.

GEO. T. CALDWELL.

Lipase studies. III. Acid production in the tissues with especial reference to uranium nephritis. C. QUINAN. *J. Med. Res.* 33, 345-76(1916); cf. *C. A.* 9, 1637. —Fresh normal tissues are acid in reaction when tested with phenolphthalein and, in weighed units, the performed acid values are const. It is suggested that a lipolytic ferment in some way plays a part in the process of spontaneous acid production as it occurs in the cellular structures. Liver, kidney and muscle tissues yield const. and characteristic values when tested with ethyl butyrate. In uranium nephritis acid production is profoundly depressed, not only in the kidneys but also in the liver and the skeletal muscles. These tissues give low values for performed acid, autolytic acid and ester-splitting activity. This reduced acidity in exptl. nephritis may be due to inhibition of intracellular ferment activity by NaCl and other substances which are retained in the body in consequence of some change in the tubular epithelium induced by the uranium nitrate. In chronic spontaneous nephritis, the performed acid values of the kidney cortex and medulla are below normal.

GEO. T. CALDWELL.

The complement-fixation reactions of the Bordet-Gengou bacillus. MIRIAM P. OLMSTREAD AND OLGA R. POVITZKY. New York. *J. Med. Res.* 33, 379-92(1916).—*B. pertussis* is related in its complement-fixation characteristic to at least 2 strains of the influenza bacillus and to at least 2 atypical pertussis strains. Immune sera of Bordet-Gengou strains have been found to cross-fix with antigens of Bordet-Gengou strains only. Immune sera of some influenza strains have cross-fixed with Bordet-Gengou as well as with influenza strains. By the use of more highly specific antigens or larger amts. of complement and hemolytic amboceptor than those ordinarily employed, a differentiation of individual strains of *B. pertussis* may be possible. To obtain an immune serum of high complement-fixing-antibody content 9 or more intraperitoneal injections of a living culture of *B. pertussis* or of *B. influenzae* are advised, as a decided rise in the antibody-content curve occurs after 9 inoculations.

GEO. T. CALDWELL.

The accumulation of anisotropic fats in the interstitial cells of the kidney. J. W. McMEANS. Pittsburgh. *J. Med. Res.* 33, 475-9(1916).—Rabbits were given cholesterol by stomach tube for periods ranging from 19 to 115 days. Fatty intimal changes were found in the aortas of 3 of the 7 animals definitely reported. In these same animals yellowish white streaks, arranged radially, marked the pyramids of the kidneys. These areas were confined to the interstitial tissues and consisted of islands of cells, apparently derived from the lining cells of the medullary capillaries. Some of these cells contained anisotropic fat.

GEO. T. CALDWELL.

Tissue reactions in experimental hypercholesterolemia. J. W. McMEANS. Pittsburgh. *J. Med. Res.* 33, 481-91(1916).—Expts. performed by feeding cholesterol and foods rich in cholesterol to rabbits are attended by definite changes within the organs of these animals. The organs are found to contain large amts. of cholesterol, free or combined. The liver and the adrenals are the most important organs in which the storage at first occurs; later the corpora lutea, spleen and endothelium of the blood vessels assist in the storage.

GEO. T. CALDWELL.

Bactericidal action of normal and infected sera upon different microbes. K. SAKIGAMI. London. *Lancet* 1916, I, 127-32.—Normal serum has a slight bactericidal action upon the staphylococcus during the first hour of exposure but after many hours its power decreases. Serum heated to 60° has no bactericidal power. Normal serum has no bactericidal action upon the streptococcus. Serum of tuberculous patients has less bactericidal action than normal serum upon the staphylococcus. Serum of persons suffering from staphylococcus infections has a little stronger action than that of tuberculous patients.

GEO. T. CALDWELL.

Mottled teeth. G. V. BLACK AND FREDERICK S. MCKAY. *Dental Cosmos* 58, 129-56(1916).—This is a dystrophy of the enamel, endemic in the Rocky Mountain region. The teeth are provided with Nasmyth's membrane, but the cementing substance is lacking between the enamel rods in the outer third or fourth of the enamel. Such teeth have a dead paper-white appearance. At times the cementing substance is replaced more or less by the dark brown coloring matter, "brownin," coloring the tooth yellow to black. The defect is more marked on the labial than on the lingual surface. Brownin in small amt. may be present in normal teeth. Brownin may be removed from mottled teeth by treatment with abs. alc. for several days, followed by gasoline for a month; the imperfect portion of the enamel may then be stained with alc. gentian violet. Dystrophies of the enamel are due to disturbed nutrition during the formation or growth of that tissue. The various dystrophies are described with reference to general appearance and histological structure. JOSEPH S. HEPBURN.

An attempt to immunize calves against tuberculosis by feeding the milk of vaccinated cows. W. L. MOSS. Buffalo. *Bull. Johns Hopkins Hosp.* 26, 241-5 (1915).—A relative degree of immunity against tuberculosis may be conferred upon calves by feeding milk of vaccinated cows. Further expts. must be made to determine whether human beings are similarly influenced.

A. P. LOTHROP.

Complement fixation in thyroid diseases. S. R. MILLER AND RUTH E. FAIRBANK. Johns Hopkins Hosp. *Bull. Johns Hopkins Hosp.* 26, 245-9(1915).—The complement fixation test of Roseo (*Policlinico* 35, 1249(1913)) is of no value as a clinical means of detg. the existence of hyperthyroid states or conditions of dysthyreosis. A. P. L.

The relation of splanchnoptosis to gastric acidity. EDGAR P. SANDROCK. Johns Hopkins Hosp. *Bull. Johns Hopkins Hosp.* 26, 262-4(1915).—S. examd. 200 verified cases of splanchnoptosis. Normal or diminished amts. of free HCl were found in 83% and of total acidity in 75% of all the cases. "In ptotic stomachs there is a general tendency toward diminished acidity; hypochlorhydria and achylia are more frequently met with than hyperchlorhydria, the ratio being about 2 to 1." In 50 cases complicated by marked atony, diminished acidity was noted in a higher % of cases. Apparently the acidity in gastropnoia is largely influenced by the amt. of associated atony. Achylia was present in 12.5% of all the cases.

A. P. LOTHROP.

The calcium factor in hemophilia. A case with calcium deficiency (*calcipriva*). ALFRED F. HESS. N. Y. *Bull. Johns Hopkins Hosp.* 26, 372-6(1915).—An atypical case is described of hemophilia, having all the symptoms of classical hemophilia, in which there was a marked deficiency in the Ca of the blood from a functional point of view. The clotting of the blood was materially hastened by the addition of a dil. CaCl₂ soln. Quant. examn. of the blood showed a deficiency in Ca and in a metabolic study a negative Ca balance was obtained; this, however, became positive on the addition of Ca salts to the diet. In a comparative metabolic study of a case of typical hemophilia the exchange of Ca was normal. H. suggests that the name *hemophilia calcipriva* be applied to this distinctive type of hemophilia in which there is Ca deficiency.

A. P. LOTHROP.

Chemical studies of the relations of oral microorganisms to dental caries. IV. A biochemical study and differentiation of oral bacteria, with special reference to dental caries. (3.) I. J. KLIGLER. Columbia Univ. *J. Allied Dental Soc.* 10, 445-58(1915); cf. *C. A.* 9, 3094.—"The organisms associated with, and predominating in, primary caries (*B. acidophilus* and *C. placoides*) ferment the common sugars, readily produce a high degree of acidity, and bring about considerable dissolution of tooth substance. On the other hand, organisms normally abundant in the mouth but not directly related to primary enamel decay, as well as those that are prominent in the later stages of caries, do not produce a high degree of acidity and induce but slight dissolution of powdered teeth." The presence of Na mucinate (0.2%) in culture media favors the development of specific oral bacteria but not of the other forms. V. Tests of some biochemical activities of oral bacteria. LOTTIE M. HULL AND JEANETTE C. MULLIKIN. *Ibid* 459-63.—Oral bacteria in general cause more active fermentation of glucose and maltose than of sucrose or lactose and in most cases a given type produces approx. the same amts. of acid from at least 3 of the 4 sugars. The highest concn. of acid is produced by *B. acidophilus*. In 0.1% solns. of salivary Na mucinate incubated with mixed saliva, both acidity and alkalinity increase during the first week followed by a decrease in acidity and a steady increase in alkalinity as putrefactive bacteria outnumber the fermentative. In several expts. the amt. of thiocyanate was apparently reduced by the action of oral bacteria but the results are not conclusive. VI. Retrospect and prospect. WILLIAM J. GIES. *Ibid* 464-74.

A. P. LOTHEROP.

Sugar content of blood, exudates and transudates. UMBERTO FEDREZZONI. Modena. *Arch. fisiol.* 13, 41-54(1915); *Zentr. Biochem. Biophys.* 18, 183(1915).—F. has detd. quantitatively the sugar content of the pleuro-peritoneal effusions of individuals suffering from various diseases and attempts to obtain from these values (in comparison with the sugar content of the blood) some criterion which will serve to distinguish exudates and transudates. By use of the Bang method for detn. of sugar, F. arrives at the following conclusions: Under normal conditions there is a definite relation between the sugar content of the blood and that of exudates and transudates; in comparison with the blood an exudate has a lower and a transudate a higher sugar content. This relation persists even after 1 or more administrations of sugar. Detn. of the sugar content of effusions has important diagnostic significance when considered in connection with detn. of sugar in the blood.

H. S. PAINE.

Antiproteolytic serum action in pregnancy, birth and child-bed and the significance of the antitrypsin method in the serological diagnostics of pregnancy. R. FRANZ. Graz. *Arch. Gynaekol.* 102, 579(1915); *Zentr. Biochem. Biophys.* 18, 189(1915).—Antiproteolytic serum action is greatly increased at the end of pregnancy as compared with the serum titer of a healthy, non-pregnant individual; this increase may be regarded as a const. symptom of pregnancy and may be utilized in diagnostics. This method has the advantage over the Abderhalden reaction of being simpler in technic. During birth and also during the dilatation period and period of expulsion the serum titer increases above that of pregnancy, but decreases during the 3rd stage of labor. The titer undergoes a further increase in affections (anemia and tuberculosis in pregnancy and fever and adnexa tumors in child-bed) which are coincident with increased albumin resorption in the organism.

H. S. PAINE.

Studies of constipation; transformation of a normal flora in vitro into a typical flora of constipation. A. DISTASO. *Centr. Bakt. Parasitenk., I Abt. Orig.* 75, 507-17 (1915); *Zentr. Biochem. Biophys.* 18, 168(1915).—The peculiar nature of constipated stools is due to putrefaction, which is connected with a gradual transformation of the intestinal flora. A butyric acid odor mingled with the odor of NH_3 was observed

when this process was imitated *in vitro* with a constipated stool. The subtilis group predominates in the stool after the completion of putrefaction. The transformation of the intestinal flora exhibits, on the whole, 3 stages. The coli forms first disappear, then the streptococci and acid-tolerant bacilli predominate and finally there ensues the stage of NH_3 production (subtilis group) in which the appropriate substances are decompd. with formation of NH_3 .
H. S. PAINE.

Intestinal putrefaction and sclerosis of the aorta. T. S. STRENHUIS. Groningen. *Folia Mikrobiol.* 3, 76(1915); *Zentr. Biochem. Biophys.* 18, 167-8(1915).—The assertion of Dratchinski (*C. A.* 6, 2643) that indole plays a part in the etiology of sclerosis of the aorta was not sustained by appropriate expts. on guinea pigs; no typical atheroma was produced in animals which were treated with indole. The assumption of Mechnikov that atheromasia is due to absorption of indole from the intestine was likewise not sustained. Dissection of a woman who had suffered for 40 yrs. from congenital hypertrophy and dilatation of the lower part of the colon with aggravated constipation (and consequent passage of aromatic compds. into the blood) failed to show any unusual hardening of the arteries; the liver was not cirrhotic and the kidneys showed only a few sclerosed vessels.
H. S. PAINE.

Phosphorus poisoning and the meiostagmin reaction. FRANCO CATTORRETTI. Turin. *Giorn. accad. med. Torino* 76, 62-6; *Zentr. Biochem. Biophys.* 18, 200(1915).—The blood serum of animals (dogs, rabbits, guinea pigs) which have been treated with P gives higher values in investigation of the meiostagmin reaction than are obtained with the same animals before treatment or with untreated animals of the same kind. These observations should be of significance in explaining the nature of meiostagmins in view of the fact that lipid substances are present in the blood in increased concn. in P poisoning.
H. S. PAINE.

Indole and its derivatives. ORESTE CANTELLI. Bologna. *Il polichin.* 1914; *Zentr. Biochem. Biophys.* 18, 169(1915).—C. discusses critically the present status of our knowledge of indole. The latter is almost exclusively a product of intestinal putrefaction and acts upon the organism as a cirrhotic poison; the greater portion of indole is destroyed in the organism and the remainder is transformed into indican. Indicanuria only possesses clinical significance in exceptional cases and can only, at best, be taken as an index of the degree of intestinal putrefaction. Only by giving due consideration to destructive and synthetic power and by repeating the tests in each separate instance is it possible to make a deduction regarding the significance of indicanuria; a persistent decrease in both effects and increased indole content of the urine indicate that the process of detoxication does not proceed to completion, inasmuch as the organs do not effect the destruction of the poisons in question to a sufficient extent.
H. S. PAINE.

Thermocalorimetric investigations in serum anaphylaxis. MARIO SEGALÉ. Genoa. *Pathologica* 5, 667-72; *Zentr. Biochem. Biophys.* 18, 196(1915).—S. studied heat radiation in anaphylaxis by detg. the body temp. as well as the total amt. of heat radiated from the animal organism. The calorimetric and thermometric curve was not appreciably modified by subcutaneous injection of a small initial dose of serum. In so far as anaphylactic re-injection was concerned it was not easy to det. heat radiation in very acute cases (intravenous re-injection). The heat radiation, as measured by the usual methods, failed to show any appreciable change when anaphylaxis had a duration of 8-13 hrs.; an increase in heat radiation was observed, however, when death by anaphylaxis occurred after a longer period. Thermogenetic lack of equilibrium, therefore, be regarded as a secondary phenomenon.
H. S. PAINE.

Cholesterol content of blood serum after administration of cholesterol in certain forms of severe anemia. COLLATINO CANTIERI. Siena. *Rassegna clin. terap. sci.*

affini Aug., 1914; *Zentr. Biochem. Biophys.*, 18, 184(1915).—C.'s expts. show that administration of therapeutic doses of cholesterol ester does not cause any considerable increase in the cholesterol content of blood serum. C. leaves undetd. the questions whether the resulting favorable therapeutic effect is due to a catalytic action on the enzymic process which takes place in the interior of the tissue and whether the administered cholesterol becomes combined so readily with the various tissues that any increase in the cholesterol content of the blood serum is impossible. H. S. PAINE.

Cholesterolemia in certain severe anemic conditions. COLLATINO CANTIERI. Siena. *Rassegna clin. terap. sci. affini*, Sept., 1914; *Zentr. Biochem. Biophys.* 18, 184(1915).—Hypocholesterolemia of considerable extent is of const. occurrence in severe anemic conditions of a toxic nature. This hypocholesterolemia has no connection with the real, underlying cause of the anemia or with the pathogenetic mechanism of the latter but is rather a direct result of the disease condition, *i. e.*, the poor general condition of the organism. Cf. C. A. 9, 1804. H. S. PAINE.

Azotemia in connection with death. D. DUMITRESCU AND ALIN POPESCU. Bucharest. *Rev. stiint. med.* Apr., 1914; *Zentr. Biochem. Biophys.* 18, 184-5(1915).—All patients (except those who suffer from kidney affections) who die after an illness of greater or less duration exhibit distinct terminal azotemia. The urea content of the blood increases in a const. manner up to the moment of death; in fact, a minimal increase was observed during the 1st few hrs. after death. The curve of urea excretion increases rapidly during the period of death agony and less rapidly during the period immediately preceding; in 1 instance there was an increase from 0.52 g. to 2.42 g. per l. at the moment of death. Persons who meet sudden death by injury do not exhibit the azotemia noted above; it appears, therefore, that rapid death does not allow the necessary time for production of terminal azotemia. H. S. PAINE.

Detection of indican, its occurrence in the feces and a peculiar manner of its formation. ORESTE CANTELLI. Bologna. *Soc. med. chir. Bologna*, session May 28, 1914; *Zentr. Biochem. Biophys.* 18, 169(1915).—C. tested the method of Obermayer, Wang and Maillard for the quant. detn. of indoxyl in the case of numerous samples of urine, previous treatment with CHCl_3 being employed. A large amt. of indican was found in the feces of an individual who suffered from obstruction of the intestine in the region of the cecum; this result was not found in the case of healthy individuals or those suffering from other diseases and C. concludes that it is indicative of intestinal obstruction. A substance with the chem. properties of indirubin was obtained in expts. under the influence of bacterial action and in expts. *in vitro*; the indoxyl which was isolated from the feces appears to be autochthonous and of bacterial origin. H. S. PAINE.

Does the detection of tryptophan and indoleacetic acid in the feces and urososein in the urine possess any particular value either in itself or in conjunction with the detection of indoxyl and indole in the urine and feces? ORESTE CANTELLI. Bologna. *Soc. med. chir. Bologna*, session June 18, 1914; *Zentr. Biochem. Biophys.* 18, 169(1915).—After numerous investigations of feces and urine with regard to the presence of the substances mentioned above, C. concludes that such tests are not sufficient to throw much light on especial disease conditions. H. S. PAINE.

Toxins of intestinal worms. D. EM. PAULIAN. *Spitalul*. No. 15/16, 1914; *Zentr. Biochem. Biophys.* 18, 194-5(1915).—Intestinal parasites produce both a local and a general effect, the latter being due to excreted toxins. Subcutaneous injections of exts. and macerations of *Taenia cucumerina*, *Ascaris*, *Oxyuris* and *Trichocephalus* in rabbits in doses of 3-15 cc. produced both local and general phenomena; among the former were necrosis and congestion and hypertrophy of the lymphatic glands, while fever, eosinophilia and congestions and hyperemia of the spleen, liver, kidneys, lungs

and brain were observed among the latter. Macerations were more toxic than alcoholic exts. or exts. prepd. with physiol. NaCl soln. Cf. C. A. 10, 780. H. S. PAINE.

Density of the blood in complete fast. D. DUMITRESCU-MANTE. Bucharest *Spitalul*. No. 21/22, 1914; *Zentr. Biochem. Biophys.* 18, 185(1915).—The H₂O content of the blood decreases in a const. manner during absolute fast and the toxicity of the blood shows a const. increase. Most of the H₂O is eliminated by the lungs and this is particularly the case during the later stages of fast when excretion by means of the urine and feces becomes negligible. The toxicity of the blood is demonstrated by the changes in the kidney tissue, i. e., the concd. poisons of the blood attack the tissue of this organ to a pronounced extent during their passage through the renal filter. Azotemia, which appears toward the approach of death in fasting animals, is a further consequence of the concn. of the blood. H. S. PAINE.

Chemical etiology of cancer according to Nowell. ERNST FRAENKEL AND WASSA KLEIN. Heidelberg. *Z. Krebsforsch.* 15, 76(1915); *Zentr. Biochem. Biophys.* 18, 152-3(1915).—The substance obtained by Nowell from carcinoma tissue (and placed at the disposal of F. and K.) was found to consist largely of Zn sarcolactate with slight admixt. of org. substance. The substance obtained by Nowell from sarcoma tissue consisted largely of Zn phosphate with slight admixt. of Zn sarcolactate. The presence of these salts is explained by the technic employed. It was possible, by subcutaneous incorporation at the base of the ear of rabbits, to produce granulation tumors with carcinoma substance as well as with Zn lactate and other Zn salts. Further inoculation of these tumors in rabbits and mice was not successful. No granulation tumor was produced in mice by subcutaneous incorporation of Zn salts. H. S. PAINE.

On the occurrence of protective enzymes in various conditions. Testing of their activity by means of the micro-Kjeldahl method. B. T. KABANOW. *Fermentforschung* 1, 206-9(1915).—A corroboration of previous findings in cases of pregnancy where dialysis and the ninhydrin reaction were used. W. A. PERLZWEIG.

Differential diagnosis between paranoia and dementia paranoides on the basis of the Abderhalden dialysis method. E. WEGENER. *Fermentforschung* 1, 233-53 (1915).—The sera of 14 patients suffering from dementia paranoides were found to digest either sex gland and brain tissues, or thyroid and brain tissues, while the sera from paranoid chronica patients never digested brain tissue, and very seldom digested tissues of gland of internal secretions, indicating that in the latter disease the brain is not affected, as it is in the former. W. A. PERLZWEIG.

Practical and theoretical considerations of the (Abderhalden) dialysis methods. V. KAFKA. *Fermentforschung* 1, 254-68(1915).—No protective enzymes were found in the sera of 32 physically and mentally normal individuals, towards the following tissues: brain, brain-cortex, testes, ovary, thyroid and parathyroid. The previous findings of Abderhalden and of Fauser regarding the degeneration of sex glands in dementia praecox are confirmed. Regarding the nature of the protective enzymes, K. doubts whether the proteolytic enzymes indicated by the dialysis method are comparable to amboceptors, since he could not demonstrate the complement-fixation phenomenon. W. A. PERLZWEIG.

Serological studies in pulmonary tuberculosis, employing the optical method. H. E. LAMPÉ AND J. CNOFF. *Fermentforschung* 1, 269-310(1915).—The previous dialysis studies of Lampé (cf. C. A. 8, 168) on tubercular serum are confirmed by the use of the optical method. The serum of non-tubercular persons did not digest tubercle bacillus protein or lung tissue. In positive cases of lung tuberculosis such digestion did occur. The most intensive development of protective enzymes was found in well nourished persons with stages of tuberculosis not too far advanced. The quantitative

possibilities of the optical method are pointed out as regards their prognostic and diagnostic values. W. A. PERLZWEIG.

The Abderhalden reaction in Parkinson's disease. C. J. PARHON AND MARIE PARHON. *Fermentforschung* 1, 311-4(1915).—In the majority of cases of paralysis agitans, positive dialysis reactions were obtained with thyroid, parathyroid and hypophysis. The use of adrenals yielded positive results only rarely, while the reaction was wholly negative with sex-glands. Frequently the reaction was positive with muscle and nerve tissues. On the basis of these findings it is suggested that the disease is brought about by changes in the thyroids, parathyroids, and hypophysis. This is accompanied by degeneration of nerve and muscle tissue. If the disease appears suddenly a latent glandular change may be suspected. W. A. PERLZWEIG.

Thermolability of complements. T. MADSEN AND T. WATABIKI. *Oversigt kgl. Danske Videnskab. Forhandling* 1915, 125-59; *Chem. Zentr.* 1915, II, 844.—Complement inactivation in the sera of swine, horse and guinea pig at temps. of 14-56° may be expressed by the law of monomolecular reactions. Between 40 and 56° the dependence of reaction velocity upon temp. follows the van't Hoff-Arrhenius law, and the temp. coefficient (μ) varies between 60,000 and 110,000. At 37° or lower the velocity of the reaction deviates from the above law. The albumin and globulin fractions (end- and middle pieces) behave similarly. It is immaterial whether the amboceptors of the employed serum are used, or they are absorbed by red blood cells and liberated by immune rabbit serum. W. A. PERLZWEIG.

Thermolability of amboceptors. T. MADSEN AND T. WATABIKI. *Oversigt kgl. Danske Videnskab. Forhandling* 1915, 161-70; *Chem. Zentr.* 1915, II, 844; cf. preceding abstract.—Amboceptors obtained by the action of swine serum on sheep blood cells and amboceptors obtained through the immunization of rabbits towards sheep blood cells or guinea-pig kidney tissue were studied. Since the complement is destroyed at temps. much lower than the experimental temp., fresh serum was added when testing. Guinea-pig serum was used for this purpose. Between 60 and 80° the rate of inactivation followed the law of monomolecular reactions. The relation between temp. and reaction velocity followed the van't Hoff-Arrhenius law; while the temp. coeff. varied between 106,000 and 16,000, corresponding to an increase in the rate of inactivation of 1.57 to 1.07 for 1°. W. A. PERLZWEIG.

Contributions to the pathology of edema. I. L. HESS AND H. MÜLLER. *Z. exp. Path. Ther.* 17, 59-71(1915).—Subcutaneous injections of aromatic *m*-diamines produced edema through the alteration of capillaries. II. *Ibid* 17, 72-3.—Subcutaneous administration of pyrocin and *m*-tolylhydrazine produced edema. W. A. P.

The chemistry of kidney-stones. MAX KAHN. *Z. exp. Path. Ther.* 17, 88-97 (1915).—The majority of calculi consist of CaC_2O_4 . While uric acid and urates are found in small quantities in all stones, calculi consisting chiefly of uric acid or urates are very rare. Shape, color and density of a stone cannot be taken as criteria of its chem. compn. Gout tophi do not always consist of uric acid or urates. W. A. P.

A study of the diagnostic value of the Russo reaction. MAX KAHN AND LAWRENCE WECHSLER. *Med. Record* 89, 106-7(1916); cf. Kahn, *Biochem. Bull.* 1913.—Comparison with tinted glass is made for the purpose of determining the color characteristic of this reaction. A table drawn from the examination of 758 urines from as many patients is given, showing the results of the Russo, diazo and Weiss tests in typhoid and other diseases. Both the Russo and diazo tests are of diagnostic value, but the Weiss test seems of doubtful worth. A. H. RAHE.

Serological method in detection of trypanosomiasis in horse disease. R. OFFERMANN. *Arch. kais. Gesundh.* 50, 1-30(1915).—The results of complement-fixation and

agglutinin tests with 12 rabbits are given in 25 tables. O. summarizes as follows: Serum from healthy rabbits frequently has an antihemolytic action, which is decidedly variable in strength. The use of 0.01 cc. or less of normal rabbit serum failed to produce the antihemolysis. A test for infection is made by using the rabbit serum in complement-fixation expts. Agglutinins, which produce agglutination of trypanosomes of horse disease, are not found in normal rabbit serum. In the serum of rabbits infected with trypanosomes of horse disease, complement-fixation antibodies and agglutinins were present. Complement-fixation amboceptors appeared on the average 9 days after inoculation and 4-9 days after the appearance of trypanosomes in the blood, while agglutinins appeared on the average 13 days after inoculation and 4-22 days after the trypanosomes in the blood. The appearance of the antibody was transient and varied in activity according to the individual and course of disease, frequently diminishing as the disease progressed but increasing toward the end. No regularity in these variations was observed, but in no case was the blood entirely free of antibody. By sterile preservation of the serum the antibody retains its activity for many months. For agglutination fresh trypanosome material must be used. The antigens of trypanosomes when preserved in the ice box retain their activity for weeks. As complement fixation gives better results than agglutination it is to be preferred as a diagnostic aid.

L. W. RIGGS.

Products of putrefaction in the intestines as a factor in blood diseases. O. CANTELLI. *Riforma medica* 31, Nos. 45-8(1915); *J. Am. Med. Assoc.* 66, 391.—C.'s expts. on rabbits confirmed the assumption that indole has a pronounced destructive action on the blood, the findings under its influence being similar to those in the blood with gastric cancer. Just as certain poisons, such as Pb, are able to modify the blood until the blood picture suggests pernicious anemia, the products of putrefaction in the intestines are able to do the same in rabbits, and probably also under certain conditions in man.

L. W. RIGGS.

Clinical determination of renal function by an index of urea excretion. F. C. MCLEAN. New York. *J. Am. Med. Assoc.* 66, 415-20(1916).—Ambard's laws are discussed and over 20 references to recent literature given. The author's formula is $I = (D\sqrt{C} \times 8.96)/(Wt \times Ur^2)$, in which I is the index of urea excretion, D is the number of g. of urea excreted in 24 hrs., C is the number of g. of urea per liter of urine, Ur is the number of g. of urea per liter of blood, and Wt is the body wt. of the individual in kg. The rate of excretion is not actually detd. for 24 hrs. but usually for 72 min., the important point being to det. the rate of excretion at the time of observation. The essential points in an observation are (1) collection of urine over a carefully timed period, (2) collection of blood near the middle of that period, and (3) accurate detns. of the urea content of the samples of blood and urine. The usual routine is as follows: The patient drinks 150-200 cc. of water and 30 min. later voids urine in order to start with the bladder empty, catheterization being employed if necessary. The time of voiding is recorded to within 1 min. About 36 min. later 7-10 cc. of blood are withdrawn from an arm vein into a dry tube containing K oxalate or citrate to prevent clotting. At the end of 72 min. from the first voiding, the bladder is again emptied and the urine measured to within 1 cc. and used for analysis, or one-half used for analysis and the other half for a simultaneous phenolsulfonephthalein test. The patient takes no food or water during this period; otherwise no restrictions are necessary. The 72 min. period is merely for convenience; 36, 60 or 120 min. periods may be used. Analyses should be by the most accurate modern methods, the urease method of Van Slyke and Cullen (cf. *C. A.* 8, 2496) being specially recommended. Three detns. are necessary: blood urea, urine urea and urine NH_3 , the latter as a correction to the urea detn. for preformed NH_3 detd. in the urea method. Duplicate detns. on blood are

recommended. Illustrations are given for a rapid method of computing the index by aid of the slide rule. Among the findings it may be mentioned that the index is independent of the N intake, and that the actual blood urea figure may be very misleading, if taken by itself, as an indication of the ability of the kidneys to eliminate N. An increased level of urea in the blood is purely compensatory, and is not due to a lack of ability on the part of the kidney to excrete the larger amts. of urea being formed in the body.

L. W. RIGGS.

Pellagra: causation and a method of prevention. JOSEPH GOLDBERGER. Washington. *J. Am. Med. Assoc.* 66, 471-6(1916).—The results of studies with a "pellagra squad" of 11 men, furnish additional evidence that pellagra is caused by deficiencies in the diet, and in this respect resembles beriberi. While a definite conclusion as to the intimate mechanism involved in bringing about or preventing the disease, cannot be drawn from the data available, the dietary deficiency is capable of prevention or correction by the inclusion in the diet of suitable proportions of fresh animal and leguminous protein foods.

L. W. RIGGS.

Effects of phlorizin on tumors in animals. F. C. WOOD AND E. H. McLEAN. Columbia Univ. *J. Cancer Res.* 1, 48-70(1916).—Administration of small doses of phlorizin to rats with either spontaneous tumors or inoculated sarcoma, did not cause absorption of the tumors.

H. G. W.

Chemotherapeutic experiments on rat tumors. RICHARD WEIL. Cornell Univ. Med. School. *J. Cancer Res.* 1, 95-106(1916).—Analyses of tumor rats after injection of NaI showed the blood to contain the highest amts. of I, after that the tumors and the liver; but if the tumors were small and not necrotic they contained little I. After injection of dyes of the diazo group the necrotic areas of tumors present an intense coloration, and often the liver is stained, but not the other tissues. The staining of necrotic areas in tumors is not due solely to the death of the cells, as areas of pulmonary caseation in the same rats are not colored. The location of colloidal dyes in necrotic tissues is not a simple physical phenomenon; the diffusibility of the dyes through membranes, the elec. charge, the chem. reaction and the chem. compn. of both colloids influence the results. A series of new synthetic compds. analogous to Congo red were injected into tumor rats, without definite therapeutic effect.

H. G. W.

Gonococcus complement fixation: A new lipid antigen. CARL C. WARDEN, Ann Arbor, Mich., AND LOUIS E. SCHMIDT, Chicago. *J. Lab. Clin. Med.* 1, 333-47 (1916).—An alc. soln. of the fats of the gonococcus serves as antigen in the gonococcus complement-fixation test, and is superior for the purpose to the watery antigen of commerce. Positive reactions are always of value. Repeated negative reactions in the absence of clinical signs are of great value. A single negative reaction has no significance whatever. While the sera of normal persons have been found wholly negative, and while it is admitted that positive reactions are largely confined to cases where the gonococcus is, or has recently been, present, nevertheless the evidence as a whole is that a positive reaction indicates the presence in the serum of some substance which reacts with the antigen (antibody?) to produce fixation of complement, and not necessarily the presence of a focus of gonococcus in the body.

H. G. W.

Influence of diet and iodides on the hyperplasia of the thyroid gland of opossums in captivity. R. R. BENSLY. Univ. Chicago. *Am. J. Anat.* 19, 57-65(1916).—The spontaneous hyperplasia observed in the thyroid gland of the opossum under lab. conditions can be produced and controlled by diet alone; given the conditions dietary and otherwise which produce an active hyperplasia, iodine will not inhibit the reaction. At all periods of the hyperplasia and to an extent which is proportional inversely to the rate of hyperplasia, iodides will cause storage of intrafollicular colloids.

C. J. WESS.

Studies in blackwater fever. V. The duration of hemoglobinuria. J. W. W. STEPHENS. Univ. Liverpool. *Ann. Trop. Med.* 9, 539-42(1915); cf. *C. A.* 9, 1510.—Of 167 cases of hemoglobinuria in this disease, 45 were not more than 12 hrs. in duration, 77 not more than 1 day, and 45 were more than 2 days. C. J. WEST.

Experimental study of the relation of uremic azotemia to indicanemia and indicanuria. MAX ROSENBERG. *Arch. exp. Path. Pharm.* 79, 266-84(1916).—It is shown by expts. on dogs with exptl. kidney injury that the hyperindicanemia accompanying acute azotemia precedes an increased indicanuria, and that in this hyperindicanemia there occurs first an increased indican formation but not an increased indican retention. Only when the kidney insufficiency continues for some time is there an increased retention. The question whether the increased indican formation occurs in the intestine or in the intermediary metabolism cannot be definitely answered, but the data seem to indicate the latter source; the liver may be the seat of this formation. In artificial azotemia, produced by the addition of urea to rabbits with normal kidneys, there is a hyperindicanuria, *i. e.*, an increased indican formation. A marked hyperindicanemia is lacking here because of the non-retention of indican. From this it is possible that the azotemia stands in causative relationship to hyperindicanemia, in the sense that azotemia stimulates the increased indican formation. C. J. WEST.

Influence of tuberculosis upon the chemical composition of the animal body. KARL DRÖGE. *Arch. ges. Physiol.* 163, 266-88(1916).—Figures are given for the wt., H₂O, dry substance, fat, fat-free dry substance, ash and ash- and fat-free dry substance for 2 series of guinea pigs, normal and tubercular. Tuberculosis seems to decrease the fat content. C. J. WEST.

Enzymes which cause cleavage of the proteins of diphtheria serum. A. REISZ AND Z. BARABÁS. Budapest. *Jahrb. Kinderheilk.* 81, 334-42(1915); *Zentr. Biochem. Biophys.* 18, 189(1915).—Investigations by the Abderhalden dialysis method yielded positive results in most of the cases which were studied. H. S. PAINE.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Lesions produced by arsenicals and their bearing on the problem of specific arsenic therapy. WADE H. BROWN. Rockefeller Inst. *Bull. Johns Hopkins Hosp.* 26, 309-14(1915).—A study has been made of about 60 As compds. in which detns. have been made of their toxic limits and the essentials of their pathological action in mice, rats, guinea pigs, rabbits, and in some instances, dogs. The toxicity of compds. containing approx. the same % of As varied widely but not more so than the variety and severity of the tissue injury produced by them. Lesions were observed in the heart, blood vessels, lungs, liver, kidney and adrenals. Some degree of adrenal injury is among the most const. changes produced by all classes of arsenicals, the measure of injury being parallel with the susceptibility of a given animal species for a given compd. The expts. emphasize the importance of a thorough knowledge of the lesions produced by As compds. in the successful prosecution of the problem of specific As therapy. A. P. LOTHROP.

Sensitiveness of the skin to epinephrine and pituitrin. A. JOSEFSON. Stockholm. *Dermatol. Wochschr.* 1915, 413; *Zentr. Biochem. Biophys.* 18, 162-3(1915).—In order to ascertain whether hypersensitiveness to epinephrine exists J. examd. individuals (patients suffering from Basedow's disease and chronic nephritis, as well as pregnant individuals) with whom the existence of epinephrinemia could be assumed. The typical cutaneous test was applied with epinephrine; the reaction consisted in a remarkable pallor at the spot of inoculation. Pituitrin gave the same reaction; choline did not give the reaction, however, and J. concludes that this substance cannot be the common constricting principle of epinephrine and pituitrin. H. S. PAINE.

The attitude of the physician as a competent judge in the saponin question. R. KOBERT. *Ärztliche Sachverständigenzeitung* 1915, No. 10; *Chem. Zentr.* 1915, II, 858.—A review of the common properties of saponins, of their differences, and of their recently discovered significance for medicine. W. A. P.

Cataphoresis of drugs. I. TRAUBE AND L. BERZELLER. *Intern. Z. Biol.* 2, 107-17(1915).—The pharmacological action of drugs was found to be greatly inhibited when single drugs or mixts. were subjected to cataphoresis. This was shown by expts. on animals and by measurements of surface activity. It was also found that by this method mixtures of drugs could be sepd. into components, and impurities removed. The inhibition is believed to be due to the increase in concn. through endosmotic movements, the increase in the degree of dispersion, and probably the flocking of some antagonistically acting constituents. W. A. PERLZWEIG.

On the influence of digitalis and of a combination of digitalis and sodium salicylate upon the leucocyte count. MAUJA LÖWENSTEIN. *Z. exp. Path. Ther.* 17, 47-58 (1915).—L. failed to confirm the stimulation of leucocytosis through the action of digitalis and of digitalis + Na salicylate. W. A. PERLZWEIG.

The action of alkaline earths upon the isolated frog heart. H. KIONKA. *Z. exp. Path. Ther.* 17, 108-26(1915).—A frog heart is arrested in systole by applying 0.04% BaCl_2 soln., 0.16% CaCl_2 soln., or 0.36% SrCl_2 soln. With smaller concns. of these salts it is arrested in diastole. The entire significance of the action of the salts is not alone explained by the concns. of their resp. solns. W. A. PERLZWEIG.

Criticism of and experiments on the cumulative action of strophanthin. KAREL KLEIN. *Z. exp. Path. Ther.* 17, 127-42(1915).—The action of large doses of strophanthin becomes evident in an hour through vomiting; the action on the heart occurs after several hours, but may last for as long as a month. A typical action may be obtained through continuous administration of small doses. The intoxication occurs in such cases fairly suddenly. Reflex salivation is suggested as a dependable indicator of intoxication. Several strophanthin preps. (commercial) were employed and the various degrees of toxicity established. It appears possible to maintain the human organism under digitalis action for a long time through continuous small dosage with strophanthin, although a fatal result may ensue without any warning symptoms. W. A. PERLZWEIG.

Acquired tolerance of strophanthin, studied with reflex salivation as an indicator. KAREL KLEIN. *Z. exp. Path. Ther.* 17, 143-60(1915); cf. preceding abstract.—Cats may acquire a tolerance to strophanthin through the administration of small doses of the drug. The tolerance occurs in the circulatory and nervous systems, although there is no parallelism between the two in this process. The tolerance, however, is not constant and may easily pass into intoxication. W. A. PERLZWEIG.

• Medicinal leucocytosis. A review of the literature and some experiments on the influence of some antipyretics on leucocytes. R. P. GEHRIG. *Z. exp. Path. Ther.* 17, 161-9(1915).—Therapeutically employed doses of such antipyretics as sodium salicylate, aspirin, salol, antipyrin and salipyrin do not appear to increase the abs. leucocyte count. W. A. PERLZWEIG.

Arsenical intoxication ten months after one injection of "novarsenobenzol" (Billon). HAROLD SPENCE. *Proc. Roy. Soc. Med.* (Dermatological Sec. 6), 19, 1 (1915).—In a syphilitic with well developed secondary lesions, an intravenous injection of novarsenobenzol (a product offered as a substitute for salvarsan) gave rise to a severe dermatitis and other evidences of arsenical poisoning. Gastrointestinal symptoms were absent and no kidney insufficiency developed. A. H. RAHE.

Action of magnesium upon the body temperature. JULIUS SCHÜTZ. Univ. Vienna. *Arch. exp. Path. Pharm.* 79, 285-90(1916).—The lowering of the temp. occurs, with sleep-producing doses of Mg, at a time when the animal is only partially paretic but yet completely awake. This period of lowered temp. exceeds the duration of the narcotic and paralysis symptoms by 1 to 2 hrs. Doses which cause only paresis and not narcosis also produce lowering of the temp. This is therefore the 1st noticeable symptom of Mg action. The intensity of the temp. decrease appears to stand in a certain relation to the intensity of the succeeding paralysis symptoms. It is possible since the change is easily measured and is the 1st symptom to appear, to use it as a method for following the Mg treatment of tetanus. CaCl_2 does not retard the temp.-lowering action of Mg. In many cases the temp. lowering is so marked that the Ca-Mg action seems to be a summation of the thermal action of the two. In these expts. narcosis and paralysis were absent. The narcotic Mg action upon the heat centers is outweighed by the stimulating effects of tetrahydronaphthylamine. C. J. W.

Pharmacodynamic action of tertiary trichlorobutyl esters. A. LOEWY AND R. WOLFFENSTEIN. Berlin. *Arch. exp. Path. Pharm.* 79, 318-36(1916).—Esters of the following acids were studied: acetic, chloroacetic, trichloroacetic, diethylaminoacetic, dimethylaminoacetic, piperidylacetic, propionic, isovaleric, diethylaminoisovaleric, pyruvic, neutral malonic, neutral diethylmalonic, acid diethylmalonic, mixed malonic, allophanic, dibromocinnamic. (These esters are described by Wolfenstein, Loewy and Bachstet (C. A. 10, 768).) In general trichlorobutyl esters are not split in the body and therefore do not show the narcotic action of the alc. The only sleep-producing compd. was the ester of diethylaminoacetic acid. Its action, however, is not identical with that of the alc. The various esters had characteristic actions, which did not resemble those of the components. Especially noticeable was the strychnine-like effect produced by the propionic, isovaleric and allophanic acid esters. C. J. W.

Destruction of morphine and morphine derivatives during the development of the chicken embryo. MAX GRÜTER. Univ. Zürich. *Arch. exp. Path. Pharm.* 79, 337-60(1916).—Fertilized and incubated eggs may be injected with morphine, heroine and codeine solns. (up to 2 cc.) without preventing the further development of the embryos. When the embryo was completely developed, the heroine was always completely destroyed, the morphine was found between 50 and 100%, while the codeine could be quant. recovered. Increased O addition during incubation produced a complete destruction of the morphine. If the embryo is killed when about half developed, all the alkaloids can be recovered quant. Thus a certain morphological stage of development is necessary in order to destroy the 2 alkaloids. The injected embryo is thus to be considered as a chronically poisoned individual. Expts. with various amts. of O indicate that the destruction of the alkaloids by the completely developed embryo is an oxidation process. The reason why morphine and heroine are decomposed and codeine and dionine are not, probably lies in the manner of the esterification of the phenol hydroxyls. C. J. WEST.

The fate of proteinogenetic amines in the animal body. M. GUGGENHEIM AND WILH. LÖFFLER. Basel. *Biochem. Z.* 72, 325-50(1916).—The expts. indicate that the proteinogenetic amines, isoamylamine, phenylethylamine, p -hydroxyphenylethylamine, indoleethylamine, β -imidazoleethylamine, lose their poisonous properties in the body. This is not the result of a coupling but of deamination and oxidation. The end products are carboxylic acids with the same number of C atoms as the original amine. Thus isoamylamine gives isovaleric acid, phenylethylamine gives phenylacetic acid and indoleethylamine, indoleacetic acid. The presence of β -imidazoleacetic acid has not been established but is very probable. The carboxylic acids are excreted as such or further decompd. in the body. Intermediate products of the oxida-

tions of the amines to the acids are the corresponding alcs., isoamyl alc., phenylethyl alc. and *p*-hydroxyphenylethyl alc. These alcs. can, in several cases, be isolated and characterized by perfusion of the surviving liver with the amine. A confirmation of this is the fact that these alcs. are oxidized by the isolated liver to the corresponding acids. Normal blood and serum of man and animals have a tonus-accelerating action upon the isolated guinea-pig intestine. The action is ascribed to a substance, sol. in alc. and stable towards heat. C. J. WEST.

Behavior of 3-hydroxythionaphthene (thioindoxyl) in the organism. Thioindican. ERWIN SCHWENK. Kaiser Wilhelm Inst. *Biochem. Z.* 72, 383-91(1916).—After feeding 3-hydroxythionaphthene to rabbits, thioindican and thioindoxylglucuronic acid were isolated from the urine. *Thioindican* was synthesized for comparison by the action of 5 g. hydroxythionaphthene and 15 g. ClSO_3H in 50 g. $\text{C}_6\text{H}_5\text{N}$. After standing 2 hrs. at 38° and 24 hrs. at 20° , the $\text{C}_6\text{H}_5\text{N}$ was removed *in vacuo*, 26 g. KOH in 50 cc. H_2O added and the mixt. again distd. *in vacuo*. Recrystd. from H_2O , 65% of the theory of thioindican was obtained, 4-sided, silver-glistening leaflets, reddened at 180° , m. unsharp at 225° . In the presence of light catalyzers it is easily decompd. by light. The *potassium thioindoxylglucuronate* was isolated as needles, m. $199-200^\circ$ (decompn.), $[\alpha] -66.12^\circ$. C. J. WEST.

I. ZOÖLOGY.

R. A. GORTNER.

Resistance of starved and normal fishes to low oxygen and the effect upon this resistance of acids, alkalies, salts, etc. MORRIS M. WELLS. Univ. Chicago. *Science* 43, 183-4(1916); cf. *C. A.* 8, 1162.—This study is not yet complete. Among the results announced may be mentioned the devising of an app. that will furnish a flow of about 1 l. per min. of O-free H_2O . Starving fishes show an increase in their resistance, i. e., a decrease in their susceptibility to low O during the first 3-8 weeks of the starving period; this resistance rapidly decreases toward death, which occurs in 12-16 weeks. The reaction of water has a marked effect upon resistance, alk. H_2O being more toxic in concns. as small as $N/3000$. If the H_2O is alk. fishes live longer corked in low-O H_2O than if the H_2O flows constantly through the exptl. bottle. L. W. RIGGS.

Action of several porphyrins upon paramecium. HANS FISCHER AND G. A. V. KEMNITZ. Univ. Munchen. *Z. physiol. Chem.* 96, 309-13(1916).—At a diln. of 1:50,000 both hemato- and mesoporphyrin have the same effect on paramecium. At a diln. of 1:200,000 mesoporphyrin is more active; it continues to be active up to 1:8,000,000. Urine- and kotporphyrin, in concns. of 1:80,000 or 10,000 have no action. C. J. W.

Inorganic constituents of alcyonaria (CLARKE) 8.

12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

Development of the baking powder industry. LUDWIG WEIL. *Pharm. Ztg.* 60, 697-8(1915). W. O. E.

Determination of preservatives in caviar. KÖPKE. *Arb. kais. Gesundh.* 50, 31-7(1915).—Analyses of 12 samples of caviar showed an av. compn. of protein 26, fat 15, water 50, ash (6 samples) 4%; the NaCl content varied from 1.5 to 9%. $\text{Na}_2\text{B}_4\text{O}_7 \cdot 10\text{H}_2\text{O}$ was reported in 5 of the samples, varying in amt. from 0.09 to 1.17%. $(\text{CH}_3)_4\text{N}_4$ was found in 6 samples in amts. from 0.005 to 0.103%; but one of these 6 contained borax. For the detn. of borax 10 g. caviar were treated with 10 cc. of fuming HCl on the water bath in a flask fitted with a reflux condenser until dissolved. Fifty cc. of MeOH were then added and distd., the process being repeated until the dis-

tillate was free of H_2BO_3 , which required not more than 3 additions of MeOH. The distillate was neutralized with 0.5 N NaOH, an excess of 2.5 cc. being added, evapd. in a Pt dish and ignited. The residue dissolved in dil. HCl was treated with 30 cc. of 40% neutral Na citrate, 1 drop of neutral 1% phenolphthalein added and sufficient mannitol to make a 10% soln. of the latter. This soln. was then titrated with 0.1 N NaOH, 1 cc. being equiv. to 0.0062 g. H_2BO_3 . This procedure was according to an unpublished method of Pfyl, which was shown to be reliable by control expts. made by adding H_2BO_3 to caviar containing no borax. $(CH_2)_6N_4$ was detd. as HCHO according to Auerbach and Barschall (*Arb. kais. Gesundh.* 22, 591(1905)). An aliquot part of the filtered distillate was made alk. and a measured excess of alc.-free standard I soln. added. After standing 15 min. the I was titrated back with 0.1 N $Na_2S_2O_3$ and the HCHO calcd. to $(CH_2)_6N_4$. This method was also tested by control expts. The amt. of $(CH_2)_6N_4$ or HCHO in caviar does not remain const. owing to a reaction of the HCHO with the albumin present. L. W. RROGS.

Utilization of cull Florida citrus fruit. A. McDERMOTT. *J. Ind. Eng. Chem.* 8, 136-8(1916).—The culls sometimes amount to 10% of a given lot of fruit, generally less. Usual causes are, extreme over- or under-size, stem-end rot, traumatic injuries to the peel, and blue molds. The problem is to find satisfactory processes for pressing the juice for at least 2 years and for removing the flavoring oil from the peels. Pasteurization renders the juice sterile apparently for an indefinite period, but after two weeks the product darkens in color and ultimately becomes offensively acrid. Removal of air prior to sealing is effective in checking the darkening. Charging the juice with CO_2 and replacing the air above it gave some specimens which remained unchanged for two years or more. The most effective process is as follows: Pasteurize under as complete a vacuum as possible (28 in.) at a temp. slightly above that of boiling H_2O and then seal. The above applies to the juice of oranges and grapefruit; lemon juice differs in that simple pasteurization is all that is necessary to prevent deterioration. The oils expressed from the peels of the culls fulfill all requirements. The decompn. caused by exposure to air can be obviated by adding 10% by vol. of abs. alc., or by keeping in a dark cool place even if protecting agents are present.

P. J. DONK.

Analysis of maple products. V. J. F. SNELL. *J. Ind. Eng. Chem.* 8, 144-6(1916).—Observations on maple sirup incidental to a search for new methods of detecting adulteration.

P. J. DONK.

Lye hulling of corn for hominy. J. W. MARDEN AND J. A. MONTGOMERY. *J. Ind. Eng. Chem.* 7, 850-3(1915).—Results are given of lab. expts. on the hulling of corn giving different chemicals used, strength of solns., time of heating and washing and temp. No common substitute for lye could be used. Not more than 2 lbs. to 12 gals. of H_2O nor less than 1 lb. to 12 gals. of H_2O could be used. At a temp. of 70° about $1\frac{1}{2}$ hrs. are required, at 90° less time. Efficient stirring is essential to good results.

P. J. DONK.

Pentosans contained in rice. T. KATAYAMA. *J. Chem. Ind. Japan* 18, 1364(1915).—The methylpentosans in all the rices and rice starches amount to nearly 1%. Ordinary rice contains more pentosans than glutinous rice. Uncleaned rice contains more pentosans than cleaned rice. The pentosan content has no relation to the difficulty of saccharification.

P. J. DONK.

Report of the committee on standard methods for the bacterial examination of milk. M. P. RAVENEL, H. W. CONN, W. H. PARK, J. F. ANDERSON AND R. S. BRISSED. *Am. J. Pub. Health* 5, 1261-2(1915).—Not less than 10 cc., taken in sterile containers, should be plated on agar containing 3 g. per l. meat ext. and the best peptone. The

reaction should be between 0.5 and 1. Plates should be incubated at 37° for 48 hrs. Samples should be dild. so that the count is between 30 and 200. A lens magnifying 2.5 times should be used. Many important tests have not been recommended because of the study required to apply them for practical use. J. GAUB.

A sanitary study of condensed milk. WILLIAM H. PARK, M. C. SCHROEDER, N. Y. Health Dept., AND PAUL BARTHOLOW. *Columbia Univ. N. Y. Med. J.* 102, 1073-83(1915).—The work covers the bacterial content of raw milk, the process of condensing, the sanitary conditions of the process, the bacterial content of condensed milk and a review of chem. analyses of condensed milk. The use of inferior milk for condensing is a general practice, the bacterial count ranging from 77,000 to 1,662,000. Since the raw milk is concd. to one-half its volume, the counts may be divided by two and the milk graded bacteriologically fair. Condensed milk intended for confectioners showed a much greater number of bacteria than that intended for domestic consumption (up to 340,000,000 organisms). Evapd. milk as a rule contains a much lower number of bacteria than condensed milk, due in part to the higher temp. to which it is subjected and in part to double sterilization. Chem. examn. showed the following variations in compn.: sucrose 33.15 to 49.85%, lactose 7.57 to 15.34% and protein 6.73 to 13.59%. Tabulated analyses furnished by Atkinson (N. Y. Dept. Health) are included. A. H. RAHE.

Detection of sucrose in milk. A. DEVARDA. *Arch. Chem. Mikros.* 8, 69-71 (1915).—A common form of adulteration of raw milk consists in addition of sucrose and H₂O. The sucrose is detected by the Ph₂NH reaction, the lactose being pptd. with basic lead acetate. The pptn. of the lactose is complete only when the concn. is below 6%. Under certain conditions the lactose content may rise above this value, and results on sucrose are unreliable. Tables are given. C. S. MUDGE.

The useful and the injurious in coffee, with special consideration of the Thum method (of cleaning). HANS FREUND. *Pharm. Zentralhalle* 56, 343-8(1915).—In cleaning coffee by the Thum method, the unclean product is placed in a horizontal revolving perforated drum which is placed within another vessel containing H₂O at about 40-70° to such a depth that the water entering the perforations stands several cm. high in the drum. Within the drum are from 4 to 8 broad brushes which revolve in an opposite direction to the drum. The treatment lasts from 1 to 2 min. for best grades of coffee, up to 5 min. with poorer grades, the addition of NaCl or Na₂CO₃ to the H₂O being sometimes necessary for the latter. The H₂O is then drawn off, the coffee dried in the same drum and then roasted. The coffee is well cleaned and the amount of material extracted is of no consequence. Analyses are given of a Santos coffee raw, after roasting in the usual manner, and after cleaning by the Thum method, and of an average wash water. The latter has a grayish brown turbid appearance and under a microscope shows earthy impurities, vegetable tissues, and a rich bacterial flora. C. O. EWING.

Coffee and chicory. P. CARLES. *Ann. chim. anal.* 21, 33-5(1916); see C. A. 10, 643. E. H.

The alkali method for the determination of fat in ice cream and condensed milk. C. M. BRADBURY. *Virginia Dairy and Food Div., Circ.* 42, 4 pp.(1914).—The short method for detg. fat in milk and cream (cf. Wisconsin Sta., *Bull.* 16, 14 pp.(1888)) has been adapted to the detn. of fat in ice cream and condensed milk. E. J. C.

Examination of cocoa. VON LUEHMANN. *Apoth. Ztg.* 30, 642(1915).—Reference is made to previous papers of Keller and of Hanausek (cf. C. A. 643). W. O. E.

Determination of fat in cacao products. W. LANGE. *Arb. kais. Gesundh.* 50, 149-57(1915).—The subject of fat extn. by the Soxhlet and similar methods is re-

viewed with especial mention of the work of Farnsteiner (cf. *C. A.* 3, 1042). Expts. by L. with Soxhlet extn. showed that 15 hrs. were required to ext. 99.6% of the fat from cacao paste containing 50.45% of fat; and that 3.8% of the total fat was extd. during the last 5 hrs. Cacao powders containing, resp., 34.03 and 15.31% of fat gave results parallel to those of the cacao paste. Chocolate containing 30.52% of fat yielded 99.7% of its fat during the first 2.5 hrs., and milk chocolate with 32.07% of fat gave a parallel result. Notwithstanding the sparing soly. of theobromine and caffeine in Et_2O , the large amt. of Et_2O used in a 20 hr. extn. (13 liters) would dissolve a portion of these substances, thus introducing an error in the fat detn. As an improvement on the Soxhlet method, L. recommends the following procedure: A weighed 250 cc. wide-mouthed flask is fitted with a rubber stopper carrying a tube bent at a right angle to be attached to an air-pump, and a filter tube the wide part of which is 3.5-4 cm. in diameter and 8 cm. long. A Witt filter plate with openings 0.75 to 1 mm. is placed in the filter tube, covered with an asbestos mat, washed free of fine fibers with water under pressure, and dried with alc. and Et_2O . Five to 10 g. of powdered cacao product, according to the fat content, are placed in the tube, leveled, 10-15 cc. of Et_2O added and the top of the tube covered with a watch glass or channeled cork. As soon as the Et_2O runs down to the plate a gentle exhaust is applied to draw the fat soln. into the flask. This process is repeated with 7-10 cc. of Et_2O until 100 cc. have been used. The flask is then exchanged for a similar weighed flask, the powder on the mat stirred with a rod and the extns. repeated until 50 additional cc. of Et_2O are used; the process so far requires 30-46 min. The Et_2O is then distd. and the flasks with the fat dried to constant wt. in a steam drying oven. A comparison of analyses of 12 samples of cacao products containing from 14.06 to 51.77% of fat showed that in every case L.'s method gave slightly lower results than the Soxhlet, the extremes being 0.09 and 0.40%. Analyses of 9 samples of cacao paste from various localities gave a fat content of 50.66 to 57.30%. To compare the rapidity of drying to const. wt. in a Soxhlet and in a wide-mouthed flask having neck diameters, resp., of 18 and 32 mm., 3 g. of cacao fat placed in each were dissolved in Et_2O , the Et_2O distd. off, and the flasks placed in the steam drying oven. After 1 hr. the amts. of volatile matter retained in the flasks were 0.0390 and 0.0018 g., resp.; after 2 hrs., 0.0068 and 0.0008 g. Petr. ether in place of Et_2O gave similar results.

L. W. RIGGS.

Sand content of Dutch cocoa. J. BOGS. *Pharm. Zentralhalle* 56, 495-6(1915).—Ash 2 g. in Pt dish, avoiding overheating, digest 0.5 hr. with 10% HCl, decant through a filter, digest 0.5 hr. with half satd. Na_2CO_3 soln., filter through same filter, wash, ignite and weigh. Wt. gives the amount of pure sand (SiO_2). A pure sand content above 0.5% indicates more than 3% of cocoa shells and points toward adulteration.

C. O. EWING.

Content of stems in Java tea and testing of tea. J. J. B. DRUSS. *Chem. Weekblad* 13, 66-71(1916).—D. agrees with the statement of Besson (*C. A.* 9, 1641) that the valuations of tea should not be based upon the content of stems. The % of stems was detd. as follows: 5 g. tea are added to boiling H_2O , which is then vigorously stirred and the leaves wholly disintegrated. The liquid is poured off and the tea again covered with water. The stems are then picked out with a forceps. Stems and leaves are then dried separately at 105° and weighed and % stems calcd. Java teas contain a higher amt. of stems than Japan teas, while British Indian and Tonkin teas contain about as much as the former. D. shows in a table that the more expensive brands of tea contain a higher % of stems than the less expensive brands, which may be explained by the fact that the finest parts fall through the finer sieves and contain hardly any stems at all.

J. T. FLOREN.

Direct determination of water in spices. T. FOLPMEER. *Chem. Weekblad* 13,

14-6(1916).—On account of the high content of volatile oils in certain spices, considerable difference may be expected between the results of the moisture detn. according to the direct and the indirect methods. Differences between the indirect and direct method for ground cloves were as high as + 8.6 to 19.3%, for mace 4.7 to 6.7% and for ginger and cinamon as low as -1 to +0.2% and -0.7 to 1.5%, resp. Higher results were obtained with xylene than with either benzene or toluene, which is attributed to the higher b. p. of xylene, as this causes decompn. J. T. FLOHL.

Microscopy of starch in bread. T. F. HANAUSEK. *Arch. Chem. Mikros.* 8, 72-8 (1915).—H. was able to identify microscopically the starches found in the various war breads after baking. The use of stains for the identification is not advisable.

C. S. MUDGE.

Chemical constitution of proteins of wheat flour and its relation to baking strength. M. J. BLISH. *J. Ind. Eng. Chem.* 8, 138-44(1916).—Attempts have been made by investigators to correlate the baking strength of flour with some chemical or physical factor but this problem is not completely solved. Lab. tests invariably furnish an infallible guide, but it is necessary to mill the wheat and have a sample actually baked into a loaf of bread by an expert baker before its strength can be accurately ascertained. The factors which may influence baking strength are as follows: Gliadin-glutenin ratio, crude gluten, physical state of gluten and sugar content, enzymes, concn. of H ions and sol. proteins. All these are discussed at length in the article. P. J. DONK.

The staling of bread considered from the physiologico-chemical point of view. I. J. R. KATZ. Amsterdam. *Z. physiol. Chem.* 95, 104-29(1915).—Bread becomes stale chiefly because the starch grains become harder and have less capacity for swelling, and a part of the sol. polysaccharides in the grains becomes insol. There is a transfer of water from the starch to the gluten, causing the bread to become crumbly. Finally, the consistency of the gluten skeleton of the bread has a certain influence upon the consistency of the bread, which makes tangible the influence of the above-mentioned changes. II. *Ibid* 136-46. The reversed changes take place when bread is baked; the amt. of sol. polysaccharide increases, the capacity for swelling increases, etc. Thus the process of becoming stale is a sort of partial return to the condition before baking. III. *Ibid* 147-51. The above-mentioned changes of starch upon heating are characteristic of all kinds of starch. C. J. WEST.

The change in the microscopic structure of bread during the process of becoming stale. E. VERSCHAFFELT AND FR. E. VAN TEUTEM. Amsterdam. *Z. physiol. Chem.* 95, 130-5(1915). C. J. WEST.

Soluble carbohydrate contents of feeding stuff as standard of quality. G. B. VAN KAMPEN. *Chem. Weekblad* 12, 902-10(1915).—K. discusses various methods for establishing a standard of quality for feeding stuffs. He shows that the sugar content varies with the quality of the material. Analyses show that compressed cakes of cattle feed of a low grade contain 3.06% sucrose, while those of av. grade contain 6.27% and cakes prepd. in the lab. contain 8.64%, all being given in terms of fat-free org. matter.

P. J. DONK.

Nutritive substance separated from pressed pupa waste of silkworm. R. INOUE. *J. Chem. Ind. Japan* 18, 1319(1915).—Boil 100 g. of the waste with 300 cc. of 25% H_2SO_4 for 16 hrs., filter, neutralize with baryta and filter again. Evap. the filtrate *in vacuo* to crystn. and dry the crystals of the nutritive substance. The compn. of this substance is: H_2O 27.41, ash 2.96, P_2O_5 0.37, sugar (glucose) 2.24, total N 11.05%. Expts. with animals show that the substance mixed with rice or similar food increases the nutritive value of the latter, also that there exists no difference between Liebig's meat ext. and the pupal nutrient on culturing bacteria. P. J. DONK.

Effects of refrigeration upon the larvae of *Trichinella spiralis*. B. H. RANSOM. Bur. Animal Ind. *J. Agr. Research* 5, 819-54(1916).—Results are given of tests in which quantities of trichinous meat varying in wt. from a few g. to nearly 400 lbs. were frozen and kept for periods varying from a few min. to 57 days at various temps. below 32° F. Artificial digestion of trichinous meat for 24 hrs. at 38 to 40° in a fluid consisting of water 1000 cc., HCl (d. 1.19) 10 cc., scale pepsin (U. S. P.) 2.5 g., and NaCl 5 g., has no apparent effect upon the activity or structure of the trichinae, released from their capsules by the process of digestion. Trichinae thus released from their capsules may remain alive and retain their normal activity for 10 days or more when kept in a 0.6% NaCl soln. at about 20°, and have been found alive and moderately active at the end of 26 days. They may likewise be kept alive for 2 weeks or more in tap water at about 20°. Trichinae have been kept alive and very active for 11 days in a 2% NaCl soln. at about 20°. Trichinae in tap water warmed to 38° become inactive within a few hrs., but may be kept in a 0.6% NaCl soln. at this temp. for a similar length of time without apparent injury. In the practical application of refrigeration as a means of destroying the vitality of trichinae, meats should be refrigerated at a temp. not higher than 5° F. for not less than 20 days, a period which allows a probable margin of safety of nearly 10 days. A short bibliography is appended. W. H. FRY.

Utilization (of prickly pear) as fodder for stock. T. H. JOHNSTON AND H. TRYON. *Rept. Prickly Pear Traveling Comm.*, Queensland 1912-14, 35-7, 52-3, 89, 113.—Analyses are given for both the fresh and the dried fruit of 6 different varieties of the pear.

E. J. C.

Sugar beet leaf feeding and drying. F. REDLICH. *Wiener landw. Ztg.* 65, 595-7, 603-4, 611-2(1915); cf. *C. A.* 9, 943.—The article gives the results of two sets of feeding expts., one carried out to det. the digestibility of sugar-beet leaves, the other to det. the physiological influence of the quantity of oxalates contained in the av. ration. There is also given a description with illustrations of several driers suitable for drying the leaves. It is stated that sugar-beet leaves make a very good feed for cattle and especially for milch cows, the oxalates contained by the av. ration increasing the fat content of the milk (by approx. 0.5%) without diminishing the yield. 50 to 60 g. of $\text{Ca}_3(\text{PO}_4)_2$ should be added to the daily ration to supply the lime required by the sol. oxalates and otherwise removed from the animal. Only mature leaves should be fed since they contain a lower % of oxalates. The leaves can be preserved without drying by allowing them to sour under the action of a pure culture of lactic acid bacilli. Chem. analyses of both fresh and dried sugar-beet leaves are given. C. F. MILLER.

The poisoning of live stock by plants of the sorghum group (FRANCIS) 11D. Ripening of the wild goose plum (MCHARGUR) 11D.

Albuminous food from oil residues, etc. V. GRAFE and K. PECHER. U. S., 1,169,634, Jan. 25. Residues from the manuf. of cottonseed, cacao, linseed or other vegetable oils are treated with a soln. of NaOH and Na_2CO_3 , or other alkali, while heated, and the resulting product is neutralized with acid to ppt. proteins dissolved in the soap soln. formed. Then the soap soln. is sepd. from the solids and the latter are washed with hot and cold H_2O . The product may be used in "meat substitutes," etc.

Shredded cereal food. J. L. KELLOGG. U. S., 1,170,162, Feb. 1. Wheat, corn, oats or other grain is crushed to a powder, made into a dough and cooked. It is then dried, broken into small pieces, formed into ribbon-like shreds and baked or toasted.

Lactic acid in bread-making. D. BRATTY. U. S., 1,170,474, Feb. 1. Lactic

acid is formed into a substantially dry mixt. with starch for use with soda in making biscuits, bread, etc.

Vinegar manufacture. J. B. PAGE. U. S., 1,171,065, Feb. 8. Melon juice is clarified, by centrifuging, *e. g.*, and is fermented and acetified after concg. by heating at a low temp. and then for a short time at a higher temp. to give the juice a brown color.

Non-hygroscopic malt extract preparations. F. HOFFMANN-LA ROCHE & Co. Ger., 285,427, Mar. 4, 1913. The hygroscopic properties common to malt exts., which render transportation difficult and induce fermentation and molding, are destroyed by the addition of casein-Ca to the ext. A prepn., *e. g.*, which is made from 1 part casein-Ca and 2 parts malt ext., manifests upon protracted standing *in pleno* no alteration; the powder remains dry and does not cake. Dry malt ext. may be mixed directly with casein-Ca, or both of these constituents may be dissolved together, and the soln. evapd. to dryness. The resulting products are applied dietetically.

14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

Liquid chlorine (ORNSTEIN) 4.

Purifying water containing acids. J. C. HECKMAN. U. S., 1,171,046, Feb. 8. Water containing acids, *e. g.*, mine water, is purified by passing it through a mass of granulated blast furnace slag containing CaO.

Distilled water. B. BLEICKEN. Ger., 285,773, Dec. 18, 1913. Addition to 283,415. A modified app. is specified.

Rapid filtration plant with reverse rinsing. O. KOERNIG. Ger., 285,872, Apr. 8, 1914.

Preventing agitation of slime sediment. RICHTER & RICHTER. Ger., 285,487, June 26, 1913.

Container for treating waste water slimes. K. IMHOFF and H. BLUNI. Ger., 285,486, Feb. 7, 1914. Addition to 275,498 (C. A. 8, 3340). The flow in the containers is started and maintained by heating a portion of the slime. For this purpose a current of warm air may be led through the slime.

Purifying sewage. G. W. NAYLOR and J. F. NAYLOR. Brit., 20,579, Oct. 6, 1914. In app. for purifying sewage, air is passed through the sewage in a tank from below a false bottom, formed of a flexible fabric such as filter cloth, felt, canvas, lawn, woven or perforated metal, which may be supported on the air-supply pipes, or on caps or jets which may carry radial perforated pipes, or on supports projecting from the base of the tank. The space below the false bottom may be divided into compartments by partitions. Frames spaced apart may be used. A thin layer of granular material or dried sludge may be placed on the false bottom. The fabric may be supported by sheets of wire netting or expanded metal.

Disinfectants. J. CHALLIS. Brit., 21,000, Oct. 15, 1914. Disinfectants and antiseptics are made by boiling together until saponified, 5 gals. phenol or of cresylic acid, 3 gals. vegetable oil (linseed, olive, or rape), 12.5 lb. KOH, and 4 gals. H₂O, and then adding 3.75 gals. acetone. In a modification, the acetone may be partially replaced by alc., benzene, naphtha, or other light distillate, and tar acids or oils other than cresylic, *e. g.*, creosote may be used.

Vacuum disinfection. APPARATEBAUANSTALT UND METALLWERKE AKT.-GES. Ger., 284,972, Aug. 27, 1912. Paraformaldehyde is volatilized in a small externally

heated vessel connected with a vacuum vessel and steam supply. Suitable app. is specified.

Vacuum disinfection. APPARATEBAUANSTALT UND METALLWERKE AKT.-GES. Ger., 286,131, July 22, 1913. Addition to 284,972 (*supra*). The process of the principal patent is modified in that instead of paraformaldehyde, other compds. are used, which upon heating yield disinfecting vapors, such as acetone, pinacol, etc., in solid or soapy form. When acetone or pinacol are heated as specified, aldehyde-like compds., with strong disinfecting power, are formed, suitable for the disinfection of skins, hides, and hair goods. When solid spirit is used, large amts. of alc. vapors are evolved promptly, and these are also disinfecting. This modification of vacuum distn. is especially suitable for disinfecting books and paper goods, since the resulting vapors are very dry.

15. SOILS AND FERTILIZERS.

R. O. F. DAVIS.

Rapid method for removal of solid residue in the determination of nitrogen in soils. C. J. KING. *Chem. Analyst* 15, 19(1915).—Fit a 10 cm. Büchner funnel with a disk of linen, about 120 mesh per inch. Moisten the linen and draw to the perforated disk by suction. To the digestion flask after cooling add about 100 cc. N-free water, shake vigorously and while still hot, pour upon the linen filter, applying suction. Wash the residue remaining in the flask several times with 25 cc. portions of hot H₂O. Finally, transfer all of the residue to the filter and continue washing until the suction flask contains about 600 cc. Disconnect the flask and distil in the usual manner. The total time required is only 6 or 8 min. The method is just as effective in preventing bumping as the official decantation method.

H. M. LANCASTER.

Nitrogen content of humus of arid soils. F. J. ALWAY AND E. S. BISHOP. *J. Agr. Res.* 5, 909-16(1916).—Earlier investigators have stated that humus in soils of arid regions carries more N than that in soils of humid regions. Study of samples of soils from California confirmed this view.

R. O. F. D.

Note on the effect of changes in the viscosity of water on the results of mechanical analyses conducted at varying temperatures. G. W. ROBINSON. Univ. Coll., North Wales, Bangor. *J. Agr. Sci.* 7, 142-3(1915).—A change in temp., by altering the viscosity of water, affects the values obtained by sedimentation. It is recommended, therefore, that sedimentations be carried out at as uniform a temp. as possible, say 12 to 14°.

W. H. FRY.

A detailed study of effects of climate on important properties of soils. C. B. LIPMAN AND D. D. WAYNICK. *Soil Science* 1, 1-48(1916).—A study was made of the physical, chemical and bacteriological characteristics of the soil from plots of a tri-state soil exchange experiment. The plots are located at the Maryland, Kansas and California Exp. Stas. Soil from each state was exchanged with soil of the 2 other states, and laid in position. After 7 years the soils have changed markedly in color. The Kan. and Md. soils at Cal. become a deeper red; Cal. and Kan. soils become bleached to a light gray or yellow gray at Md. In general, the hygroscopic coeff., the moisture equiv. and the wilting point of any of the soils increase when the soil is moved to Cal. Bacterial numbers increase in arid soils placed under humid conditions, and the opposite is true for humid soils. NH₃, NO₃, and N-fixation follow the general trend of bacterial count. This applies with nitrification only with certain forms of N. Cellulose destruction by soils proceeds with greater rapidity under arid than under humid conditions with any given soil type. Cellulose destruction appears to follow in general

the opposite course of other micro-organic activities in soils as affected by climate. Marked changes in the acid sol. constituents of soils are wrought by climatic effects. The Cal. soil increases in Ca at Kan. and Md. and loses in Fe. The general tendency is for soils to increase in Fe and decrease in Al when placed under arid conditions and *vice versa*. Interesting data are submitted on the total H₂O-soluble constituents in the soils studied. Large increases occur in the Cal. soil when it is moved to Kan. and Md. The Md. soil gains in H₂O sol. matter when moved to Kan. or to Cal.

J. J. SKINNER.

A peculiar clay from near Mexico City. E. W. HILGARD. *Proc. Nat. Acad. Sci.* 2, 8-12(1916).—A sample of clay from near Mexico City showed the remarkable property of swelling enormously when wetted, increasing in vol. 25 to 32 times. Sp. gr. of the clay was 2.25. Analysis by acid digestion showed sol. Na salts 2.60, lime 9.06, MgO 17.11, Al₂O₃ and Fe₂O₃ 5.24 and SiO₂ 43%; by fusion, lime 8.9, MgO 27.07, Al₂O₃ and Fe₂O₃ 10.63 and SiO₂ 51.43%. The predominant base was magnesia instead of alumina as in ordinary clays. This clay is readily decomposed by dil. acids. The name lucinite is proposed for it.

R. O. E. D.

Carbon and nitrogen changes in soils variously treated: Soil treated with lime, ammonium sulfate and sodium nitrate. R. S. POTTER AND R. S. SNYDER. *Soil Science* 1, 76-93(1916).—The total N detns. show there is a smaller loss or a greater gain of N for the limed soils than the corresponding unlimed soils. The loss of N from the soils treated with NaNO₃ and the gain of N in those treated with both NaNO₃ and Ca point to denitrification.

J. J. SKINNER.

Effect of grinding on the lime requirement of soils. R. C. COOK. *Soil Science* 1, 95-98(1916).—Using the Veitch method of detg. the Ca requirement of soils, acidity was increased by grinding sandy soils of N. J. Ground quartz sand was more acid than unground. These results are opposite to those of Brown and Johnson (*J. Am. Soc. Agron.* 1, 216) who found that grinding sandy soils decreased acidity. The finer the soil was ground the more basic it became, and its basicity was roughly proportional to the amt. of sand contained. C. explains that this sand possibly contained basic internal constitution. It is concluded that soils should not be ground when used for detg. Ca requirement by the Veitch method.

J. J. SKINNER.

The influence of some common humus-forming materials of narrow and of wide nitrogen-carbon ratio on bacterial activities. P. E. BROWN AND F. E. ALLISON. *Soil Science* 1, 49-75(1916).—Working with Miami sandy loam it was shown that animal manures gave the greatest effect on ammonification. Oat straw and corn stover had a less effect than the manures, and clover and cow peas showed the least effect. This increase was independent of the N-C ratio of the materials added and was probably dependent on the chem. compn. of the substances. The dried-blood-fresh soil method gave better results than the casein-fresh soil method. NO₃ was increased in the same way as NH₃ by the various organic materials. The leguminous green fertilizers exerted somewhat greater effects than the manures and more influence than the non-legumes. The increase in NO₃ was independent of the N-C ratio and was favored by manures to a large extent. Straw, stover and non-legumes had almost as great an effect as manures, and leguminous hay had the least effect. Dextrose gave better results in the azofication expts. than mannitol. There was little similarity between the effects of the different organic materials on the different bacterial processes. The manures and legumes increased the crop of oats. The substances with wide N-C ratios decreased the crop yield while those of narrow ratios gave increases. The influence of the various substances applied to the soils was noted on a 2nd crop of oats, but the relative effects were different. The non-legumes had as great an influence as the legumes; previous conclusions are confirmed that with the use of non-legumes sufficient

time must elapse for azofication to occur if as beneficial effects are to be secured as with legumes. The N-C ratio of the materials applied to the soil did not seem to be of as much importance in detg. the effect on the 2nd crop of oats as in the case of the 1st crop.

J. J. SKINNER.

The history of lime-nitrogen. A. FRANK AND N. CARO. *Chem. Ind.* 38, 445-6 (1915).—A review.

F. W. SMITHER.

Boron; its absorption and distribution in plants and its effect on growth. F. C. COOK. Bur. Chem., U. S. Dept. Agric. *J. Agr. Res.* 5, 877-91 (1916).—The investigation was undertaken to det. the absorption of B and its distribution in plants grown on soils fertilized with horse manure treated with borax or calcined colemanite to destroy larvae of the house fly. Manure treated with these materials was left 10 days and then applied to the soil. The amt. used was 0.63 lb. per 8 bu. or 10 cu. ft. 20 tons to the acre amounted to 216 lbs. of borax per acre. It made little difference in the amts. of B absorbed by the plants whether borax or colemanite was used. Most plants absorbed B in proportion to the amt. present in the soil. Leguminous plants absorbed most and wheat and oats little B. Distribution in the roots, tops and fruit of leguminous plants is fairly even. Potatoes had more B in the roots than in the tops. The yield of wheat was very slightly affected. Not more than 0.62 lb. of borax and 0.75 lb. of colemanite should be added to 10 cu. ft. of manure and the treated manure should be mixed with untreated manure when used for leguminous plants. For other plants B-treated manure should not be used at higher rate than 15 tons per acre. Cf. C. A. 9, 3313.

R. O. E. D.

The use of low-grade phosphates. JAMES A. BARR. *Bull. Am. Inst. Mining Eng.* 1916, 243-5.—Phosphate rock concn. processes in operation at the present time involve tailing losses of 15-25% of available phosphate through the escape of fine particles with the SiO_2 . A radical improvement of methods would make available approx. 100,000,000 tons of low-grade Florida and Tennessee rock carrying 68-72% $\text{Ca}_3(\text{PO}_4)_2$. Smelting or electrometallurgical processes are possibilities but perhaps the most simple solution of the problem is the use of finely ground rock (90% through 100 mesh) in the raw state.

H. L. OLIN.

Determination of manganese in soils. A. K. BRYNILDSEN. *Tidsskrift Kem. Farm. Terapi* 12, 317-23 (1915).—Ext. the ignited soil with HCl and dil. an aliquot representing 2 g. to 400 cc. and boil. Neutralize the acid and add NaOAc and HOAc. After boiling 2 min. dil. the soln. to 800 cc. and filter off the pptd. Fe and Al. Dissolve and reppt. in the same way. Evap. the combined filtrates and wash solns. to 500 cc. and filter the Fe and Al which may be pptd. at this point. If the HOAc is present in concn. there will be no Mn lost prior to this pptn. At this point $\text{MnO}_2 \cdot \text{H}_2\text{O}$ may sep.; this is readily brought into soln. by oxidizing with H_2O_2 . Treat the AcOH soln. of Mn with Br water which ppts. MnO_2 quant.; filter, wash, treat with KI soln. and titrate the I liberated with 0.01 or 0.001 N $\text{Na}_2\text{S}_2\text{O}_3$. The data obtained by this method agree closely with those by Treadwell's MnSO_4 method, and the figures obtained by oxidizing the MnO_2 and weighing as Mn_2O_4 . The Mn in the various Norw. soils ranged from 0.2% to 0.02%.

A. R. ROSE.

"Electro-potash" as fertilizer. SIGURD RHODIN. *Kungl. Landbruks-Akad. Handl. Tidsskr.* 54, 710-29 (1915).—A report of field expts. which have led to no definite conclusions. The "electro-potash" (electrically treated feldspar) products by the method of Lindblad and Yngstrom are so far the most promising. The fertilizing value of these substances is very largely dependent upon the nature of the humus, type of plant and vegetation period.

A. R. ROSE.

The fertilizer value of sodium chloride. III. H. G. SÖDERBAUM. *Kungl. Landbruks-Akad. Handl. Tidsskr.* 54, 673-95 (1915); cf. C. A. 9, 685, 1525.—An

historical review and a report of field expts. which give no support whatever to the hypothesis that NaCl may replace K salts in fertilizers. A. R. ROSS.

The influence on crop and soil of fertilizers applied to permanent meadow. CHARLES CROWTHER AND ARTHUR G. RUSTON. Univ. Leeds. *J. Agr. Sci.* 7, 197-218(1915).—Plot expts. and the effects of various fertilizers upon soil and vegetation are reported. W. H. FRY.

An apparatus for mixing powdered substances (HUDIG) 1. The chemical evidence of smelter smoke injury to vegetation (MITCHELL) 9.

Fertilizers. KALIWERKE GROSSHERZOG VON SACHSEN AKT.-GES. and K. HEPKKE. Ger., 286,187, Feb. 17, 1914. Finely ground silicates containing K are mixed with finely ground dried MgOH.Cl and moderately ignited. Even at 180-200° the oxychloride evolves large amts. of HCl which acts, in the nascent state, on the ground silicate, disintegrating it. Feldspar, phonolite, leucite, nepheline, or the like, are specified. The mixt. is heated in a furnace of suitable construction, to dull redness. A rotary drum furnace, such as is used for burning cement, calcining MgO, and the like, is preferred. The reaction product sinters but a very little upon heating, and after cooling it may be removed from the furnace as a fertilizer in condition for distribution on the soil. The amt. of disintegrated K is dependent upon the amt. of added oxychloride. The advantages of this process over former methods are economy in fuel and direct applicability of the product.

Fertilizers. W. B. BOTTOMLEY. Brit., 20,789, Oct. 9, 1914. Peat is mixed with an insol., finely divided phosphate, such as rock phosphate, bone ash, or bone meal, and certain aerobic microorganisms, such as those obtained in putrefying gelatin or meat ext., are caused to grow in the mixt., preferably at a temp. of 30°. The phosphates are converted into forms sol. in NH₄ citrate soln. or H₂O.

Phosphates. W. B. BOTTOMLEY. Brit., 20,788, Oct. 9, 1914. Phosphates, particularly Ca phosphates, are rendered sol. in NH₄ citrate soln. by subjecting them at a suitable temp., e. g., 30°, to the action of certain aerobic microorganisms which occur in putrefying organic matter. The finely divided phosphate may be wetted with a 1% soln. of gelatin or meat ext. which has been allowed to putrefy; or the gelatin soln. or meat ext. may be first added and followed by putrefying liquor or a bacterial culture. By long continued action, some of the phosphate may become H₂O-sol., but a week or 10 days is sufficient to convert a large proportion into the citrate-sol. form.

16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Determination of sugar in liquors and aperitives. ED. DELLE. *J. fabr. sucre* 56, No. 3(1915).—The French laws call for a different rate of taxation on straight liquors and aperitives. The sugar content is taken as the standard for differentiation, those containing more than 200 mg. per l. being termed spirituous liquors and those under 200 mg. per l. aperitives. The official method calls for dealcoholization, return to the original vol. with water, and detn. of the density at 15°. A soln. having d₁₅ 1.087 contains 200 mg. of sugar per l. This figure does not allow for the increased gravity due to sol. matter other than sugar which may be present. To det. correctly the amt. of sugar present it is necessary to dealcoholize, decolorize with animal charcoal, clarify if necessary with Pb acetate, remove Pb, and finally invert and det. total sugars as invert by one of the alk.-Cu-tartrate methods. H. R. SMITH.

Action of ultraviolet rays upon alcoholic fermentation. ROMOLO AND REMO DE FAZI. Rome. *Ann. chim. applicata* 4, 301-29(1915).—The action of ultraviolet rays is favorable to alc. fermentation for a relatively long time (12 hrs.). Beer yeast, exposed to ultraviolet rays for a definite time, increases in activity, and is not killed by the rays even after 14 hrs. exposure. It is possible to select beer yeast by the action of ultraviolet rays. The expts. were carried out in quartz flasks placed about 20 cm. from a Hg lamp used as the source of the rays. A résumé is given of previous work done on this subject. S. LEVY.

Continuous process of rectification, especially of alcoholic fluids. P. WONNEBERGER. Z. *Schiess-Sprengstoffw.* 10, 13-6, 29-31(1915).—W. gives diagrams of rectification app. and reasons why the continuous rectification app. should replace the periodical app. In an app. described in detail which is used in the explosives works the fluid flows from a const. pressure tank through a warmer into the distg. column. The column consists of tunneled compartments. As the fluid flows down over these compartments it is met by a stream of steam going in the opposite direction. The volatilized alc. passes up through the rectifier to a condenser. The water and heavy residue settle to the bottom of the column. The water is drawn from the top of the residue and passed through an app. for heating the incoming assay. The heavy residue is drawn off at the bottom. The advantages of the continuous rectification app. over the periodic consist in higher production, better quality of product, concn. of the impurities, and self-reliant, equable movement of the parts of the app. O. L. T.

Modern liquor tanks for the brewing industry. WERNER BERGS. *Chem. App.* 3, 4-6(1916).—Descriptions, with 7 cuts, of tanks of Al, enameled Fe, and reinforced concrete lined with ebonite. J. H. MOORE.

Dealcoholizing beer. W. BECKER and D. H. MONTGOMERY. U. S., 1,171,306, Feb. 8. Beer is heated to 75° and then sprayed on the surface over which it flows as a thin film maintained at about 75° to distil off the alc. The treatment is repeated as many times as necessary to reduce the alc. to the desired amt.

Yeast from molasses. G. ROTH. U. S., 1,170,110, Feb. 1. Molasses is dild., acidulated and boiled, the clear liquor is drawn off, further dild. and acidulated with H₂SO₄ to cause pptn. of fine suspended matter which is sepd. after stirring or aeration. The clear product thus obtained is mixed with distillers' wash, nutrient salts, etc., pitched with yeast and fermented, with lactic acid bacilli added if desired.

17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

The testing of cotton and other dressing materials. M. LAHACHE. *Union pharm.*, March 15, 1915; *Repert. pharm.* 28, 4-11(1916).—Simple tests are given for the principal constituents of medicated cotton and gauzes as well as physical qualifications for absorbent cotton and gauzes. L. H. CHERNOFF.

Beniform. FREYMUTH. *Apoth. Ztg.* 30, 699(1915).—A cryst. powdered mixt. consisting of 60% Ca saccharate and 40% Na citrate, indicated in catarrhal conditions of the intestinal tract. W. O. E.

Glycerol substitutes. C. MANNICH AND F. SCHIRMER. Univ. Goettingen. *Apoth. Ztg.* 30, 713-4(1915).—The following preps. were examd.: (I) Lempellin, a liquid, d₄₀ 1.005, contained a slime-yielding material preserved with boric acid. (II) Dr. Henkel & Co.'s substitute (technical), a thick, colorless, sticky liquid of sweetish taste.

d_{20} 1.21, containing reducing sugars 4.7, sucrose 40.0%. (III) Dr. Henkel & Co.'s (cosmetic), a liquid, d_{20} 1.23, containing reducing sugars 12.6, sucrose 36.8%.

W. O. E.

Enesol. HANS SCHMIDT. *Pharm. Ztg.* 60, 724(1915).—In view of the fact that dil. AcOH ppts. basic Hg salicylate from a soln. of enesol and further that the filtrate therefrom yields on evapn. and boiling with magnesia mixt. methylarsinic acid as the Mg-salt, it appears certain the above prepn. is substantially a mechanical mixt. of the well known Hydragryrum salicylicum and arthenal ($\text{AsO}(\text{ONa})_2\text{Me} + 5\text{H}_2\text{O}$).

W. O. E.

Grass tree gum or acaroid resin as a source of benzoic acid. J. C. UMNEY. *Perfumery Essent. Oil Record* 6, 212(1915).—The resin obtained from *Xanthorrhoea hastilis* yielded from 4.6 to 7.2% of BzOH. When the BzOH is removed by digestion with alkali and the residue is subjected to destructive distn. a heavy acid oil consisting chiefly of phenol is obtained. The resin contains about 1% of a fragrant oil, has some value in perfumery and could be used as a substitute for benzoin, storax and balsam of tolu.

C. O. EWING.

Revision of monographs for the essential oils of the United States Pharmacopoeia. J. C. UMNEY. *Perfumery Essent. Oil Record* 6, 334-7(1915).—Critical comments are given regarding some of the proposed limits for certain of the chem. and physical consts. and other properties of the volatile oils of the forthcoming U. S. P. IX.

C. O. EWING.

"Mercurio coleolo" in antisypilitic therapy. FRANCESCO SIMONELLI. *Rass. clin. terapia, sci. affini.* 14, 329-34(1915).—This is a double oleate of Hg and cholesterol dissolved in oil of sweet almonds. This prepn. of Hg is said to be very effective in both primary and secondary stages of lues, and are better tolerated. D. I. MACHT.

Morphine determination in opium and tinctures. A. HESSELBO. *Archiv Pharm. Chem.* 22, 18-26, 48-55, 74-84(1915).—A critical examn. of the method of Dietrich used in the Pharm. Dan. More accurate results are attained by titrating with 0.1 N acid than by weighing the morphine. The sepn. of the morphine is greatly facilitated by shaking the mixt. Removing coloring matter by means of $\text{Al}(\text{OH})_3$ is apt to cause loss of morphine. Alc. interferes and if present in excess it should be largely removed by evapn. to $\frac{1}{2}$ vol. There is no advantage in using EtOAc as 10 cc. ether will hold all the narcotine present in soln., and the difference in soly. of morphine in these two solvents is insignificant. The amt. of NH_4OH used is very important as an insufficient amt. will not ppt. all the morphine and an excess will cause re-solution of the ppt. One cc. 0.1 N acid is equiv. to 0.0285 g. anhydrous and 0.03003 cryst. morphine.

A. R. ROSE.

Peppermint oil. ALFRED MOHLK. *Archiv Pharm. Chem.* 22, 128-32, 189-92, 241-7(1915).—This oil can be purified by distn. *in vacuo* but this procedure has no advantage over steam distn. M. considers the solubility in 70% alc. as an important test and also recommends combined menthol detn. by the method of Powers and Kleber (U. S. Pharm., 1905). There is no significant relation between the chem. and phys. consts. From the analytical results the following consts. are derived: d_{20} 0.9021, $[\alpha]_D^{19}$ 30.019°; acid no. 0, ether no. 33.8, acetyl no. 186, total menthol 42.3%, combined menthol 9.4%, sol. in 70% alc. 1-2.8%.

A. R. ROSE.

Camphorated chloral. D. E. TSAKALOTOS. *J. pharm. chim.* 12, 355-8(1915); cf. C. A. 3, 2199; 4, 3202; 6, 2240, 2351.—The cryoscopic method was used to det. whether camphorated chloral was simply a mixt. or a mol. compd. Camphor, after recrystn. from petr. ether m. 176°; pure chloral- H_2O m. 51.6 to 51.7°. When increasing amts. of camphor are added to 100% chloral- H_2O , the temps. of solidification of the

mixts. decrease steadily, and their detn. becomes more and more difficult, due to superfusion. At 69.5% of chloral- H_2O , the temp. is 22.0°. Between 69.5 and 42.41%, the melted mixts. are so viscous that no crystn. is possible. At 42.41%, the temp. of solidification is definite again, 28.1°, and steadily increases to 176° as the % of camphor rises. The region of great viscosity indicates the existence of 1 or more compds. of the components.

S. WALDBOTT.

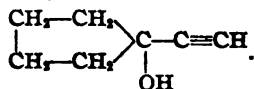
Nor-Camphor. J. CALSEN and R. STÜSSER. U. S., 1,169,316, Jan. 25. *Nor*-Camphor, $C_9H_{16}O$, an oily liquid b. 105°, yielding a semicarbazone, $C_{16}H_{17}N_3O$, m. 167°, forming a soln. with Na salicylate adapted for subcutaneous injection, is formed by boiling and injecting steam into a reaction mixt. of ketopinic acid 10 and 60% H_2SO_4 300 parts at 137–140°, adding Na_2CO_3 to the distillate, extg. with ether, drying, evapg. the ether and distg. *in vacuo*.

Leucocytic extract. R. A. ARCHIBALD. U. S., 1,171,299, Feb. 8. Blood is dild. with 1% citric acid soln. and treated with dil. HOAc to destroy the red corpuscles, the mixt. is centrifuged to ppt. the leucocytes and the ppt. after removal of the supernatant fluid is emulsified by grinding with quartz sand and neutralized with NaOH, mixed with distd. H_2O and heated to 58° for 1 hr. to destroy antiferments. The product is incubated at 37° to effect autodigestion. The resulting liquor is suited for use in treatment of infectious diseases. It may be mixed with tricresol and sterilized at 58° for 1 hr.

Antiseptic therapeutic composition. M. ENGELMANN. U. S., 1,170,056, Feb. 1. Ag phosphate is pptd. on clay which serves as a carrier to extend the surface of the phosphate while retaining its bland, protective and drying action. The mixt. is intended for use as an antiseptic on wounds.

Solid mixture for preparing formaldehyde solutions. G. P. FULLER. U. S., 1,170,624, Feb. 8. A solid polymer of CH_2O is mixed with 0.0005–0.003 of a mol. proportion of Na_2SO_3 or with similar small amts. of other sulfites, hydroxides, carbonates, arsenites, cyanides, borates or phosphates, to form a H_2O -sol. product. Cf. C. A. 9, 2291.

Sodium acetone. G. MERLING, O. CHRZESCUSKI and O. PFEFFER. U. S., 1,169,341, Jan. 25. Na acetone, $NaO.C(CH_3)(CH_2)$, a colorless cryst. compd. stable only below 0°, sol. in ether, forming 3-methylbutinol (a colorless oil b. 105–6°) by reaction with C_2H_2 , is made by mixing $NaNH_2$ 40 with abs. ether 600 parts, cooling to –20°, slowly adding 58 parts of dry acetone while keeping the temp. below –15° and evapg. the ether *in vacuo*. Na ethylmethyl ketone with C_2H_2 yields 3-methylpentinol, b. 120–1°. Na diethyl ketone and C_2H_2 form 3-ethylpentinol, b. 135–7°. Na methyl propyl ketone and C_2H_2 form 3-propylbutinol, b. 137–8° and Na-cyclopentanone and C_2H_2 form the C_5H_9 -carbinol of the formula



Other hydrocarbons may be used instead of C_2H_2 and instead of acetone, EtOAc, methyl ethyl ketone or acetaldehyde may be used to obtain similar compds.

Fermenting sugars. K. DELBRÜCK and K. MEISENBURG. U. S., 1,169,321, Jan. 25. In fermenting sugars with *Bacillus macerans*, *e. g.*, in producing alc. and acetone, a temp. of about 40° is maintained and peat, asbestos or other inert material serving as a distributor of large surface is added to the material undergoing fermentation. The yield of alc. and acetone may be increased 3-fold by addition of the inert carrier.

Alcohol; acetone; cattle food. K. DELBRÜCK. U. S., 1,169,322, Jan. 25. After fermentation of maize, rye, potatoes or oats by action of *Bacillus macerans* the product is distd. to obtain alc. and acetone and the residue is used for cattle feed.

Alcohols. B. S. LACY. Brit., 20,550, Oct. 5, 1914. Alcohols are obtained by the action of basic substances upon alkyl halides in the presence of a liquid, the reacting substances being intimately mixed and heated to over 100° under a pressure exceeding the vapor pressure of the liquid alone. The production of MeOH from MeCl and milk of lime soln. is described in an example; CaCO₃, NaOH, or a mixt. of milk of lime and NaOH or Na₂CO₃, may also be used.

Mononitro- and dinitroaminobenzenearsonic acids or their derivatives substituted in the amino group. C. F. BOHRINGER & SÖHNE. Ger., 285,604, Dec. 25, 1912. These compds. are obtained by reacting upon 4-Cl-3-nitro- or 4-Cl-3,5-dinitrobenzenearsonic acid, with NH₃ or its derivs., and then nitrating the resulting mononitro compds.

High percentage solutions of lecithin in oils and fats. ERBEN DES KARL A. FISCHER. Ger., 286,061, Feb. 2, 1913. Stable mixts. of oils and fats with lecithin, from which the lecithin does not sep. and which contain about 40% lecithin, are obtained by mixing alc. lecithin solns. which are freed by fractional cooling from constituents difficultly sol. in alc., with oils and fats, together with high mol. fatty acids such as oleic acid, and then driving off the alc. by heat. *E. g.*, to 60 parts of a mixt. of 75 parts of olive oil and 25 of oleic acid, are added 80 parts of a 50% alc. lecithin soln., which has been freed from the difficultly sol. portions of the lecithin by fractional cooling. The mixt. is poured upon a flat dish and heated to 50–60° in order to expel the alc. The product contains 40% lecithin. It is not affected by light, and may be preserved for a long time without a sepn. of lecithin. In the 40% lecithin soln. are contained: P 1.66, N 0.78%, and moisture 2.19%.

Dentifrices. F. J. RHODES. Brit., 20,879, Oct. 12, 1914. Dentifrices in powder, paste, or liquid form contain K or other alk. thiocyanate in conjunction with media of a substantially neutral character. A powder dentifrice may consist of 1 part of KSCN, 14 of pptd. chalk, together with essential oil flavorings. Glycerol or tragacanth may be added to this powder to form a paste. For a liquid dentifrice, 1 part of the thiocyanate is dissolved in 7 parts of spirits of wine. KSCN may be formed by digesting together 3 parts of KCN, 6 of H₂O, and 1 of S, and then adding 3 of H₂O and filtering, evapg., and crystallizing.

Dentifrice. F. J. RHODES. U. S., 1,169,998, Feb. 1. KCNS, 5–15%, is added to a neutral dentifrice, formed, *e. g.*, of CaCO₃, glycerol and flavoring, to supply any deficiency of thiocyanate which should be present in the saliva.

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

Sulfuric acid substitutes. ANON. *Chem. Trade J.* 58, 28(1916).—Owing to the greatly increased demand in England for H₂SO₄ in explosives production, the supply for ordinary manufacturing purposes is greatly below the demand, and expts. have shown the suitability of niter cake as a substitute in connection with various applications in the woolen trade. These include the extn. of grease from suds obtained in scouring, the refining of grease, extg. cotton from mixed rags in the making of shoddy, as well as stripping color from rags, in the latter trade. The cake is dissolved in hot H₂O by the aid of steam, and the soln. used hot. Such a soln. in an equal wt. of H₂O is the equiv. in acid strength of 1/4 the vol. of 60° Bé. H₂SO₄. W. W. WINSHIP.

The decomposition of ammonia. R. PLANK. *Z. ges. Kälteind.* 22, 19-23, 43-6 (1915); *J. Am. Soc. Refrig. Eng.* 2, 34-43 (1915); *Ice and Refrig.* 49, 57-60, 108-10 (1915).—A critical survey of the work and data on this subject is given in order to det. its bearing on (1) the fire and explosion risks in operating NH_3 compression systems and (2) the performance of the system. The decompn. of NH_3 is hindered by lowering the temp. and increasing the pressure, though for kinetic reasons the method of pressure increase may favor decompn. In general, the amts. of non-condensing gases observed are in great excess of what could be expected under the normal operating conditions of temp. and pressure. The amt. of decompn. found in practice is ascribed to the combined action of high temp., rapid compression and the presence of catalysts (iron surfaces) hastening the rate of decompn. No exptl. work is presented. The following precautions are recommended in order to decrease the likelihood of decompn.: (1) Avoidance of high speed in compression. (2) Wet compression; temp. in discharge pipes to be 100° at highest. (3) Cooling of discharge gases by water-jacketing discharge pipe. (4) Lessening catalytic action of surfaces in contact with hot gases by covering inside surfaces of pipe with enamel which is a much poorer catalyzer of the decompn. than iron.
E. C. MCKELVY.

American potash. C. ELSCHNER. *Mining Sci. Press* 112, 155-6 (1916).—A letter describing the exptl. production of K fertilizer salt from natural brines by the Inyo Development Co., at Keeler, Cal. KCl constituting about 4% of the solids of Owens Lake, was formerly wasted in the form of spent H_2O after crystn. of the Na_2CO_3 through evapn. by solar heat. The fertilizer salt produced is a mixt. of the carbonates, sulfates and chlorides of K and Na; it is free from MgCl_2 and MgSO_4 . Recent runs show 29% to 34% KCl. The extn. of K can be done profitably only as a by-product with Na as the main product.
W. W. WINSHIP.

The interrelations of pure and applied chemistry. F. W. CLARKE. *Science* 43, 257-63 (1916).—An address.
E. J. C.

The foreign trade of the United States of America in products of the chemical industries in the fiscal year 1913-14. K. PIETRUSKY. *Chem. Ind.* 38, 429-41 (1915); cf. C. A. 9, 695.—A statistical review.
F. W. SMITHER.

Chemical industry in Holland during the war. H. G. *Chem. Ind.* 38, 442-3 (1915).—A review.
F. W. SMITHER.

The Russian chemical industry and the war. ANON. *Chem. Ztg.* 40, 61-3 (1916).—With a short bibliography.
J. H. MOORE.

Fixation of atmospheric nitrogen (SKERRETT) 4. Potash in certain copper and gold ores (BUTLER) 8.

Rapid crystallization. F. CROTOGINO. *Ger.*, 286,085, Feb. 6, 1913. The crystn. is effected by cooling hot satd. solns. with a current of air passed over them. The passage of air is controlled so that a continuous crystal scum does not form over the surface of the soln.

Aluminium salts from natural silicates. M. F. COOLBAUGH and E. H. QUINNEY. U. S., 1,170,418, Feb. 1. Rocks containing Al silicate and comparatively free from K compds., e. g., kaolin, shales, or clays, are mixed with about 1.7 times as much CaCO_3 as there is SiO_2 present, heated to the temp. of incipient fusion, quickly cooled and leached with dil. H_2SO_4 in the proportion of $3\text{H}_2\text{SO}_4:\text{Al}_2\text{O}_3$. The $\text{Al}_2(\text{SO}_4)_3$ is then crystd.

Dissolving or extracting crude potassium salts. H. DRESCHER. *Ger.*, 286,010, Jan. 17, 1912. The material is treated in the first section of the app., in the same

direction with one solvent, and upon passing to the second section of the app., the first ext. is withdrawn and the material is treated in counter current with another extg. liquid, which is withdrawn separately. The material is preferably treated repeatedly, as specified.

Fluorine compounds of the rare earth metals. GEBR. SIEMENS & Co. Ger., 286,018, May 17, 1913. Addition to 284,889 (C. A. 10, 100). According to the principal process, in certain circumstances, especially with slight acidity and a short period of reaction, a double fluoride of the rare earths and the pptg. agent, especially of Ca, is formed first as an intermediate product. If the reaction is discontinued at this stage, this double fluoride is obtained, and serves as a valuable product. *E. g.*, 11 g. of the crude oxides of the rare earths are dissolved in a small excess of HCl or HNO₃, and the soln. is dild. with H₂O to 100 kg. After the mass has been heated to boiling, 13 kg. of fluorspar are added, and the reaction mass is boiled for about 0.5 hr., *i. e.*, until the pptn. is complete. The product seps. in a granular form, and may be washed out readily. The yield, after drying, is 18.2 kg. of the double fluoride, the theoretical yield being 18.4 kg. The compd. is completely insol. in acid. By the action of solns. of the rare earths on the double compd., the latter is decomposed further with the formation of fluorides of the rare earths.

Ammonium bromide. M. ISSLEB. Ger., 286,183, Apr. 10, 1914. NH₄Br is obtained from end-lyes of the potash industry or from other mother liquors and from coal. The coal used for coking is sprayed with a suitable amt. of the lyes, and coked. The resulting sublimate is combined with the H₂O of condensation, the solns. are evapd. at 60°, the NH₄Cl crystg. out is sepd. from the mother liquor containing Br, and the latter is evapd. at 40° until a crust forms, when 15 times its wt. of 95% alc. is added and allowed to act for 24 hrs. in closed vessels at the ordinary temp. The alc., which contains NH₄Br principally in soln., is distd. off. The NH₄Br, by treatment with soda lye and sepn. of the resulting mixt. of Na salts with 12 times its wt. of 90% alc., can be converted into pure NaBr, which alone goes into soln. and remains as a residue as soon as the alc. is distd. off. If to 100 kg. of coal are added, before coking, 5 kg. of potash end-lyes containing Br, about 3.5 kg. more of H₂O are to be evapd. than when ordinary coal is used, since the end-lyes contain about 30 kg. of solids in 100 kg. Upon coking coal, NH₃ is generated. Other than this, the mother liquors consist of a series of readily sol. salts, with chlorides predominating, but bromides being present also. These chlorides and bromides, especially those of Mg, are readily decompd. upon heating with splitting off of HCl and HBr. Therefore, upon coking coal, NH₄Cl and NH₄Br are doubtless formed, if lyes containing Br are employed to spray the coal. Either a solid sublimate of these NH₄ salts is obtained, or they are found dissolved in the H₂O of condensation. The sublimate is added to the H₂O of condensation in an evaporator, the sublimate is dissolved, and the soln. is evapd. at not above 60° until crystals begin to form. The mother liquor is carefully centrifuged from the crystd. NH₄Cl which is washed with a small amt. of H₂O. The mother liquor contains the readily H₂O-sol. NH₄Br, together with larger amts. of NH₄Cl and other impurities. It is evapd. to dryness in a flat vessel at about 40°, with stirring. The resulting salt crust is transferred to 15 times its wt. of 95% alc., the closed vessel is shaken vigorously, and after 24 hrs. the alc. is filtered off. The residue on the filter is washed again with 2 parts by wt. of 95% alc., the filtrate and washings are united and distd. to recover the NH₄Br which was dissolved in the alc. Crude NH₄Br is obtained as a residue. To obtain pure NH₄Br, the crude salt is treated with soda lye and the resulting mixt. of Na salts is mixed with 12 times its wt. of 90% alc., NaBr alone going into soln. and being obtained pure after distg. off the alc. and recrystg. from H₂O.

Sulfides of aluminium and magnesium. A. LANG. Ger., 285,284, Mar. 31, 1914. Addition to 265,656 (C. A. 8, 1322). Compds. which yield with H_2O pure H_2S are obtained with the aid of a priming mixt. of heavy metal and S. E. g., a mixt. of Al and S is compressed, together with a mixt. of FeS, to bodies which are kindled to form the desired sulfides. Upon the addition of H_2O , the FeS remains unaffected, while the Al and Mg sulfides yield H_2S .

- **Lead arsenate.** E. O. BARSTOW. U. S., 1,169,114, Jan. 25. Pb arsenate is made by reaction, in H_2O , of As_2O_3 and Cl, neutralizing the HCl formed with Na_2CO_3 and adding somewhat less PbO than would be required to combine with all the H_2AsO_4 present.

Formaldehyde-sulfoxylates. H. SPECKETER and E. MARBURG. U. S., 1,169,365, Jan. 25. Alkali metal CH_3O -hyposulfites are reduced to sulfoxylates by the action of electrolytically prepared spongy Zn.

Zirconium carbide and titanium carbide. O. RUFF. Ger., 286,054, July 10, 1914. The corresponding oxides are heated in admixt. with coal or in a carbonizing atm. The carbides of Zr and Ti, because of their great hardness, find application as abrasives, being employed in the form of a fine powder, as uniform as possible, which is used as such or which is formed into stones with binders. By the usual process a molten compact mass is obtained, and this must be powdered before use. The direct production of a fine powder is effected by heating the mixt. to a temp. just below the m. p. of the carbide. E. g., 1 kg. of crude or purified ZrO_2 is mixed with 300 g. coal and heated in a graphite crucible. At a temp. of about 1900° a copious evolution of gas sets in, and continues upon the gradual further increase of the temp., until exhausted. The temp. is raised in this manner to about 2100° . For the manufacture of TiC, a mixt. of 1 kg. rutile and 450 g. coal is heated, at first to about 1300° , and then the temp. is gradually increased as specified above. The fineness of the final product is detd. by the height of the final temp.

Absorbing carbon monoxide. BADISCHE. Brit., 20,616, Oct. 6, 1914. In the sepn. of CO from other gases, by absorption in ammoniacal solns. of Cu_2Cl_2 or other cuprous salt or Cu_2O , the deposition of Cu from the solns. is prevented by introducing O or gas containing O, such as air, into the gas treated, or into the absorbent soln., or into both. Addition of sufficient O also oxidizes the dissolved CO and thereby regenerates the cuprous soln. Cf. C. A. 9, 2801.

Freeing and separating thorium from other rare earths. F. JOSR. Ger., 286,087, Mar. 10, 1914. From the soln. of the phosphates of the rare earths in dil. acids, the Th is pptd. pure, in a single operation, by means of pyrophosphoric acid or its sol. salts, as Th pyrophosphate. E. g., 1000 g. monazite, with a content of 5% ThO_2 is disintegrated, for 6-8 hrs., with 1250 g. concd. H_2SO_4 . After cooling, the mass is transferred to about 10 l. H_2O , and siphoned off from the undecomposed residue. The residue is decanted 2 or 3 times with H_2O , and the H_2O added to the soln. siphoned off. It is then dild. with H_2O until the soln. contains 50-70 g. H_2SO_4 per l. By this dild. the phosphates of the rare earths contained in an av. monazite remain in soln. To this soln. are added with const. stirring 50-60 g. Na pyrophosphate, dissolved in 1 l. H_2O . A fine flocculent ppt. of Th pyrophosphate seps. After some time the supernatant liquid, which contains the phosphates of Ce, La, etc., is siphoned off, and the ppt. is decanted with H_2O , to which 2-3% mineral acid has been added, until the wash H_2O contains only small traces of rare earths. The very pure ppt. of Th pyrophosphate can be converted, after drying, directly into $Th(OH)_4$ by fusion with alkali hydroxide, or it may be dissolved in a mineral acid, and, after conversion into the oxalate, it may be treated with NaOH to obtain the hydroxide; this is suited for further working to the nitrate.

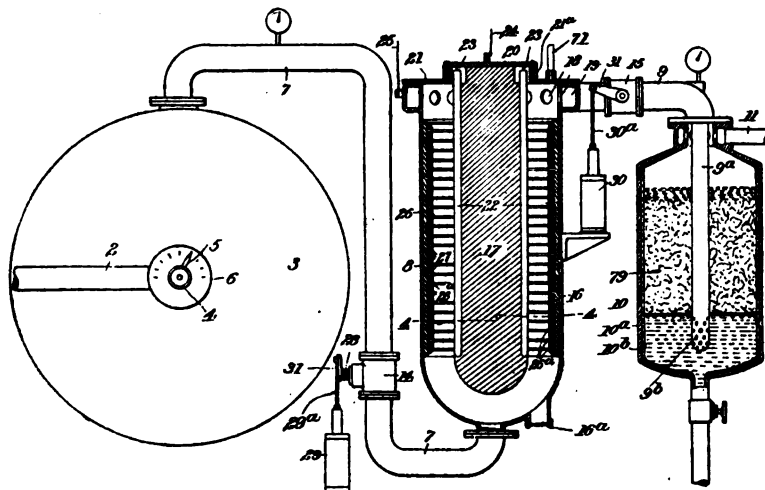
Recovering metals from waste oils. M. E. ROTHBERG. U. S., 1,170,342, Feb.

1. Waste oils carrying metals such as Pb, Sn or Zn (obtained as by-product in plating with these metals) are treated with slightly more mineral acid, *e. g.*, concd. H_2SO_4 , than required to combine with the metal present. Care is taken to proportion the acid so that it does not emulsify the oils and metallic salt soln. formed and the latter is allowed to sep., after agitation of the acid with the oil.

Finely divided alumina-carbon mixtures for manufacture of aluminium. H. F. D. SCHWAHN. U. S., 1,171,360, Feb. 8. $\text{Al}_2(\text{SO}_4)_3$ is heated in a revolving kiln fired with producer or natural gas and the Al_2O_3 produced, mixed with amorphous C from the combustion products, is carried off with the gases from the kiln and collected. The SO_2 formed is also recovered. The Al_2O_3 -C mixt. is used in the production of metallic Al. Cf. C. A. 9, 1227.

Obtaining sulfur from sulfur oxides. W. F. LAMOREAUX. U. S., 1,169,726, Jan. 25. SO_2 or smelter or burner gas is reduced by contact with incandescent C, sufficient heat being supplied to the gas before bringing it into contact with the C to insure practically complete reduction. Heat interchange from the hot gases produced is used for the preliminary heating. Cf. C. A. 9, 1742.

Apparatus for obtaining nitrogen oxides from the air. W. T. HOOFNAGLE. U. S., 1,169,824, Feb. 1. Dried air is fed into an expansion tank 3 through a valve carrying a pointer 5 indicating the rate of flow. It then passes to a reaction chamber which is formed with an outer metal shell 16, a central core 17 of insulating material (fastened to the metal cap 20), a surrounding series of glass tubes 22 positioned close together (closed at the bottom and filled with Hg or acidulated H_2O) and conducting wires 23 leading from the cap into the tubes. A cylindrical metal electrode 26 is fitted



closely within the reaction chamber and carries thin annular ribs 26a with insulating rings 27 between them. When an elec. discharge takes place between the electrodes, the ribs form annular discharging or concentrating points and the arrangement of electrodes forms a rectifying medium for the high tension a. c. used so that the current discharged through the air becomes partly uni-directional. A current of high voltage but small heating effect causes combination of the N and O as air is supplied from the tank 3. Inlet and outlet valves 14 and 15 are controlled by solenoids operating against

springs. The gases formed are passed into an absorber 70 containing dil. HNO_3 and stone or other solid material 79 to break up the gas bubbles.

Electrical insulating composition. F. A. ROBINSON. U. S., 1,170,000, Feb. 1. Elec. insulation is formed on wires, etc., by application of one or more coats of walrus or whale oil which are heated to 500° to harden them. The coating will withstand heating to 650° without carbonizing.

Electric insulating materials. H. GROSSMANN. Brit., 20,409, Oct. 1, 1914. A fusible insulating and filling material for elec. purposes and adapted to be sold in powdered form consists of a mixt. of powdered colophonium and gypsum, preferably in about equal proportions. Powdered paraffin wax may be added in order to render the mixt. less brittle when fused. In this case, suitable proportions are 45% of colophonium, 45% of gypsum, and 10% of paraffin wax.

Waterproofing polished surfaces, porous stone, insulating masses. H. v. D. HEIDE. Ger., 285,967, Feb. 10, 1914. The surfaces are sprayed with an aq. liquid, consisting of ammoniacal Zn soln. and soap. About 60 g. of NH_4 or alkali soap are dissolved in 1 l. of H_2O , if necessary, with the addition of some alc. A soln. of about 8 g. $\text{Zn}(\text{OH})_2$ in 100 g. NH_3 soln. of sp. gr. 0.90, is mixed with 900 cc. H_2O , and the resulting soln. is mixed with the soln. first prepared. The soaps are prepd. preferably from purified oleic acid.

Extruding plastic materials. E. HILLABY. Brit., 20,426, Oct. 1, 1914. A machine for producing sheets, bands, strips, etc., of plastic material of uniform thickness.

Phenol-aldehyde condensation products. F. POLLAK. Brit., 20,977, Oct. 14, 1914. Condensation products, of light color and air and light resistant, are obtained from the sol. intermediate condensation products of phenol and aldehyde which have been made with a minimum quantity of condensing agent, by washing with H_2O and then adding a dil. aq. soln. of a substance adapted to dissolve or oxidize any free phenol present. Suitable substances are alcs., ethers, ketones, aldehydes, hydrated phenols, H_2O_2 , or sugar. The resulting product is washed thoroughly, and the insol. final condensation product is produced in the usual way.

Phonograph records. J. W. AYLSWORTH and E. L. AIKEN. U. S., 1,170,391, Feb. 1. A fusible phenolic resin is dissolved in alc. or other solvent, mixed with $(\text{CH}_3)_4\text{N}_4$ or other reagent which will harden the product on heating, and with an inert filler such as dry wood pulp, the solvent is removed by evapn. and the product after being powdered is molded and heated.

Chewing gum. A. G. MEIER. U. S., 1,171,392, Feb. 8. Chalk is used as a carrier for PhOH , thymol, or an essential oil which is added to chewing gum to flavor it or give it antiseptic properties.

Cylindrical sheet metal filler for absorption and reaction towers. F. RASCHIG. Ger., 286,122, Feb. 6, 1914. The height of these towers is practically the same as their cross section, corresponding to 15 to 20 mm. with a wall of about 1 mm. thickness. The filler elements are simple in construction, offer but slight resistance to the current of gas, and effect an intimate contact between the gas and liquid. In a tower of 1 cu. m. about 300 sq. m. of active surface are contained.

Repairing scored engine cylinders. L. LORENTOWICZ. U. S., 1,169,658, Jan. 25. Scores in cylinders are treated with a flux, e. g., acid and NH_4Cl , filled with Sn and Ag and the filling is shaped to the contour of the cylinder wall.

Stencil fabric. A. E. STRIPPEL. U. S., 1,169,520, Jan. 25. See Ger., 282,433 (C. A. 9, 2298).

Compositions for finger prints. H. JORGENSEN. U. S., 1,170,273, Feb. 1. One surface of a paper blank is treated with a soln. formed of French gelatin 100, Russian gelatin 25, glycerol 25, $K_4FeC_6N_6$ 50 and H_2O 1000 parts, and the fingers are treated with a soln. of $FeCl_3$ 7.5, $Ca(OCl)_2$ 2.5, concd. HCl 10 and H_2O 30 parts and then impressed upon the prepared paper to effect reaction with the coating and develop the finger prints.

"Artificial cork." F. RASCHIG. U. S., 1,170,102, Feb. 1. A composite cork of sp. gr. 0.22 is formed of cork particles agglomerated with a binder of casein or albumin which is hardened *in vacuo* at a max. temp. of $70-80^\circ$ which is gradually reached after continued heating for 4-5 days. This slow hardening and drying avoids rendering the product brittle as in the case of more rapid heating at a higher temp.

19. GLASS AND CERAMICS.

G. H. BARTON, A. V. BLEININGER.

Analyses of excellent window glasses. *Schnurpfel's Rev. Glass Works* 1, 41 (1915). Analyses are given: SiO_2 (a) 71.23, (b) 71.92; Al_2O_3 (a) 1.70, (b) 0.85; MgO (a) 0.20, (b) 0.16; CaO (a) 16.09, (b) 13.65; Na_2O (a) 10.78, (b) 13.42. (a) is more permanent than (b). C. H. KERR.

Window glasses. *Schnurpfel's Rev. Glass Works* 1, 23(1915).—Six formulas are given of German, Austrian and Belgian window glass. C. H. KERR.

Compounds for iridescent glass. *Schnurpfel's Rev. Glass Works* 1, 3(1915).—Six formulas are given. C. H. KERR.

Resists for etching. *Schnurpfel's Rev. Glass Works* 1, 5(1915).—Several formulas are given. C. H. KERR.

Glass etching inks. *Schnurpfel's Rev. Glass Works* 1, 35(1915).—Four formulas are given. C. H. KERR.

Recent researches on siloxide glass. *Schnurpfel's Rev. Glass Works* 1, 3-5 (1915). C. H. KERR.

The continuous drawing and rolling of plate glass. H. J. *Diamant* 37, 545-6, 565-6, 585-6, 605-6(1915), 2 figs.—Two systems are partially described. The glass is ladled from the tank into a pot where it is brought to the required temp. and from which in one system it is drawn in a continuous sheet up an incline through a leer, and in the other is allowed to flow through rollers onto a horizontal table and leer. J. B. PATCH.

A durable silver plate for glass and porcelain. J. P. *Glashütte* 45, 297-8(1915).—A specially prepd. $AgCl$ is mixed into a paste according to 1 of 2 recipes and burned into the surface of the glass or porcelain. Upon this foundation the Ag is plated electrolytically. The ingredients of the paste are $AgCl$ 31, $Pb_2(BO_3)_3$ 3, KNO_3 3, $Na_2B_4O_7$ 1.5; or $AgCl$ 31, $Pb(C_2H_3O_2)_2$ 1.5, Na_2CO_3 1.5, KNO_3 0.4, H_3BO_3 0.4 and $Na_2B_4O_7$ 0.4. Oil is added until a convenient paste is obtained. The $AgCl$ is reduced with Zn and acid, thoroughly washed, dried and kept in the dark. If the acid for the reduction is H_2SO_4 , the first paste is used; if HCl , the second recipe gives better results. J. B. PATCH.

The silvering of glass beads and the working up of the silver residues. J. R. *Glasind.* 26, Nos. 35-36(1915).—Ammoniacal $AgNO_3$ is reduced by milk or grape sugar. The residues are reduced further and the sediment preserved. J. B. PATCH.

Clay for the glass industry. ANON. *Glasind.* 26, Nos. 41-4(1915).—The article deals very briefly with the compn., properties, fusibility, burning and kinds of clay used in European glass factories. J. B. PATCH.

The consumption of fuel in glass works. *Schnurpfeil's Rev. Glass Works* 1, 5 (1915).—In German practice the amt. of coal required to produce 1 lb. of glass melted and ready for use is: 2 lbs. for pots, $1\frac{1}{2}$ lbs. for day tanks, 1 lb. for continuous tanks. Data for other fuels are given. C. H. KERR.

The annealing oven. *Schnurpfeil's Rev. Glass Works* 2, 53(1916).—A drawing and brief description are given of a leer used in Germany and Austria for the annealing of tumblers, chimneys, etc. C. H. KERR.

Flattening stones. *Schnurpfeil's Rev. Glass Works* 1, 23-5(1915).—A standard recipe is: raw fire clay 28, burnt clay 72 (or raw 28, burnt 28, graphite 44). The addition of graphite or talc is recommended. After light burning the stones are polished with a mixt. of 25% each raw and burnt fire clay, Pb_2O_3 and water glass, all finely ground and well rubbed in. C. H. KERR.

Recipes for glass melting pots. *Schnurpfeil's Rev. Glass Works* 1, 41(1915).—Recipes for Belgian, French, English, German and Bohemian clays are given. C. H. KERR.

A hint from enamel technology. SCHWARZBACH. *Diamant* 37, 525-6(1915).—To secure uniformity and complete fusion of the constituents of an enamel the addition of $Na_2B_4O_7$, MgO or NH_4Cl is recommended. J. B. PATCH.

Pennsylvania fire clay. L. C. MORGANROTH. *Bull. Am. Inst. Mining Eng.* 1916, 475-81.—Geologically the most important Penn. clays are from the Pottsville Conglomerate Series. Some of the Upper Coal Measures are also very important. C. H. KERR.

A comparison of some kaolins in respect to size of grain. CHARLES F. BINNS. N. Y. State School of Clayworking and Ceramics. *Trans. Am. Ceram. Soc.* 17, 356-72 (1915).—In addition to the 3 original cans of the Schultze app. (5.0, 7.5 and 13.5 cm. diam.) 2 more were added (21.5 and 30.0 cm. diam.). The velocity of the H_2O was, resp., 1.5, 0.7, 0.18, 0.08 and 0.04 mm. per sec. Eng., Ger. and Georgia clays are very similar in size of grain. Some of the Eng. clays usually considered of less than first quality show rather large contents of coarse grains. N. Carolina clays showed large excess of coarse grains. C. H. KERR.

The electrical conductivity of a porcelain mixture and a shale upon heating. CHAS. S. KINNISON. U. S. Bureau of Standards, Pittsburgh. *Trans. Am. Ceram. Soc.* 17, 422-31(1915).—Test pieces $\frac{9}{16}$ in. diam. $\times \frac{3}{4}$ in. long were made from a typical porcelain mixt. and from Bedford shale, Pt disk electrodes being imbedded in each end, the distance between electrodes being $\frac{1}{4}$ in. The temp. was increased 1° per min. to 1400° for the porcelain and 1150° for the shale. During the heating up the elec. cond. was measured by a Wheatstone bridge set. Sources of error were: (1) formation of gas blebs; (2) possible difference in temp. between furnace and specimen; (3) shortening of the specimen during the test. Before vitrification starts conduction is by electrons, during incipient vitrification it is partly by ionization; and after passing the softening point of the principle composite eutectic conduction is due mostly perhaps to the ions. With the porcelain body the resistance changed rapidly from 100,000 ohms at 975° to 15,000 at 1050° and then more gradually to 2000 at 1150° and finally very slowly to 1000 at 1325° . The Bedford shale resistance changed rapidly from 90,000 ohms at 875° to 12,000 ohms at 950° , then more gradually to 2000 ohms at 1050° and finally very slowly to 1000 ohms at 1150° . Changes in the curves from rapid to slow decrease in cond. with temp. increase shows the change from solid to liquid condition. The results show that these silicates behave as electrolytes and show ~~disagreement~~ ^{disagreement}. A molten condition is not essential to the presence of ions since ~~polymers~~ ^{polymers} ~~can be~~ ^{can be}

noted much below the m. p. Large differences in cond. are due more to the speed with which ions are permitted to travel than to change in ionic concn. C. H. K.

System calcium oxide, aluminium oxide, magnesium oxide (RANKIN) 6. Chemistry of amorphous solids (LEWIS) 2. Artificial insulating materials 4.

Coloring glass. H. ROSENTHAL. U. S., 1,169,571, Jan. 25. Glass for use in eye glass lenses is tinted by exposure at close range to rays from an X-ray tube. The same effect is produced in 6-24 hrs. as by exposure to sunlight for 10-20 yrs.

Color screens. E. J. BRADY. Brit., 20,827, Oct. 10, 1914. Color screens for artificially producing daylight comprize a single homogeneous glass containing Ni and Cu or Co, or both. Potash-lime glass is preferably used. The glass is used for elec. light bulbs and shades.

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

Rational production of portland cement. F. FERRARI. Livorino. *Ann. chim. applicata* 4, 329-41(1915).—F., assuming x = hydraulic modulus = $\text{SiO}_2/\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$, and y = index of clay = $\text{CaO}/\text{SiO}_2 + \text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$, develops the formula $y = -2.5x + 7.5$ as the expression of a rational law of portland cement burning—"Facility of burning and value of the clinkers are proportional." The typical compn. of cement and easy burning are reached when $x = 2$ and $y = 2.5$. The mix formed according to these factors burns with easy handling of the furnace, gives homogeneous granulation, equal and complete scorification of clinkers, which are hard, heavy, brown, strongly refracting, does not expand on discharging from the furnace, and is of slow set. Unburned or fused particles are absent. There is the normal, const. thickness of material covering the refractory in the zone of scorification. Departure from the above calcd. values of x and y gives undesirable conditions of burning and poor clinkers.

S. LEVY.

The incomplete hydration of cement. N. C. JOHNSON. *Am. Gas Light J.* 103, 283(1915); see C. A. 9, 1380.

A. J. PHILLIPS.

Some fallacies in cement testing. W. L. GADD. *Concrete Inst. London* 5; *J. Am. Soc. Mech. Eng.* 37, 487-8(1915).—Cement stored in sacks may become either slow- or quick-setting and no relation was found in the setting time of this material compared with cement aerated in thin layers for 24 hrs. before testing. Pure dry air was found not to affect the setting time; moist air free from CO_2 had a distinctly retarding effect although only a trace of moisture was absorbed and air containing CO_2 had an accelerating effect. Attention is called to the fact that the size of sieves is not generally specified; with the same wt. of cement a large sieve is more effective than a small one. G. rejects the possibility that there is free CaO in cement and considers that unsoundness is due to the presence of an abnormal silicate which disintegrates with increase in vol.

A. J. PHILLIPS.

Lutes and cements. S. S. SADTLER. *Met. Chem. Eng.* 14, 197-200(1915).—A classification of formulas according to compn. and use in the following divisions: Water-, oil-, acid- and chlorine-proof, plaster of Paris cements, marine glue, gasket compns., machinists', leather- and Fe-cements, MgO compns. and oxy-chloride cements.

A. J. PHILLIPS.

Testing and handling cement aggregates. H. S. MATTIMORE. *Cement World* 8, No. 12, 40-1(1915).—Field tests have shown that it is not advisable to replace all

sand by screenings. The voids are detd. by placing sand loosely compacted in a cylinder which has a hole drilled in the bottom through which a tube leads to a buret filled with H_2O . This app. is so placed that gravity causes the H_2O to rise slowly and thus eliminates the formation of air pockets. By reading from the buret the vol. of H_2O that has flowed out, an accurate result may be obtained. Cf. *C. A.* 9, 853.

R. L. SIBLEY.

The use of gas tar and coal tar on concrete subjected to high velocities of water. C. H. PAUL. *Reclamation Record*, Jan. 1916; through *Eng. Contr.* 45, 56(1916).—The regulating outlets through the Arrow Rock Dam are painted with 2 coats of thin water-gas-tar, followed by 2 coats of coal tar, a better bond thus being obtained. This practice is not so much for waterproofing as to fill all voids and prevent erosion caused by formation of a vacuum in small voids or pockets.

A. J. PHILLIPS.

Battery-room floors impervious to acid 4.

Lime and cement kilns. H. WALKER. *Brit.*, 20,972, Oct. 14, 1916. In a process of calcining lime or cement in a shaft kiln of the kind in which the calcining zone is situated at a considerable distance above the bottom of the kiln, the charge is kept moving and continuously discharged by mechanically driven rocking or rotating breaking and agitating bars.

Impregnating and improving woods. F. HASSELMANN. *Ger.*, 286,115, May 28, 1908. The process is suitable as well for the treatment of freshly cut as for seasoned pine and also other common woods such as beech wood and the like, which thereby acquire beautiful and characteristic colorings suiting them for ornamental purposes. The wood is heated for 2 to 5 hrs. in an aq. soln. of $FeCl_3$, $NH_4Al(SO_4)_3$ and $MgCl_2$, heated to 80–100° and stirred constantly, and then allowed to cool in the liquor without stirring. The lye consists preferably of 1.5% $FeCl_3$, about 2% $NH_4Al(SO_4)_3$, and 1.5–2% $MgCl_2$, and is used in an av. concn. of 5%. After cooling in the lye, the wood is dried carefully. During the drying the chem. reaction is said to be completed, so that the wood becomes resistant to extn. According to the amt. of the materials used, the wood acquires a silver gray, yellow, or brown color. If white ants, borers, or the like are to be excluded, schoenite ($MgSO_4 \cdot K_2SO_4 + 6H_2O$) is also added to the lye. The wood is fireproofed, to an extent, by the addition of KCl .

Impregnating and coloring wood. C. H. SHATTUCK. U. S., 1,169,289, Jan. 25. Wood is treated with the acid liquors from the destructive distn. of wood, under gradually increasing temp. and pressure, to give the wood a dark color and remove gums and resins.

Preserving wood. J. P. é ICAZA. U. S., 1,169,349, Jan. 25. Wood is impregnated with a soln. of $MgCl_2$ of a d. of at least 15° Bé. and is then given a H_2O -resisting coating by application of a sol. silicate which reacts to form Mg silicate.

Wall covering from slag. S. W. OSGOOD. U. S., 1,169,506, Jan. 25. A finely divided colored mineral ingredient for use in coatings for walls, tarred roofing paper, shingles, etc., is prepared by running molten slag into a soln. of Na or K silicate, to which coloring materials or a hardening agent (e. g., Al , Ca or Mg -silicate or sulfate) may be added.

Paving composition. E. A. PATERSON. U. S., 1,171,236, Feb. 8. A paving mixt. is formed of road metal mixed with powdered $CaCO_3$, asphalt and sol. silicate containing a relatively low % of combined H_2O .

Artificial stone. P. KUHN. U. S., 1,170,499, Feb. 1. Plaster of Paris 6, is mixed with portland cement 6, $MgCO_3$ 1, ashes 4, wood shavings 12, and H_2O 16 parts.

Artificial stone. W. W. BREBB and E. E. DAVIS. U. S., 1,170,038, Feb. 1. A dry mixt. is formed of crushed pumice 1.5, gypsum 1.5 and portland cement 1 part and each cu. ft. of this mixt. is mixed with 10 gals. of a 1% NH_4Cl soln.

21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

Fuel values. J. H. PATTERSON. *J. Soc. Chem. Ind.* 35, 10-2(1916); *Colliery Guardian* 111, 132-3(1916).—The value of a fuel must be measured by the amt. of heat that can be obtained from that fuel by the expenditure of a definite amt. of money, and the number of thermal units (B. t. u.) per penny is designated as the abs. heat value. P. compares various fuels on this basis and gives as the values under 1915 conditions, (1) town gas 27,000; (2) oil fuel 29,000; (3) foundry coke 70,000; (4) coal powder 107,300; (5) producer gas 110,600; (6) washed coal 126,000; (7) coke breeze 200,000.

H. L. OLIN.

The coals of Brazil. I. C. WHITE. *J. Ind. Eng. Chem.* 8, 195(1916).—The Permian coals of South Brazil whose field covers several hundred square miles contain about 35% of ash, of which 2-8% is S. Crushing, washing and briquetting processes reduce the ash of 33% of the coal to 14% and raise the heat value to 13,500 B. t. u. About 42% of the output is slack carrying 25% ash. The lignite of areas of North Brazil are unmapped but promising.

H. L. OLIN.

Utilization of peat. ANON. *Electrician* 76, 658(1916).—The Wiesmoor power station uses peat as fuel and supplies energy to Wilhelmshafen and 6 other towns. The plant has been in operation since 1909. There are 3 turbo-generators of 1250 kw. capacity each. 75 tons of peat are consumed per day. The calorific value of the peat briquets is 5400 B. t. u.

C. G. F.

"Natalite," a motor fuel consisting of alcohol and ether made from molasses. ANON. *Intern. Sugar J.* 18, 32-3(1916).—Claims are made that this product is the equal of petrol.

A. GROSS.

The formulas for the indirect analysis of generator gas. FRITZ HOFFMANN. Berndorf. *Chem. Ztg.* 40, 81-2(1916); see *C. A.* 10, 266.

J. H. MOORE.

Gas-producer for steam raising. E. C. MILLS. *J. Soc. Chem. Ind.* 34, 1001-2 (1915).—The Mills producer is a movable structure mounted on rollers and set immediately opposite the furnace, from which the ordinary boiler-grate is removed. The air used in the gas combustion under the boiler is preheated by being drawn through a jacket surrounding the producer, loss of radiant heat being thereby prevented. Comparative tests on a Cornish boiler showed the new process to be 50% more efficient than hand firing.

H. L. OLIN.

Effect of atmospheric conditions on light given by Hefner lamp. E. OTT. *Gas World* 63, 493-5(1915); *Electrician* 76, 227-8(1915).—Expts. were made to det. the decrease in illuminating power of a Hefner lamp due to decreasing partial pressure of O_2 in the air. The supply of O_2 was varied by changing the pressure of the air supplied and also the CO_2 and aqueous vapor content of the latter. By reducing the air pressure from 800 mm. to 700 mm., the light from the lamp decreased 1%; while by reducing from 700 mm. to 600 mm. the illuminating power fell off about 7%. Formulas are given expressing the change in illuminating power of the Hefner lamp with change in altitude (i. e., partial pressure of O_2).

F. L. GROVER.

Copper sulfate method of determining iron in powdered coke. J. R. CAMPBELL. *Chem. Analyst* 15, 13(1915).—Weigh 5 g. powdered coke sample into a No. 2 beaker.

add 75 cc. CuSO_4 soln. (2%), boil for 10 min., filter and wash. Acidify the filtrate with HCl , oxidize with HNO_3 , ppt. and reppt. to remove traces of Cu salts. Dissolve final ppt. in HCl and det. Fe with KMnO_4 or $\text{K}_2\text{Cr}_2\text{O}_7$. Calc. to Fe_2O_3 and deduct from apparent ash to give true ash. A blank detn. for the purpose of correction should also be run. Powdered samples frequently contain Fe coming from the mortar or steel pulverizing app. This can be shown by making comparative analysis on a duplicate specimen using an agate mortar in its prepn. H. M. LANCASTER.

Modern development in the combustion of blast-furnace gas with special reference to the Bradshaw gas burner (HEUSSENER) 9. Petroleum and natural gas resources of Canada (CLAPP) 8. Rhode Island coal (ASHLEY) 8.

Composition fuel. W. T. VINT and S. G. GRIMSHAW. Brit., 20,625, Oct. 6, 1914. Canna root is used as a binder in conjunction with a waterproofing material such as pitch in briquetting coal or other fuel. Preferably, a mixt. in equal proportions of anthracite and dry steam and bituminous coals amounting to 94 parts is mixed with 4 parts of ground pitch; about 2 parts of canna roots are then added, either dry and ground, with subsequent heating in a sep. mill by the admission of steam until the mass is cooked, or in the form of a pulp which is injected with high-pressure steam, less of the canna root being required in the latter case.

Making coal briquets. E. R. SUTCLIFFE, J. H. PHILLIPS and D. A. THOMAS. Brit., 20,679, Oct. 7, 1914. The raw material is powdered so as to pass through a 200 mesh, and with or without a binder is subjected to high pressures (reaching 10 tons per sq. in.) in a completely enclosed mold space permitting of the transverse expansion of the block or briquet under the internal stresses created as a result of the compression.

Furnaces. R. F. HISLOP and G. R. HISLOP. Brit., 20,929, Oct. 13, 1914. In a gas furnace for heating metal sheets and of the kind comprizing a gas-producer supplying gas to a combustion chamber where it is mixed with air before entering the heating chamber, the gas-producer, combustion chamber, and heating chamber are so arranged with regard to one another that the gas in passing from the producer to the heating chamber travels horizontally and is twice deflected at right angles.

Retort furnaces. S. N. WELLINGTON. Brit., 20,457, Oct. 2, 1914. Vertical retort furnace for the destructive distn. of coal, etc., of the kind in which the retorts are situated between series of horizontal heating flues connected together in pairs and to gas and air supply conduits in such a manner that the direction of flow of the heating gases can be reversed through the pairs of flues.

Continuous analysis of gas. ALLGEMEINE ELEKTRIZITÄTS-GES. Ger., 285,781, May 30, 1914. The gas under examn. is brought into contact with the reagent, and the thermal change is measured by thermo elements. The cold junction is kept at the same temp. as the reagent liquid and the gas to be analyzed.

Determining the benzene content of gases. J. H. REINEKE. Ger., 285,920, June 24, 1914. The method is dependent upon the illuminating power of a flame regularly supplied with the gas under examn., which is detd. with the aid of a Se cell, or the like, and a galvanometer. As expts. have shown, the illuminating power of the gas carrying the C_6H_6 is found to be so small that in all cases it may be disregarded.

Gas-producer. J. E. BELL. U. S., 1,170,496, Feb. 1.

Vertical retort for producing coal-gas. A. McD. DUCKHAM. U. S., 1,171,183, Feb. 8.

Apparatus for cooling and removing heavy hydrocarbons from coal gas. H. A. CARPENTER and A. W. WARNER. U. S., 1,169,615, Jan. 25.

Washing gas. H. A. BRASSERT. U. S., 1,169,764, Feb. 1. Gas is passed successively through coarse and fine sprays, vertically, and is then led over baffles to remove entrained H_2O .

Gas-washing tower. H. A. BRASSERT and C. J. BACON. U. S., 1,169,765, Feb. 1.

Gas-washer. H. A. BRASSERT. U. S., 1,169,766, Feb. 1.

Gas-scrubber. H. A. CARPENTER. U. S., 1,170,510, Feb. 8.

Isoquinoline. GES. FÜR TREERVERWERTUNG. Ger., 285,666, Jan. 29, 1914. Crude isoquinoline of coal tar serves as the initial material.

22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

Oil refining. F. E. KNOCH. *Oildom* 6, 63-5(1916).—A general description and discussion. F. W. SMITHER.

European refining methods. L. SEULENFRIED. *Oildom* 6, 66-7(1916).—A general description (with a chart) of the methods of refining paraffin-base crude oil in Central Europe (Austro-Hungarian and Roumanian fields). F. W. SMITHER.

Report on switch and transformer oils. Sludge formation. P. DIGBY. *J. Inst. Elec. Eng.* 53, 146-56(1915).—250 cc. of oil are placed in a long-neck 500 cc. flask closed by a stopper and fitted with a glass tube extending to the bottom of the flask and a short tube connected to a suction pump. O_2 is drawn through the oil in presence of finely divided Cu and Fe, with the flask set in the oil bath and kept at 138° . The test requires 14 hrs. The flask is cooled and the sludge formed measured. A standard for dry oil is based on dielec. strength and sp. resistance; a small amt. of moisture reduces the 2 enormously. Thermal transference = $k(f)$ (coeff. of expansion)/ (f) (viscosity) with viscosity expressed as Redwood, Saybolt, or Engler units. The greater the sp. gr. and viscosity, the greater the % C formed by arcing in oil. Analysis is given. All products are considered the result of oxidation with the formation of complex organic acids, dehydrogenated hydrocarbons, and oxidized resinous asphaltenes. Some manufacturers consider sludging a purely chem. reaction between unsatd. hydrocarbons and O_2 of the air and design transformers to minimize the surface exposed, or cover it with an inert gas. W. H. BOYNTON.

Report of committee D-2 on standard tests for lubricants. *Proc. Am. Soc. Testing Materials* 15, I, 273-83(1915).—Viscosity: Saybolt Universal viscosimeter is proposed, the temp. being 100° , 130° or 210° F. according to the nature of the oil. Sp. gr.: Geissler pycnometer is proposed, but the statement is made that for fluid lubricants a Westphal balance or a hydrometer gives sufficiently accurate results. Free acid: Oil is treated with EtOH and titrated with $N/6$ KOH. Cloud and pour tests: Oil is first heated to 75° F. For cloud test oil is cooled and the temp. at which the lower half of the sample is opaque is noted. For pour test oil is cooled and at each drop of 5° F. it is noted whether the oil will flow. The reading previous to the congealing temp. is called the "pour test." Minority reports which adversely criticize some portions of the majority report are given. A long discussion (pp. 295-324) relates mainly to viscosity. E. W. BOUGHTON.

The turpentine industry in the Southern States. CHARLES H. HERTY. Univ. N. Carolina. *J. Franklin Inst.* 181, 339-67(1916).—The evolution is traced of the modern procedure for the collection of the oleoresin by means of gutters and cups. This pro-

cedure produces a larger yield of turpentine and of rosin than does the old "box" method and is less destructive to the trees. The distn. of the gum is described. Also in *Chem. Eng.* 23, 95-102(1916).

JOSEPH S. HEPBURN.

Petroleum resources of Canada (CLAPP) 8.

Fractional distillation of petroleum or tar oils in vacuo. L. STEINSCHNEIDER. *Ger.*, 285,969, Apr. 15, 1913.

Crude-oil preheater for oil stills. P. PORGES, R. NEUMANN and G. GLASS. *Ger.*, 286,024, Jan. 30, 1914. An app. is specified whereby the heat contained in the distillates is utilized for preheating the crude oil.

Destructive distillation of wood. T. W. PRITCHARD. *Brit.*, 20,867, Oct. 12, 1914. A process of distn. consists in charging the retort with wood or other solid material in such a manner that a space for the circulation of gases is left between the charge and the wall of the retort, replacing the air in the retort by a non-supporter of combustion, such as CO₂ or coal gas, heating the retort, and equalizing the temp. throughout the charge by withdrawing the gases and vapors generated from the lower part of the retort and re-introducing them into the upper part.

Destructive distillation of wood. L. HANSON. U. S., 1,169,956, Feb. 1. Oil is distd. from wood by quickly heating in a retort to a temp. above 340° and injecting superheated steam into the retort at a temp. above 340° to mix with the vapors distd. from the wood and carry off the vapors, which are led to a condenser.

Recovering turpentine from wood. W. K. FREEMAN. U. S., 1,169,325, Jan. 25. Blocks, chips or finely divided long leaf pine or other resinous wood are placed in a closed digester and the air is expelled by H. Then a soln. of fiber-liberating material is run in at the bottom of the digester to force the gas out and steam is admitted to heat the contents of the digester and vaporize the oil. Part of the cooking soln. is circulated through the digester, a separator and the steam generator and the vapors are drawn off from the soln. and H₂O and oil are condensed and sepd. from each other.

23. CELLULOSE AND PAPER.

A. D. LITTLE.

Utilization of wood waste. ARTHUR D. LITTLE. *Mel. Chem. Eng.* 14, 133-5 (1916); *J. Ind. Eng. Chem.* 8, 102(1916); *Chem. Eng.* 23, 83-6(1916).—Large scale measurements of longleaf pine mill waste and logging waste show that 1/3 of the wood in the tree is wasted. The annual total waste is thus very large. Much of this waste is available for utilization for paper, alc., etc., and advance in this direction is urged. Data on the principal characteristics of longleaf pine are given. V. NUNEZ.

The celluloid industry and its economic importance. F. PLATE. *L'Industria* 29, 346, 364, 380(1915). S. LEVY.

Preparation of celluloid using the bast celluloses of mitsumata and mulberry as raw materials. HIROTARO NISHIDA. *Kogyo-Kwagaku Zasshi* 18, No. 210, 18-25 (1915).—Yields and analytical consts. of cellulose nitrate prepd. from unsized tissue papers made from *mitsumata* and from mulberry fibers are given. Nitration products from *mitsumata* are of good quality but yields are lower than for cotton. Results from mulberry are fairly good. V. NUNEZ.

Cellulose esters. SOCIÉTÉ ANON. POUR L'INDUSTRIE CHIMIQUE À BALE. *Brit.*, 21,016, Oct. 15, 1914. Cellulose fatty-acid esters, consisting of glass-like jellies and

giving very viscous solns., are prepd. by treating cellulose at a temp. not above 200° with Ac_2O or other fatty-acid anhydride, dild. or not with glacial HOAc , in the presence of feebly acting catalysts, until a solid jelly is obtained without liquefaction of the mixt. The esters obtained may be converted into others showing different soly., by treatment of their solns. in suitable solvents such as phenols, cresols, or tetrachloroethane, with hydrolytic agents, or by heating such solns. In examples, cellulose or feebly nitrated cellulose is treated at a temp. below 20° with AcOAc , glacial HOAc , and SO_2Cl_2 or a mixt. of ZnCl_2 and PCl_5 , and the glass-like mass obtained dissolved in tetrachloroethane and converted into acetates by heating, after the addition of NaOAc to neutralize the SO_2Cl_2 .

Dyeing nitrocellulose. FARBW. v. M. L. & B. Ger., 285,323, Feb. 4, 1914. To the nitrocellulose solns. are added substances which, with or without the addition of catalyzers or oxidizing agents, produce, by subsequent oxidation, the desired color. E. g., *p*-hydroxyphenyl-*p*-aminotolylamine 5, and zapon varnish 100 are dissolved, and small traces of CuCl_2 , dissolved in alc., are added.

Wood-pulp from resinous woods. J. ARTSCHOURIN. U. S., 1,169,592, Jan. 25. Brown wood pulp is obtained from resinous wood by treating the wood with a soln. of alkali of 4-7° Bé. at a temp. of about 100° (this soln. being too dil. to decompose the incrusting substances of the wood), under a pressure of 3-5 atm. and after drawing off the soln. and sepg. the resinous materials from it the wood is again treated with the same soln. and simultaneously with steam under 5-6 atms. pressure.

Wood-pulp for paper. C. BACHS-WÜG. U. S., 1,169,597, Jan. 25. Wood blocks in a digester are exhausted of air, impregnated with SO_2 to bleach and soften the outer portions of the blocks and then cooked in a NaCl soln. and ground.

24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

Trinitrotoluene. M. COPISAROW. *Chem. News* 112, 247-8(1915); cf. following abstract.—Six isomers of trinitrotoluene are known: α -, 2, 4, 6, m. 80.8°; β -, 2, 3, 4, m. 112°; γ -, 2, 4, 5, m. 104°; δ -, 3, 4, 5, m. 137.5°; ϵ -, 2, 3, 5, m. 97.2°; ζ -, 2, 3, 6, m. 79.5°. Com. trinitrotoluene, while principally the α -form, is accompanied by other modifications, produced from *m*-nitrotoluene, which constitute about 4.5% of the com. mononitrotoluene. All of the isomers of trinitrotoluene are of practically the same value as explosives. They may be distinguished by acetone and NH_3 with which the α -form gives deep red, β -form greenish yellow, γ -form blue, ϵ -form rose-red and the ζ -form orange-red. The manuf. of trinitrotoluene is usually carried out in 2 or 3 stages, the concn. of acids being gradually increased, and although by itself a simple process, numerous chem. and technical difficulties are met with when the manuf. is conducted on a large scale. Chief among these is the presence in the product of inorganic impurities derived from Pb compds. in the acids or from the action of the acids on the app. in which the nitration is carried out, and of organic intermediate compds. and by-products due to imperfect stirring, to concn. and ratio of acid and to duration and temp. of reaction. A check on the operation may be found in the appearance and analysis of the spent acid which varies in color from yellowish to dark brown, the color being the darker the less the nitric and the more the sulfonic acids, as well as organic matter, present. The mineral matter present during the process may act either as a catalyst or a chem. reagent. When the mineral acids act upon the metal parts of the app. H may be set free and it may reduce some of the nitro compds. Under the working conditions amino groups may be diazotized yielding cresols and nitrocresols whose salts are highly sensitive

explosives and thus there may be obtained as by-products: (1) trinitrobenzoic acid, and even tetranitromethane, owing to oxidation in case of overheating or pressure. The intense odor of the latter is sometimes observed in the factories, but the former, owing to its solubility, generally escapes detection; (2) phenolic compds., like cresols, owing to the reduction of some of the nitro compds.; (3) sulfonic acids, when the quantity of nitric in the mixed acid is below the minimum. In the process of manuf. of trinitrotoluene the following must be observed: (1) The amt. of HNO_3 to be used must exceed at least by $\frac{1}{2}$ mol. the quantity theoretically required for the carrying out of the nitration to a certain stage. (2) The extent of nitration should be regulated more by the concn. of the acids, temp., and duration of reaction than by the actual quantity of HNO_3 present. (3) The reaction product should not be kept in contact with the spent acid longer than is really unavoidable. (4) The concn. of acid and material of plant should be such as to reduce their action on one another to a minimum. (5) The starting materials (toluene and acids) must be pure. The residue from the mother-liquors consists of a complex mixt. of various di- and trinitrotoluenes. By nitrating this with a mixed acid containing only 15% of HNO_3 a "liquid trinitrotoluene" is obtained, which has considerable power, and has the property of gelatinizing collodion cotton, as nitroglycerin does. It is used in the manuf. of gelatinized explosives. It contains 16.6 to 17.2% of N, whereas pure trinitrotoluene contains 18.5% and dinitrotoluene 15.4%. Other details of importance to manufacturers and users of trinitrotoluene are set forth.

CHARLES E. MUNROE.

The purification of trinitrotoluene. M. COPISAROW. *Chem. News* 113, 37-8 (1916); cf. C. A. 10, p. 527 and preceding abstract.—The purification is largely limited to removal of acid and volatile matter since mineral matter and intermediate and by-products are present only in very small quantities. Acid is removed by agitating the molten trinitrotoluene several times with hot water. Long exposure must be avoided because (1) trinitrotoluene is somewhat volatile in steam, (this vapor is the source of the bitter taste observed in the washing department; it may cause headache and even sickness, and (2), a side reaction may set in with the formation of dinitro-cresols in a manner similar to the formation of dinitrohydroxybenzoic acids from trinitrobenzoic acids. The use of alkalis for neutralization of the acid is not permissible. Even NaHCO_3 may give rise to dangerous Na salts of phenolic by-products. Volatile matter (moisture) can be removed by keeping the trinitrotoluene at 95–100° for several hrs. The purification of a crude product containing a comparatively high % of mineral matter and org. by-products is a somewhat more complicated problem. The most radical way in such a case is to recrystallize the crude product from alc. or toluene (in the latter case the mother liquor from the crystn. can be transferred directly to the nitrating plant), thus removing practically all impurities. The second method consists in treating the crude product with H_2SO_4 , HNO_3 , or H_2SO_4 with an addition of about 5% of HNO_3 . The use of H_2SO_4 is based on the fact that trinitrotoluene is not easily attacked by concd. H_2SO_4 , in which it is fairly sol. at 90–100°, sepg. unchanged, on cooling or diln., while most of the impurities are sulfonated. A little HNO_3 added to the H_2SO_4 prevent the substitution of NO_2 by SO_3H and the partial oxidation of org. impurities. It is not advisable to lower sp. gr. on diln. below 1.2 as: (1) A fairly high concn. prevents some of the org. impurities from sepg. out with the trinitrotoluene. (2) It makes easier the subsequent reuse or concn. of the acid. (3) The solubility of trinitrotoluene in acid does not decrease on further diln. Extended data and a chart relative to the acidity of different samples of trinitrotoluene are given and it is stated that even pure α -trinitrotoluene (re-crystd. from acetone and then from alc.), melting at 80.7°, was found to be not quite neutral. C_1 attributes the acidity to phenolic rather than acid compds.

CHARLES E. MUNROE.

Preparation of trinitrotoluene. M. GIUA. *L'industria* 29, 507(1915); through *Ann. chim. applicata* 4, 363.—Symmetrical trinitrotoluene is generally produced by the action of HNO_3 on toluene. It crystallizes in white needles that turn yellow in the air and m. 80.6° . It may be distd. without alteration. Heated above 240° it burns without deflagration. It does not explode by impact; a Hg fulminate is necessary. G. studied the conditions that ought to be observed in nitrating to obtain the best yield and purest product. S. LEVY.

Explosion of a nitrotoluene still. Board of Trade, Marine Dept., Dec. 1915; *J. Soc. Chem. Ind.* 35, 143.—A "steam" explosion occurred due to fracture of inside coil. CHARLES E. MUNROE.

Proximate analysis of nitrocellulose solutions and solvents. A. D. CONLEY. *J. Ind. Eng. Chem.* 7, 882-7(1915).—C. enumerates in detail the constituents of nitrocellulose solns., particularly those in commercial use and describes the uses of such solns. Methods are given for detg. nitrocellulose in these solns. by pptn. with CHCl_3 ,* for detg. resins and oils and for sepg. and detg. the various solvents, including Hoffman's diacetone alcohol ("Alco. Deo."). The character of flash points and the effects on it of different solvents and viscosity and its detn. are discussed. C. E. MUNROE.

The manonitrometer for the titration of gun-cotton powders, nitration acids and other substances containing nitrogen. V. PLANCHON. *Ann. chim. anal.* 20, 189-97 (1915).—The app. employed differs from nitrometers of the well-known Lunge type in that the reaction between the Hg, H_2SO_4 , and nitric ester is carried out in a vacuum in a flask attached to a manometer and that volumes as great as 50 cc. of 95% H_2SO_4 are employed. It is claimed that the manonitrometer is more precise because the pressure exerted on the gas in the nitrometer causes secondary reactions to occur between the N oxides and H_2SO_4 which gives rise to errors in readings. Also in *Z. ges. Schiess- und Sprengstoffw.* 11, 22-4(1916). CHARLES E. MUNROE.

Limits of inflammability of mixtures of methane and air. G. A. BURRELL AND C. G. OBEREFL. Dept. Interior, Bur. Mines, *Tech. Paper* 119, 27 pp.(1915).—The smallest proportion of CH_4 with air which permitted self-propagation of flame when ignited from bottom by flash from 7 amp. at 220 v. in a box $5\frac{3}{4}$ ft. high and $5\frac{3}{4}$ cu. ft. capacity with a paper diaphragm for vent at top was 4.9%; on ignition at top it was between 5.7 and 5.8%. With the diaphragm at the bottom and box vertical 5.4-5.5%; with box on side, 5.5-5.6%; with 2800 cc. vessel 12 in. high by 5 wide, ignition at top, 5%; hempel pipet, ignition at top, 5.5-5.6%, iron pipe 7 ft. long, 12 in. diam., ignition at top, 13.4-13.9%, ignition at bottom, 15-15.4%; hempel buret with small spark from induction cell 12.4-13.2%. Clements' results on effects of changes in O and CO_2 contents on limit of inflammability are reviewed (*C. A.* 7, 3840). C. E. M.

Notes on the ignition of explosive gas mixtures by electric sparks. J. D. MORGAN. *Electrician* 76, 536-8(1916).—From expts. M. concludes that it is necessary to distinguish between the energy that produces the spark and the "incendivity" and that a measure of one is not a measure of the other except when other physical conditions are kept const. Ignition seems to depend upon the ionization caused by the spark. Experiments on the effect of adjustments and voltage variation were made in a coal-gas mixt. For safe working, the voltage should be kept as low as possible. It is believed that complete solution lies in a suitable relay system such as will operate the bell perfectly on as low as 0.1 amp. in the relay circuit. It was necessary to raise this current to 0.6 amp. before ignition occurred. The greater safety of a. c. was also demonstrated. KAPP in discussion advised the distribution of condensers along a bare wire system to prevent sparking. S. T. WALKER said he preferred single stroke

signals and explosive-proof cases for a sparking app. Also in *Colliery Guardian* **111**, 66-8(1916).
W. E. RUDER.

Researches on fire-damp. ENRIQUE HAUSER. *Bull. Am. Inst. Mining Eng.* **1916**, 521-34.—In the study of the retardation of the flash point of CH_4 , H. used as the means of ignition wires heated with currents at low potential (4 v.) in order to prevent sparking on fusion, with attendant ignition. He concludes that incandescent filaments may be used as successfully to produce inflammation as the flame or spark provided that the wires are not melted nor oxidized during the period of retardation of explosion.
H. L. OLIN.

Question of ammonia explosions. G. GATTANEO. *Z. ges. Kälteind.* **22**, 3-4 (1915).—The possible causes of several recent accidents in German refrigeration plants are discussed and the necessity of an exptl. investigation of the subject pointed out.

E. C. MCKELVY.

Continuous process of rectification (WONNEBERGER) 16.

Primers. W. H. BUELL. *Brit.*, **21**,082, Oct. 16, 1914. Charging a primer cup or the rim of a rim-fire cartridge with priming compns. containing a detonating azide and a nitrated org. substance, such a mixt. being described in 3,907, 1910. The detonating azides are the salts of heavy metals, especially Pb, Ag and Hg. The nitrated org. substance may be nitrocellulose, nitro-starch, trinitrotoluene, a nitrated carbamide such as nitrourea, or diazoaminobenzene. Substances leaving an alk. residue may be added, namely K_2CO_3 or Na_2CO_3 , $\text{Ba}(\text{NO}_3)_2$ or KNO_3 , or Na, K, or K Co azide. AmOAc may be used to dissolve the nitrocellulose, and glass may be added. KClO_4 , or Ba or K perchlorate, nitrate, or peroxide, may also be added, but preferably not. One example contains 3 parts by wt. of nitrocellulose and 1 part of Pb azide. Another example contains 11 parts of nitrocellulose, 6 parts of Pb azide and 3 parts of Na azide. The specification also describes mixts. of detonating and alk. azides, and mixts. of alk. azides with other substances, such as Sb_2S_3 and KClO_4 .

Primers for small arms. E. RITTER VON HERZ. *Ger.*, 285,902, July 14, 1914. The normal Pb salt of trinitroresorcinol, alone or in combination with O carriers and the usual components of priming compns. are used. Compared with the fulminate compn., these new mixts. are found to have a greater initial velocity and less dispersion. The smoke formation and the fouling of the gun are also less. The Pb compd. of trinitroresorcinol may be used, under certain conditions, for the manuf. of primers, cartridges, and the like. E. g., if upon 1 g. of trinitrotoluene, in a No. 8 shell, about 0.2 g. of the Pb trinitroresorcinol compd. is pressed, followed by 0.15 g. fulminate, the same action is obtained as from the employment of 1 g. trinitrotoluene with the usual covering of 0.555 g. fulminate. These combined cartridge shells are much less affected by moisture than shells with only fulminate covering.

Cartridges for mining and military purposes. C. CLAESSEN. *Ger.*, 284,400, July 5, 1913. Addition to 281,497 (*C. A.* **9**, 1906). Instead of Hg fulminate or a mixt. of Hg fulminate and KClO_4 , other easily ignited and moisture-proof compds. or mixts., such as black powder, gun cotton, smokeless powder, picrates, perchlorate compds., and other flame carriers, may be used. The charges for such cartridges may be made up of 0.85 g. tetryl (tetranitromethylaniline), 0.15 g. Pb_2N_2 , and 0.05 g. K picrate or, instead of the last, 0.10 g. KClO_4 with 20% milk sugar.

Ammunition. C. W. MULLER and J. PATTEN. *Brit.*, 20,969, Oct. 14, 1914. In the manuf. of gun cartridges, arranging at the forward end of the explosive charge a layer or wad of $(\text{NH}_4)_2\text{CO}_3$ or $\text{NH}_4\text{NH}_2\text{CO}_3$ or other like substance, preferably impreg-

nated with paraffin, vaseline, petroleum, jelly, or other oily substance, to cool and lubricate the gun barrel. A further quantity of such materials may also be placed in other parts of the cartridge.

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Notes on a new process of bleaching. S. F. PRICKHAM. Brooklyn. *J. Ind. Eng. Chem.* 8, 108-9(1916).—P.'s invention "consists of a process of bleaching by substituting for the usual lime and soda boils a single boil in a soln. of soap, preferably a pure vegetable soap, in which is dissolved a sufficient amt. of C_6H_6 , or its homologs or derivatives as found in the light distillates of some varieties of petroleum, especially that of California, as distinguished from the light distillates of paraffin petroleum. The strength of the soln. in both soap and C_6H_6 would depend upon the kind and character of the material to be bleached, light cotton fabrics requiring less than heavy cottons, and any cotton less than flax, jute, or hemp." For heavy woven flax P. recommends for each 100 lbs. of goods, water 50 gal., soap 10 lbs., C_6H_6 3 gal. After boiling the soap soln. is washed out and the goods bleached in any chemic. P. prefers $NaClO$ made by mixing a 58% soln. of Na_2CO_3 and a soln. of $CaOCl_2$ in the cold and allowing to stand 4 days, a slight excess of Na_2CO_3 being present. Bleaching requires 3-5 hrs. After washing the bleached goods they are soured, washed and calendered as usual. By this method a complete bleach of cotton or linen can be made in 1-2 days. A patent was denied the above process, the Patent Office declaring that "Benzine" and "Benzene" were identical. L. W. RIGGS.

The effect of sulfuric acid in dissolving cellulose. W. ZÄNKER. *Kunststoffe* 6, 17-9(1916).—A general discussion of the effect of acidity of cellulose used in the manuf. of artificial silk, together with a brief review of tests previously published (cf. *C. A.* 8, 1675, 2219; Schwalbe, *C. A.* 1, 1696, 2179). F. W. SMITHER.

Spinning nozzles for the manufacture of artificial silk. K. SÖVERN. *Kunststoffe* 6, 4-7, 19-20(1916).—A description with cuts of patented devices. F. W. S.

Recognition of the commoner adulterants of kapok. E. BELLOLI. *L'industria tessile e tintoria* 16, 208(1915); through *Ann. chim. applicata* 4, 365.—B. discusses in detail the physical, microscopical and microchem. properties of genuine kapok, and gives the methods for distinguishing it from products of less value, especially from akund (*Calotropis gigantea e procera*). S. LEVY.

Oxalic acid substitutes in the laundry. E. D. KÖRPPING. Lockport. *J. Ind. Eng. Chem.* 8, 196(1916).—Among substitutes for $(COOH)_2$ in laundry practice there has been offered an acid sodium fluoride which causes white goods to finish a dirty yellow, the discoloration being increased by repeated washing. The addition of NaF to water containing compds. of Ca, Mg, and Fe causes a pptn. of CaF_2 and MgF_2 which in a gelatinous condition carry down the Fe and hold it in the pores of the fabric. L. W. RIGGS.

Bluish and greenish gray dyes. M. H. ISLER. U. S., 1,169,404, Jan. 25. Nitro or amino derivs. of normal or isodibenzanthrone are treated, in $PhNO_2$, with $AlCl_3$, $SbCl_5$, PCl_5 or PCl_3 . Dark violet-black powders are formed, insol. in H_2O and in dil. acids and alkalis, giving blue-green to red-violet solns. in $PhNO_2$, green-blue to black-blue solns. in quinoline and blue vats with alk. hyposulfite soln., dyeing cotton blue-gray to green-gray fast to Cl.

Blue disazo dye. W. NEELMEIER, H. JORDAN and K. HEUSNER. U. S., 1,169,344, Jan. 25. A dye of the formula $(\text{OCH}_3)(\text{NH}_2)\text{ClC}_6\text{H}_3\text{N}:\text{N}:\text{C}_{10}\text{H}_7(\text{SO}_3\text{H})(\text{OC}_2\text{H}_5)\text{N}:\text{N}:\text{C}_{10}\text{H}_7(\text{SO}_3\text{H})(\text{OH})$ is made by diazotizing and combining 5-amino-4-chloro-2-acetyl-amino-1-phenyl methyl ether, 1-amino-6-sulfo-2-naphthyl ethyl ether and 1-naphthol-4-sulfonic acid. Its Na salt is a dark powder sol. in concd. H_2SO_4 with a bluish color. On cotton it gives blue shades which change to fast greenish blue after diazotization and development with β -naphthol.

Blue-violet dye. M. LATTEN. U. S., 1,169,329, Jan. 25. A dye of the formula $(\text{OH})_2\text{C}_6\text{H}_3\text{N}:\text{N}:\text{C}_6\text{H}_4(\text{OC}_2\text{H}_5)(\text{CH}_3)\text{N}:\text{N}:\text{C}_{10}\text{H}_7(\text{SO}_3\text{H})_2\text{N}:\text{N}:\text{C}_6\text{H}_4(\text{OC}_2\text{H}_5)(\text{CH}_3)\text{N}:\text{N}:\text{C}_6\text{H}_3(\text{OH})_2$ is made by combining the tetraazo compd. of 1,5-naphthalenediamine-3,7-disulfonic acid with 2 mol. proportions of cresidine, further tetraazotizing and combining with 2 mol. proportions of resorcinol. Its alk. salt is a grayish black powder sol. in hot H_2O with a reddish violet and in concd. H_2SO_4 with a greenish blue color. It gives violet shades on cotton which are rendered fast on treatment with CH_3O .

Yarn-dyeing apparatus. J. J. FRARON. U. S., 1,170,440, Feb. 1.

Dyeing artificial silk. F. KUNERT. U. S., 1,169,267, Jan. 25. Artificial silk is dyed by successive treatment with, and combination between, a diazo- or tetraazo- or diazoazo compd., *e. g.*, the diazo compd. derived from *p*-nitro-*o*-toluidine or *m*-aminoazotoluene or *m*-nitro-*o*-anisidine, and an anilide or nitroanilide or other arylide of 2,3-hydroxynaphthoic acid. Non-sulfonated compds. are used to give fast colors. After dyeing, washing and soaping, the material may be treated with HOAc , HCOOH or tartaric acid to brighten the color.

Kier for dyeing. A. KLUGE. Brit., 20,561, Oct. 5, 1914. A kier for dyeing straw, chip, etc., with the usual hooded central uptake tube, has a circulation-producing means below its perforated false bottom, consisting of a steam-coil provided with perforations directed inwards, either horizontally or slightly downwards.

Aniline-black and like dyeing. B. KEEGAN. Brit., 20,467, Oct. 2, 1914. Khaki and like shades are obtained on wool by immersing it in a bath containing *m*-toluylenediamine and a dichromate, and subsequently adding H_2SO_4 . According to an example, the bath contains *m*-toluylenediamine, NaCl , HOAc , and $\text{Na}_2\text{Cr}_2\text{O}_7$, H_2SO_4 being subsequently added and the mixt. brought to the boil. Other agents which on treatment with H_2SO_4 yield an oxidizing agent may be substituted for the dichromate.

Dyeing. G. G. HEPBURN. Brit., 21,052, Oct. 16, 1914. Aniline-black and like dyeing. Shades are produced on wool, alone or mixed with vegetable or other fiber, by treating the wool first in a bath containing aq. HOCl , and then, after washing or not, in a bath containing an org. or inorg. salt of an aromatic amine, *e. g.*, aniline, *m*-phenylenediamine, *p*-diaminodiphenylamine, α - or β -naphthylamine, benzidine, toluidine, dianisidine, or *p*-diaminostilbene.

Dyeing. E. E. M. PAYNE. Brit., 21,087, Oct. 16, 1914. Textile materials, such as wool, silk, cotton, linen, etc., are dyed by means of solns. of humus; the material may be treated with mordants before or after dyeing, and the shades produced may be modified by addition of other dyes, *e. g.*, logwood or indigo-white, to the dye-bath. The humus soln. may be prepd. by leaching peat-moss litter with dil. NaOH soln., pptg. the humus from the resulting liquor by addition of H_2SO_4 , filtering off the ppt., and redissolving it by addition of sufficient NH_3 or other alkali to give a neutral soln. According to an example, wool is dyed a khaki shade by first degreasing, then mordanting with $\text{K}_2\text{Cr}_2\text{O}_7$ and $\text{KHC}_4\text{H}_4\text{O}_6$, or with basic Cr sulfate, FeCl_3 , FeSO_4 , or alum and $\text{KHC}_4\text{H}_4\text{O}_6$, then dyeing in a bath containing humus obtained from peat as described above, with addition of logwood, neutralizing if required by passing through a soln. of borax, and finally treating with a soln. containing soap and oil or a superfatted

soap. When the material is first dyed and then treated with a mordant, the humus soln. should be acidified, *e. g.*, with HOAc; or the material may be treated with a mineral acid prior to dyeing.

Dyeings on vegetable fiber. BADISCHE. Ger., 283,742, and addition 285,230, Feb. 7, and Apr. 4, 1914. Rich dyeings are obtained by combining benzoyl-1,7-aminonaphthol or its derivs. substituted in the benzoyl residue, with unsulfonated diazo-, diazoazo-, or tetrazo compds. According to the addition patent, the *N*-arylsulfo derivs. of 1,7-aminonaphthol are combined with unsulfonated diazo-, diazoazo-, or tetrazo compds.

Dyeings on pelts, hair, feathers. FARBW. v. M. L. & B. Ger., 285,769, Apr. 30, 1914. The material, mordanted or not, is treated with solns. of 1,8-diamino- or 1,8-dihydroxy-, or 1,8-aminohydroxynaphthalene derivs., which contain in each benzene nucleus of the naphthalene, another OH or NH₂ group in the *o*- or *p*-position. Cf. C. A. 10, 394.

Waterproofing textiles. E. GIRZIK. Ger., 286,120, July 4, 1913. Textile materials are impregnated with solns. of cellulose esters and castor oil. Cf. Aust., 3,034, 1913 (C. A. 8, 2229).

Artificial silk and other molded articles. R. ADLER. U. S., 1,169,756, Feb. 1. An ammoniacal soln. of oxycellulose is mixed with an ammoniacal soln. of casein. A transparent ppt. is formed from which artificial silk or molded articles of other character may be made. CH₂O may be used for hardening them.

Purifying wool-scouring liquors. E. V. CHAMBERS, T. C. HAMMOND and G. G. JARMAN. U. S., 1,170,962, Feb. 8. Wash liquor obtained by scouring wool with soap solns. is heated and centrifuged to sep. grease without sepg. soap and alkali and the remaining liquor is prepd. for further use in scouring and freed from excess alkali by treatment with CO₂.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

Percentage mixtures of leaded zincs and basic sulfate white lead. J. E. HECKEL. *Drugs, Oils and Paints* 31, 289-91(1916).—Tables and charts are given which enable manufacturers to formulate mixts., containing leaded zincs and sublimed lead sulphate which will contain definite amts. of ZnO and basic sulfate of Pb. E. W. BOUGHTON.

Notes on prepared paints for metal surfaces. H. A. GARDNER. *Drugs, Oils and Paints* 31, 292-3(1916).—Pigments that are basic in nature or that contain the CrO₄ radical prevent rusting of Fe. Specifications for red lead should require 85-90% of Pb₃O₄, the remainder to be practically pure PbO. PbO has a valuable "cementing" action in the paint film. Formulas are given for paints of different colors, to be used on metal. Anti-fouling and anti-corrosive paints for marine use are briefly discussed. When coal tar is used in paint it should be free from NH₃ or H₂O. For painting galvanized Fe, preliminary treatment with a soln. of a Cu salt is proposed. E. W. B.

Paint and varnish industry during 1915. *Drugs, Oils and Paints* 31, 288(1916).—A statement of general conditions. Among other facts it is noted that pigments which require the use of K salts during manufacture, such as Prussian blue and the chromes, have advanced in price. E. W. BOUGHTON.

Ponceau colors in paint. A. COBENZYL. *Farben-Ztg.* 21, 392-3(1916).—Description of the manif. of "satin white," a mixt. of Ca aluminate and CaSO₄, which is used as a base for ponceau lakes. E. W. BOUGHTON.

Ponceau colors in modern varnish manufacture. ANON. *Farben-Ztg.* 21, 346-8 (1916).—General information regarding properties, use, etc. E. W. BOUGHTON.

Linseed oil and other oil varnishes. O. PRAGER. *Seifensieder-Ztg.* 42, 853-4, 893-4, 913, 936-7, 977, 1021-2, 1065-6, 1113-4 (1915).—Discussion of raw materials and methods of manufacture. E. SCHERUBEL.

The use of raw linseed oil in paints. J. F. SACHER. *Farben-Ztg.* 21, 134-5 (1915).—In Germany linseed oil is always bleached before being used for the manufacture of paint, while in England and the U. S. untreated raw linseed oil is extensively used. If raw linseed oil is used its drying properties must be first ascertained. A note by the editor states that the selection of raw oil, boiled oil, or "stand" oil must depend upon the nature of the paint. E. W. BOUGHTON.

Report of Committee D-1 on preservative coatings for structural materials. P. H. WALKER, et al. *Proc. Am. Soc. Testing Materials* 15, Pt. I, 186-272 (1915).—The Committee proposes specifications for raw linseed oil from N. American seed, for raw Chinese wood oil and for boiled linseed from N. American seed, and also proposes standard definitions for terms used in paint specifications (cf. C. A. 9, 2458). A complete report of the Havre de Grace bridge paint tests is given, showing in detail compn. of paints, conditions of application, rating on inspection, etc. A report of coöperative work on Chinese wood oil is given, showing results obtained by the heating test and the I jelly test on pure and adulterated samples. The results obtained by the committee using the "light break" method of Ware and Schemann (cf. C. A. 8, 3244) were not satisfactory. Oils from American grown nuts were very similar to the pure oil from Chinese nuts. A report is given showing the results obtained with paints on steel plates at Atlantic City and the relation of these results to the classification of the pigments as "inhibitive, indeterminate, or stimulative." The results indicate that such classification (by means of the "water test") does not give reliable information regarding the values of the pigments in oil paints. Report of coöperative work on boiled linseed oil is given. Two members of the Committee obtained very concordant results for hexabromides by Eibner's method (cf. C. A. 7, 903). Inspection of the white paint test fence at Washington indicates that composite paints containing both Pb and Zn pigments show superiority to single primary pigment paints. A report on a fungus growth which appeared on some of the panels is given. Report of coöperative work on paint thinners other than turpentine shows the results of coöperative work on evapn. and flash tests. Report on sampling liquids is given (cf. C. A. 9, 2361). The discussion of the report of Committee D-1 contains some changes in the reports of the sub-committees. E. W. BOUGHTON.

Standard specifications for the purity of raw linseed oil from North American seed. *Year Book, Am. Soc. Testing Materials* 1915, 417-9.— $D_{15.5}^{15.5}$, 0.932-0.936; d_{25}^{25} , 0.927-0.931; acid no. (max.), 6.0; sapon. no., 189-195; unsapon. matter (max.), 1.5%; η_{25} , 1.4790-1.4805; I no. (Hanus) (minimum), 180. Methods of testing are given. E. W. BOUGHTON.

Standard specifications for purity of boiled linseed oil from North American seed. *Year Book, Am. Soc. Testing Materials* 1915, 420-22.— $D_{15.5}^{15.5}$, 0.937-0.945; acid no. (max.), 8.0; sapon. no., 189-195; unsapon. matter (max.), 1.5%; η_{25} , 1.479-1.484; I no. (Hanus) (minimum), 178; ash, 0.2-0.7%; Mn (minimum), 0.03%; Ca (max.), 0.3%; Pb (minimum), 0.1%. Methods of testing are given. E. W. BOUGHTON.

Standard specifications for the purity of raw Chinese wood oil. *Year Book, Am. Soc. Testing Materials* 1915, 423-27.— $D_{15.5}^{15.5}$, 0.939-0.943; acid no. (max.), 6.0; sapon. no., 190-195; unsapon. matter (max.), 0.75%; η_{25} , 1.515-1.520; I no. (Hübl 18 hrs.) (minimum), 165; heating test, Browne's method (cf. C. A. 7, 2315) (max.), 12

min.; I jelly test (max.), 4 min. Methods of testing are given. An immersed stem thermometer is recommended for the heating test, and if a long stem thermometer is used the reading must be corrected for emergent stem. The I jelly test is made as follows: In a wide-necked 200-cc. Erlenmeyer flask, place 2.5 g. (wt. correct to 1 mg.) of the oil. Add 10 cc. of CHCl_3 from a pipet and stopper the flask immediately. Carefully insert a small glass vial into the flask so that the vial stands upright. Into the vial from a pipet run 10 cc. of a soln. of I in CHCl_3 , containing 0.035 to 0.036 g. of I per cc. Place the flask in a bath containing water at 25 to 26° and allow it to stand there for a few min. Keep the flask stoppered, except when it is necessary to remove it to insert the vial and to add the I soln. Tilt and rotate the flask so that the vial is upset and the contents of the flask are thoroughly mixed, at the same time starting a stop watch. Keep the flask in the bath at 25 to 26° and at the end of every quarter min. tilt the flask towards a horizontal position. Note the time required for the formation of a jelly that does not flow, but sticks to the bottom of the flask or slides as a mass. Record time in minutes and quarters thereof. Pure Chinese wood oil should require $2\frac{3}{4}$ to $3\frac{1}{4}$ min. for the formation of the jelly. If the temp. of the laboratory is more than 2° or 3° above or below 25°, place the flask containing the I soln. in the bath and allow it to remain there for several minutes before pipetting out the 10 cc. for the test.

E. W. BOUGHTON.

Standard specifications for turpentine. *Year Book, Am. Soc. Testing Materials* 1915, 428-30.—A revision of proposed specifications (cf. C. A. 8, 3503). The specifications apply to either gum spirits or wood turpentine. Color shall be "standard" or better. Turpentine must be clear and free from suspended matter, and water. $D_{18.8}^{18.8}$, 0.862-0.872; $n_{18.8}^{18.8}$, 1.468-1.478; initial b. p., 150-160°; 90% of the turpentine shall distil below 170°; the polymerization residue shall not exceed 2% and its $n_{18.8}^{18.8}$ shall not be less than 1.500. Methods of analysis are given.

E. W. BOUGHTON.

The analysis of boiled linseed oil. W. FAHRION. *Farben-Ztg.* 21, 88(1915).—A continuation of the discussion of the nomenclature of resinate and linoleate boiled oil. Cf. C. A. 9, 1848.

E. W. BOUGHTON.

Condensation products of nitroaniline and formaldehyde and their use in varnish. ANON. *Farben-Ztg.* 21, 63-4, 86-7, 113-4(1915).—An extensive review.

E. W. BOUGHTON.

The resistance of modern enamels and varnishes to chemical agents. KRUMHAAER. *Farben-Ztg.* 21, 336-8, 390-2(1916).—A consideration of the properties required for enamels and varnishes for different purposes, such as marine varnishes, automobile enamels, etc.

E. W. BOUGHTON.

Physical and chemical characteristics of the most important resins used in the varnish industry. ANON. *Farben-Ztg.* 21, 325-6, 350-1, 367-70(1916).—A compilation of data.

E. W. BOUGHTON.

Glass etching inks 19. Artificial insulating materials 4.

Pigment. H. A. GARDNER. U. S., 1,169,253, Jan. 25. A mixt. of basic Pb carbonate and BaCO_3 is formed by reacting with CO_2 or Na_2SO_4 or Na_2CO_3 upon a soln. or suspension of basic Pb acetate and Ba(OH)_2 or other Pb and Ba compds.

Zinc sulfide pigment. C. RANSON. U. S., 1,171,246, Feb. 8. Zn sulfide containing combined Zn oxide is freed from the latter (1) by heating under pressure with a small excess of NH_4SH at 135°, or (2) by heating with a 6-8% soln. of HCl or HF (followed by washing with alkalis to eliminate ZnCl_2 , if HCl is used), or (3) by calcining at 600-700° with 5% of S and 1-2% of Na silicofluoride or fluosilicate.

Paints. INTERNATIONAL COLOR and CHEM. CO., INC. Ger., 285,968, Jan. 27, 1914. Paints and similar colors are obtained by combining a pigment, in the presence of H_2O , with a metal soap and a color vehicle. Cf. Fr., 467,464 (C. A. 9, 2001).

Anti-rust coating. B. ZSCHÖKKE. Ger., 285,708, May 30, 1914. Addition to 276,122 (C. A. 9, 530). For the fat or oil vehicle specified in the principal patent for the chromic acid soln., can be substituted inorganic and organic adhesives, binders, and coating masses of all kinds, such as water-glass, cements, gypsum, tar, dextrin, resins, water colors, and the like. By using glue colors the further advantage is secured that the chromic acid and its salts harden the lime substance, so that such colors are not only anti-rust, but also, to a certain extent, waterproof. E. g., 100 parts of permanent white ($BaSO_4$) and 5 of lime powder are rubbed to a paste with 80 parts of a 10% $K_2Cr_2O_7$ soln., or 100 parts of tar containing H_2O are mixed with a 5% aq. soln. of Na_2CrO_4 at the ordinary temp.

Coating steel. G. D. FRIDT. Brit., 20,621, Oct. 6, 1914. Steel surfaces are prevented from rusting beneath a coating of paint by a preliminary treatment with an alc. soln. of H_3PO_4 . The soln. may be applied with a brush, or by dipping, and incrustations of rust may be removed by rubbing with an emery cloth in the presence of the soln.

Tar paint. J. W. DUNFORD. U. S., 1,170,883, Feb. 8. Coal tar 25 gals., is mixed with oil of tar 25 gals., graphite 25 lbs., linseed oil 5 gals., yellow ochre 15 lbs., Fe oxide 20 lbs., oil of turpentine 5 gals., slate ground in linseed oil 20 lbs., and pine tar 10 gals., to form a paint for use on roofs, bridges, etc.

Filler and "graining ground" for use on wood or metal. C. F. COOPER. U. S., 1,169,930, Feb. 1. Zn white 50, is mixed with another dry pigment such as ochre or PbO 40, shellac 5 and alc. 5 parts.

Varnish-paint or "graining ground" for use on metals. C. F. COOPER. U. S., 1,169,931, Feb. 1. A dry pigment 42-50, is mixed with CaO 13-17, varnish 13-17, turpentine 12-18 and $NaCl$ 2%.

Paint- and varnish-remover. C. ELLIS. U. S., 1,169,783, Feb. 1. Benzyl alc 30, is mixed with benzyl acetate 25, cresylic acid 5, solvent naphtha of high b. p. 40, CCl_4 15 and paraffin 5 parts. Benzaldehyde, Me phthalate, benzyl cresylate, and thickening agents such as starch, infusorial earth and whiting, are specified in other formulas.

27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

The hydrogenation of oils and fatty compounds. G. F. JAUBERT. *Rev. Ges. Chem.* 18, 117-33, 144-60(1915).—An outline of the whole industry including a discussion of catalysis, the production of hydrogen and the hydrogenation of fats, etc. Part 2 is a detailed description, with drawings of all processes and patents used by the 27 largest concerns in the world.

L. H. CHERNOFF.

Refining vegetable oils. C. BASKERVILLE. *J. Ind. Eng. Chem.* 8, 118-21(1916).—B.'s process is as follows: Two % of prepared cellulose, a suitable amt. of $NaOH$ (stronger than ordinarily used) and a detd. amt. of Na_2CO_3 are added to the oil and the whole agitated while it is being heated to 45-64° to produce the break, after which it is filtered. If linters are used, 1/4 to 1/2% of the dry cellulose is added. E. S.

Thermal values of fats and oils. I. Heat of bromination. J. W. MARDEN. *J. Ind. Eng. Chem.* 8, 121-6(1916).—A special app. was devised to det. the heat of bromination consisting of a specially constructed mixing chamber placed in H_2O contd. in the

ordinary form of H_2O calorimeter or in a Dewar tube. The heats of bromination in calories per g. of oil were detd. on a number of oils and these values compared with the I nos. The heat of bromination is not directly comparable to the I no. The heats of soln. of Br and most oils in CCl_4 are very small.

E. SCHERUBEL.

Northern fur seal oil. M. TSUJIMOTO. *J. Chem. Ind. Japan* 18, 798-808(1915).—This seal is found on Robbin Island off the eastern side of Karafuto, Japan. Three samples were examd.: (1) and (2) were body oils and (3) foot oil. The consts. for (1), (2) and (3), resp., were as follows: d_{15} 0.9256, 0.9251, 0.9356; acid no. 1.02, 1.65, 20.0; sapon. no. 188, 186, 195; I no. 155, 157, 133; n_{20} 1.4783, 1.4790, 1.4772; butyrefractometer at 20°, 79.9, 81.2, 78.0; unsaponifiable matter 0.62%, —, —; oxidized acids 0.12%, —, —; m. p. of fatty acids 26°, 28-9°, 33°; polybromide 43.2%, —, 24.85%; Br content of polybromide 69.83%, —, 69.48%. These bromides do not melt but decompose at about 250°. This property corresponds to that of the bromides of other marine animal oils.

E. SCHERUBEL.

"Soy" and "sake" oils. M. TSUJIMOTO AND T. UENO. *J. Chem. Ind. Japan* 18, 1072-7(1915).—These oils are by-products of the soy and sake brewing industry. "Soy" oil is obtained from a mixt. of soy beans and wheat together with aromatic and decompn. products. The yield of the oils is small, being about 0.25 to 0.30% for "soy" and 0.01 to 0.02% by vol. for "sake" oil. "Soy" oil is best refined by reducing with Zn dust and H_2SO_4 and then treating with Kambara earth. It can then be used in the manuf. of soap. "Sake" oil has not been prepared commercially. The consts. of "soy" and "sake" oils, resp., are: d_{15} 0.9000, 0.9031; solidification p. -3°, turbid at 0°; acid no. 59, 22.5; sapon. no. 184, 179; I no. 128, 101; n_{20} 1.4650, 1.4660; unsapon. matter 2.88%, —.

E. SCHERUBEL.

Yeast fat. O. NEUSS. *Seifensfabr.* 36, 38(1916).—Dr. Lindner found a yeast plant contg. 18% fat on the dry basis. By propagating this at 20° upon a cloth in large iron pans the product may be readily removed, pressed and dried. A fat content as high as 50% on the dry basis has been obtained. The fat is similar to olive oil and makes a good curd soap.

E. SCHERUBEL.

The Wijs iodine solution. S. UENO. *J. Chem. Ind. Japan* 19, 30(1916).—U. concludes from exptl. work that: (1) The soln. prepd. by the formula given by Holde, Ubbelohde, and Marcusson (7.1374 g. I and 39.3573 g. ICl_3) is not unfit for the detn. of I value, notwithstanding excess of Cl. (2) I values obtained with solns. prepd. as above and as per Lewkowitsch (8.6676 g. I and 7.9617 g. ICl_3 , correct proportions by calcn.) practically agree with that obtained with the "normal" soln. (prepd. from I and Cl) on the day of prepn., after 1 week, and after 2 weeks. (3) An old Wijs soln. gives a slightly lower I value. (4) A fair excess of Cl in the Wijs soln. tends to give high I values which approach the normal after a time (in days) proportional to the excess value. A moderate excess of I has practically no effect on the detn. of I value. (5) The I values of Chinese and Japanese wood oils obtained with an old Wijs soln. are lower than normal, but can be increased to normal by prolonging the time of absorption. The deep reddish brown color produced on mixing Wijs soln. with wood oil is not due to photochemical influence. Examn. of the iodo-chloride of the fatty acids of wood oil shows that more Cl is absorbed than corresponds to the formula ICl_3 .

F. W. SMITHER.

The Uba cane grown in Natal and the extraction of the wax from it. WM. CLACHER. *Intern. Sugar J.* 18, 22-3(1916).—A description is given of the Uba cane. The wax is extd. from the filter press cake (which contains from 14 to 17%) by the benzene process. The cane wax is sol. in kerosene which on cooling deposits the wax as a pale yellow sediment. As the benzene process is expensive, the method used for removing wax from shale oil by freezing is recommended.

A. GROSS.

The use of lignite for the manufacture of montan wax. RUD. MATTHIAE. *Grimma. Chem. App.* 3, 1-3, 13-5(1916).—Plans of plant, list of necessary app., costs and profits, and directions for operating are given. J. H. MOORE.

The sampling and analysis of beeswax. M. S. SALAMON. *J. Soc. Chem. Ind.* 35, 8-10(1916).—S. emphasizes the necessity of securing true samples. With a piece of refined beeswax, it is best to take shavings from each corner and also from the center of the block on both sides, as a mixture of waxes has a tendency to settle out in layers on cooling. In prepg. wharf samples, the amt. of the sample being too large (sometimes as much as 30 lbs.) to melt in lab. vessels, it is best to take the shavings (with a potato parer) from each piece and melt these. It is often best to halve the original wharf sample (consisting of a lot of pieces) and prep. a sample from each half, analyzing the 2 samples separately. The usual detns. of acid value, ester value, etc., should be supplemented by qualitative tests, particularly directed to the presence or absence of paraffin wax, and if necessary a detn. of hydrocarbons. In applying the Weinwurm test for paraffin, it is not sufficient merely to note whether the soln. is clear or cloudy; unless distinct flakes are observed, no conclusion should be come to without further tests. Certain hard waxes, such as Chilian and Egyptian, give a clear soln. even when 5% of paraffin wax is present, while other waxes, such as Madagascar and Abyssinian, will give a slightly cloudy soln. even when pure. It is always best to prepare a further sample of wax to which 5% of paraffin wax has been added: if the original wax was adulterated with paraffin wax distinct flakes will then usually be seen in the Weinwurm soln. obtained from this prepd. sample. If these flakes are not observed it may be concluded that the original sample was free from paraffin wax providing the ester nq. was normal. In any case a clouding point test should always also be applied for confirmation. A table is given of the characteristics of the various varieties of beeswax, showing the av., max., and min. figures obtained in the analysis of over 500 commercial wharf samples. The m. p. detns. were made in capillary tubes closed at one end. There appear to be 2 distinct types of Abyssinian beeswax; one is dark red in color and has an av. acid value of 20 and ester value 76, while the other is pale in color and has an acid value of 18 and an ester value of 73. Cf. C. A. 9, 2322.

F. W. SMITHER.

Toilet soap base. B. ZIENLE. *Seifensieder-Ztg.* 42, 1057-8(1915).—Much lower grade fats are now used for toilet soap and about 5% of light colored rosin is added to increase lather and cover odor.

E. SCHERUBEL.

Toilet base from cheap fat. T. M. *Seifensieder-Ztg.* 42, 1081-2, 1106-7(1915).—By handling cheap fats according to the Krebitz process a satisfactory toilet base can be made.

E. SCHERUBEL.

Determination of active oxygen in washing materials. A. GRÜN AND J. JUNG-MANN. *Seifenfabr.* 36, 53-5(1916).—The ordinary methods of titrating active O by means of KMnO_4 , do not give correct results where oxidizable matter is present. The iodometric method gives better results and is recommended.

E. SCHERUBEL.

Fat content and deterative value of soaps. BERGO. *Seifensieder-Ztg.* 42, 1105-6(1915).—Owing to the scarcity of raw materials since the war it is no longer desirable to manufacture soaps of high fat content, and it is advocated to fill soaps so as to reduce the fat content to 40 or 50%. Another suggestion put forth is to incorporate fat solvents such as C_6H_6 , CCl_4 or naphtha which will save soap.

E. SCHERUBEL.

Liquid soaps. MAX DOENHARDT. *Pharm. Ztg.* 60, 847(1915).—Most liquid soaps, both potash and tar, become opaque, thicken or sep. when subjected to cold. In order to obviate such tendency in the case of tar soap, the following formula is suggested as yielding a completely H_2O -sol. prepn. and one immune to cold: Ol. rusci

25, Liq. kalii caustici (35%) rec. paratur 18, Ol. rapae 20, Spiritus 25, Aq. destillata 12. Birch tar is first mixed with the KOH soln., the rape oil added, then saponified and the mixt. dissolved in alc.

W. O. E.

Soap preparations containing sucrose. J. BOES AND H. WEYLAND. *Chem. Ind.* 38, 447-54(1915).—A review and discussion of the patent claims, literature, etc., together with exptl. data on solid and liquid soap of known compn. from which it is concluded: (1) The service-value of a soap is detd. by the ratio of detergent power to injurious effect. (2) The detergent value is best ascertained not through chem. analysis (fatty acid content, free alkali, etc.), but by a detn. of the lathering power and the internal friction or hardness. (3) The caustic action of free alkali may not be considered as a detergent effect, but as a colloidal chem. process in which adsorption compds. are formed. (4) The chemical detergent effect of free alkali and its action on goods, colors, etc., depend solely upon its OH-ion concn. (5) Non-dissociated alkali sucrate as well as sucrose have no detergent value. (6) The addition of free alkali to soap and its subsequent partial neutralization with sucrose are based on false premises. (7) The sucrose soap studied showed no advantageous properties, the low-lathering power and the small inner friction or hardness being decided disadvantages. (8) The demonstrated small service-value of sucrose soap excludes its use as a substitute for ordinary Na soap.

F. W. SMITH.

Report of Committee D-2 on standard tests for lubricants 22.

Hydrogenating fatty compounds. E. B. HIGGINS. U. S., 1,170,814, Feb. 8. Fatty acids or other unsatd. compds. to be hydrogenated are mixed with a formate, preferably Ni or Zn formate, and another catalytic material, e. g., PdCl₂, and heated in an inert atm. or in H₂ to effect hydrogenation.

Refining cottonseed oil. G. M. HOLBROOK. U. S., 1,169,154, Jan. 25. Crude cottonseed oil containing about 1% of free fatty acids is treated with 4% its wt. of an 18° Bé. NaOH soln. and 0.75% its wt. of a 44° Bé. Na silicate soln. and agitated and gradually heated to cause the soap stock to settle.

Refining cottonseed oil. G. M. HOLBROOK. U. S., 1,169,155, Jan. 25. Crude cottonseed oil containing about 1% of free fatty acids is agitated with about 1% its wt. of an 18° Bé. NaOH soln. to neutralize the acid, then 3% of the same soln. is added together with 0.75% of a 44° Bé. Na silicate soln., the oil is agitated and heated to about 45° and the soap stock formed is sepd. from the oil.

Saponifier. E. TWITCHELL. U. S., 1,170,468, Feb. 1. A saponifier for liberating fatty acids and glycerol from fats and oils is formed by treating crude "naphthalene-stearo-sulfonic acid" with NaCl soln. to wash out impurities, at the same time converting part of the sulfonic acid into the Na salt, washing out fatty impurities with naphtha, dissolving the product in a large amt. of H₂O and adding a compd. of Ba, Ca, Sr or Mg to ppt. the insol. alk. earth salt of the acid. The ppt. is dried and ground and forms a highly concd., stable saponifying agent.

28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

Action of copper solutions on sucrose. Determination of invert sugar in the presence of sucrose. E. SAILLARD. *Compt. rend.* 161, 591-3(1915).—In the detn. of reducing sugar by the use of alk. Cu tartrate soln. the presence of sucrose in the soln. causes more Cu to be reduced than the amt. of invert sugar present would other-

wise produce. The amt. of this increased reduction depends on the concn. of sucrose, reducing sugar, and Cu soln., and on the manner of heating. High temps. cause more reduction than moderate heat. S. has evolved a method using a somewhat less alk. Cu soln. and heating to 64° for 22 min. Tables showing the amts. of Cu reduced by various amts. of invert sugar and the increase due to various amts. of sucrose have been worked out for these conditions. The increased reduction is appreciably less than in the usual 2 min. boiling procedure. The amt. of reducing sugar has a very marked influence on the action of the sucrose. If large amts. of reducing sugar are present there is little action due to sucrose. When the amt. of reducing sugar is nearly equiv. to the Cu in the soln. the reduction due to sucrose is practically zero. No explanation is given. An adaptation of the above outlined method applicable for the detn. of reducing sugar in beets, sirups, sugars, and molasses is as follows: Clarify a normal soln. of the sample with $\text{Pb}(\text{OAc})_2$. Remove Pb with dry Na_2CO_3 , filter, and det. reducing sugars using the special solns. with heat for 22 min. at $63-4^{\circ}$. Filter the Cu on an Allihn tube and det. by Bertrand's method. Find the corresponding wt. of reducing sugar by consulting the table.

H. R. SMITH.

Action of sucrose on cupropotassic solutions. L. MAQUENNE. *Compt. rend.* 161, 617-23(1915).—A series of expts. to establish the effect of sucrose alone on alk. Cu tartrate solns. was carried out. A const. vol. of the Cu soln. was made up with water to a const. vol. after the addition of varying wts. of pure sucrose and this mixt. was heated in a uniform manner. It was found that for increasing per cents of sucrose the amt. of Cu reduced increased rapidly to a max. and then gradually diminished. It was impossible to add enough sucrose to reduce all of the Cu. With about 50% of sucrose in the mixt. under these particular conditions only about $\frac{1}{4}$ of the Cu was reduced. It is thought that complex sucrates of Cu and K are formed, whose coeff. of dissociation decreases as the concn. of sucrose increases; this action diminishes the strength of the alk. Cu tartrate soln. It is noted that in contrast to this slow action, the action of reducing sugars on alk. Cu solns. is very rapid. This shows that the reducing action of sucrose alone is not due to a preliminary hydrolysis to invert sugar but is a direct function of the sucrose mol. It was found impossible to establish a simple relation between the reducing power of sucrose and of invert. On detg. the reducing sugars in a soln. containing also sucrose, when the ratio of sucrose to invert is small the reduction will be less than the sum of the actions on each one alone under the same conditions. This is explained by the fact that the action of reducing sugar on the alk. Cu soln. is very quick and hence the strength of the Cu soln. is diminished before appreciable action has taken place on the sucrose. This weaker Cu soln. causes less reduction due to sucrose. But when the ratio of sucrose to reducing sugar is large, the total reduction is greater than can be accounted for by the two factors separately. Saillard states that under these conditions sucrates predominate in the soln. and these sucrates acting on the invert sugar like salts of Cu with a weak acid produce a greater amt. of Cu_2O in the same way that CuK carbonate acts in the Soldaini soln.

H. R. SMITH.

The determination of crystallizable sugar by invertin. H. PELLET. *Ann. chim. anal.* 20, 121-2(1915).—A preliminary note, with some general discussion.

P. M. GIESY.

New method for the determination of reducing sugars. E. SAILLARD. *J. fabr. sucre* 56, No. 3, 1(1915).—The usual methods using alk. Cu solns. introduce an error when sucrose is present. This is due to the action of the alkali in boiling soln. causing some of the sucrose to hydrolyze to reducing sugars. S. uses a weakly alk. Cu soln. and heats to only $63-4^{\circ}$ for 22 min. Under these conditions much less sucrose is hydrolyzed and all of the reducing sugar originally present will have thrown down the

equiv. amts. of Cu_2O . The Cu_2O is filtered using an Allihn tube, washed with warm water, and the Cu dissolved in a soln. containing 50 g. $\text{Fe}_2(\text{SO}_4)_3$ and 200 g. H_2SO_4 per l. The tube is washed with water and the entire soln. titrated with KMnO_4 soln. (1 cc. = 10 mg. Cu). A special table to fit these new solns. and conditions has been prepared so that the amts. of reducing sugar for each detd. wt. of Cu pptd. may be quickly ascertained. This method is now in use at the lab. of the Syndicate of Sugar Manufacturers.

H. R. SMITH.

Contribution to the Fehling-Soxhlet sugar determination. RUOSS. *Z. anal. Chem.* 55, 1-23(1916).—A critical review and study of methods. The volumetric methods of Soxhlet (*Z. anal. Chem.* 20, 45(1880)) and Pfleger (*Ibid* 43, 356, 364) are only applicable with sugar solns. of more than 0.5% (1-0.5), necessitating concn. by evapn. (with risk of formation of reducing products) or reinforcing by the addition of a known amt. of dextrose (cf. Schöndorff, *C. A.* 2, 3104). R. has derived from the published work of Soxhlet a mathematical equation by which the amt. of sugar can be accurately ascertained to 0.001% in solns. containing 0.1 to 1.0%. A table is given showing for the number of cc. of the sugar soln. equiv. to 100 cc. of Fehling soln.: "Fehling %" as found, and "correct %," as calcd. The use of the table and methods of calcn. are explained in detail. Below 0.1% the found and calcd. values agree to the second decimal place. The following method was devised for detg. the presence of Cu^+ ions in the boiled sugar-Soxhlet soln. without filtration: Solns. A. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ 69.278 g. per l.; B. $\text{NaKC}_4\text{H}_4\text{O}_6$ 346 g. + 103.2 g. NaOH per l.; C. To 300 cc. of 96% AcOH add 200 cc. of H_2O and dil. to 1 l. with NaCl soln. (330 g. per l.); 300 g. of tartaric acid may be substituted for the AcOH. D. KCNS 30 g. in 100 cc.; E. $\text{K}_4\text{Fe}(\text{CN})_6$ about 10% soln. Example of titration: Heat 1 cc. A + 1 cc. B + 1.5 cc. of dextrose soln. (0.5%) to boiling in an Erlenmeyer flask, then add 2 cc. of C at once with gentle whirling; to the clear soln. add 3 drops of D and whirl vigorously. A white ppt. of CuCNS forms leaving a blue soln. if Cu^+ ions are present; now add a few drops of E (down an inclined rod) and whirl again; the color becomes brownish red (with slight whirling a brown ring forms at top of soln.). The above is repeated with varying amts. of the sugar soln. till no color change is produced on adding $\text{K}_4\text{Fe}(\text{CN})_6$. With sugar solns. of 0.1 to 1.0% sugar content the following solns. were used: a 69.278 g. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ + 250 g. NaCl per l. Dissolve the CuSO_4 in 100 cc. H_2O and dil. with the NaCl soln. (add 1 or 2 drops of dil. H_2SO_4 or HCl if turbid); b same as B above; c 400 cc. 96% AcOH + 150 g. NaCl + 15 g. KCNS per l. To 400 cc. of AcOH add 100 cc. H_2O and 15 g. KCNS, and dil. to 1 l. with the NaCl soln.; d, 10% $\text{K}_4\text{Fe}(\text{CN})_6$ soln. Titration: Heat to boiling 1 cc. a + 1 cc. B + sugar soln., add at once 2 cc. of c and whirl vigorously, cool to about 50°, and add a few drops of d; repeat as above till no color change. If too much of c is added the Cu_2O ppt. may not dissolve, which is the case when the KCNS is mixed with b; solns. A, B, C, D, E do not have this disadvantage. Using an undild. Fehling soln., the disappearance of the blue color and the reddening with $\text{K}_4\text{Fe}(\text{CN})_6$ is sharper; the same holds if a dild. Fehling soln. is used with an undiluted sugar soln. Detn. of percentages between 0.01 and 0.1%: at least 10 mg. of NaOH or 10 mg. $\text{NaKC}_4\text{H}_4\text{O}_6$ per 1 cc. of sugar soln. must be present. The sugar soln. and soln. A must be accurately measured (a pipet of such diam. that 10 cm. = 1 cc.). The titration is made as above using following proportions: 10 cc. of sugar soln. + 1 cc. B + 1 cc. A, 2 cc. C, 3 drops D, 3 drops E. A study of the iodometric method of de Haën and Moser (*Z. anal. Chem.* 43, 597(1905); *Z. anorg. Chem.* 56, 143(1907)) showed that great accuracy can not be attained with the method as usually executed, due to the oxidation by the liberated I of substances formed on boiling sugar solns. with alk. CuSO_4 soln. (cf. Glaud, *Compt. rend.* 119, 73(1894)). A better procedure is to filter off the Cu_2O , dissolve the latter in HNO_3 , expel nitrous fumes and

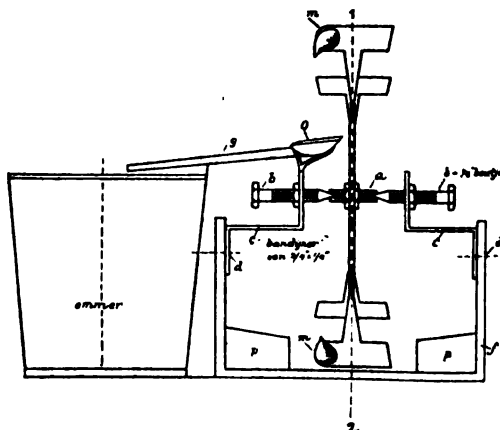
det. Cu iodometrically (cf. Lehmann, *Arch. Hygiene* 30, 274 (1898)), or dissolve the Cu_2O in $\text{Fe}_2(\text{SO}_4)_3 + \text{H}_2\text{SO}_4$ and titrate with KMnO_4 . The method of Bang based on the titration of the excess of Cu^+ salt with hydroxylamine sulfate soln. is not very accurate (about of same order as the rough or preliminary Fehling detn.), results differing from those obtained by polarization by 0.7%. Pavy's method (*Z. anal. Chem.* 19, 98) has no advantage over the Soxhlet; results vary with rate of titration; working with the dil. sugar solns. required errors are multiplied tenfold; the action of the air vitiates the results. The safranin method of Lindhardt and Hasselbach (*C. A.* 5, 312) has the disadvantage of color reproduction by action of the air, a slight shaking causing uncertainty as to the results. R. concludes that the volumetric Soxhlet method and those methods in which the Cu_2O is filtered off and washed surpass all other methods for accurately detg. sugar. If nitrogenous and coloring matters are completely removed from the sugar soln. by means of $\text{Hg}(\text{NO}_3)_2$, the sugar can be more accurately detd. gravimetrically or volumetrically than by polarization or fermentation. Cf. Schöndorff, *C. A.* 2, 3104; Rupp and Lehmann, *C. A.* 3, 1185; Kinoshita, *C. A.* 2, 2566; Ruoss, *J. prakt. Chem.* 22, 60.

F. W. S.

Protection against evaporation of water in the filtration of sugar solutions which are to be polarized. J. J. WEISS. *Z. Zuckerind. Böhmen* 39, 455-6 (1915).—W. discusses the results obtained by Bates and Phelps in studying changes in concn. of sugar solns. due to a filtration before polarization. Covering the filtering funnel with a glass plate or watch glass is considered to be a sufficient precaution against evapn. during filtration. W. describes a simple filtering vessel based on this principle.

H. S. PAINE.

A juice sampling device. H. E. DEBRIAS BACHER. *Arch. Suik-erind.* 23, 888-90 (1915); see fig.—From a circular piece of sheet Cu $\frac{1}{16}$ in. thick is cut a piece consisting of a central circular disk with a number of radial T-shaped arms. In two or more of these T's a depression (m) is hammered, and then all the arms are bent at right angles to the plane of the disk. The wheel is mounted as shown in an open launder. The speed of the wheel (and hence the size of the sample) is regulated by making the baffles (p) constrict the stream to a greater or less extent.



W. L. BADGER.

A rapid picnometer method for the determination of "gravity solids." HERBERT S. WALKER. *Intern. Sugar J.* 18, 33-7 (1916).—A 100 cc. picnometer with ground-in thermometer and capillary side arm is used. Since all detns. are made at room temp., the cap to the side arm is discarded and the arm itself cut off 2 or 3 mm. above the graduation mark, thus facilitating rapid filling to a definite vol. All calcs. can be eliminated by making a picnometer to contain exactly 100 g. of H_2O at a given temp. according to the tables used. The wt. of the liquid in the picnometer would then be 100 times its d. as compared with H_2O at that temp. and if a tare were made exactly to counterpoise the empty picnometer, the wts. required to balance the picnometer filled with sugar soln. would indicate the d. of that soln. without calcn., following which the Brix reading could then be obtained from tables, applying the same correction

used for Brix spindles in case the detn. were not made at the standard temp. Directions and tables of correction are given for using picnometers of different capacities and for solns. of the same or different ds. Also in *J. Ind. Eng. Chem.* 8, 262-4(1916).

A. GROSS.

Recovery of glutamic acid and betaine from extracts of the residue remaining from the recovery of sugar from molasses. K. ANDRLEK. *Z. Zuckerind. Böhmen* 39, 387-91(1915).—A. has improved his previous method for recovery of glutamic acid by substituting crystn. from aq. solns. for crystn. from hydro-alc. solns. One kg. of concd. ext. (78° Balling) of molasses residue is gradually mixed (with const. stirring) with 140 g. concd. (98%) H_2SO_4 dild. with 200 cc. H_2O . After cooling to 55° the liquid is rapidly filtered from the pptd. K_2SO_4 and allowed to stand 18-24 hrs. The approx. 150 g. of impure glutamic acid (contaminated with K_2SO_4) which sep. during this time are treated with 300 cc. boiling H_2O and the soln. is filtered hot (most of the K_2SO_4 remains undissolved). The filtrate is decanted from the 1st crystals (K_2SO_4) which sep., glutamic acid being deposited on subsequent cooling. The glutamic acid thus obtained is recrystd. from hot H_2O , sufficient (2-3 g.) animal charcoal being used to decolorize the soln. on the last crystn.; 30 g. colorless glutamic acid crystals with 9.5% N, m. p. 201-3° and $[\alpha] = +12.04^\circ$, are thus obtained. In view of the difficulty of sepg. K_2SO_4 and glutamic acid this method was modified by using H_3PO_4 (810 g. of 40% H_3PO_4 to 1 kg. concd. ext. (78° Balling) of molasses residue) instead of H_2SO_4 , the general subsequent procedure being essentially the same; 30 g. pure glutamic acid with 9.59% N, m. p. 202.5° and $[\alpha] = +12.04^\circ$ were obtained. The method was again modified by mixing 1 kg. of the concd. ext. (78° Balling) of molasses residue with 450 g. of a 30% tartaric acid soln. After 1 hr. the liquid was filtered from pptd. K tartrate and the filtrate was concd. on a H_2O bath to approx. 15° Balling and inoculated with glutamic acid crystals. Glutamic acid sepd. in 12 hrs.; when a higher concn. was employed glutamic acid sepd. as a gel. Recrystn. from hot H_2O (decolorizing with animal charcoal on the last crystn.) yielded a total of 60 g. colorless glutamic acid crystals, this being twice the yield obtained by the previous methods. Betaine phosphate was obtained by mixing 1 kg. of the concd. ext. (78° Balling) of molasses residue with 810 g. of approx. 40% H_3PO_4 , filtering off the cryst. mass of K_2PO_4 and glutamic acid which sepd. after 48 hrs., adding 300 g. of 40% H_3PO_4 to the filtrate and concg. on a H_2O bath to a wt. of approx. 800 g. The mass of crystals (impure betaine phosphate mixed with K_2PO_4) which sepd. after 48 hrs. was fractionally recrystd. from hot H_2O , the resulting 3 fractions being finally combined, decolorized with animal charcoal, and recrystd.; pure betaine phosphate was thus obtained [yield not stated]. Pure betaine was obtained by treating 100 g. betaine phosphate (dissolved in 750 cc. warm H_2O) with approx. 20 g. $Ca(OH)_2$ (in the form of 5° Bé. milk of lime) until the reaction became alk., filtering, concg. the filtrate on a H_2O bath until crystn. ensued and recrystg. until purity was attained.

H. S. PAINE.

The presence of reducing sugars in freshly harvested sugar beets. H. PELLET. *Bull. assoc. chim. suc. dist.* 32, 59-92(1915).—A very complete summary of the work done in the past century concerning the presence or absence of reducing sugar in sugar beets, together with a report of work done in 1913-4 by P. *et al* on this subject. Analyses made in various factories in France, in Egypt, Holland, Italy, Belgium, Spain and England are recorded. P. concludes that: (1) Freshly cut beets contain from 0.04% to 0.50% of reducing sugar, most specimens containing from 0.08% to 0.05%. (2) There is no relation between the richness in sucrose and the amt. of reducing sugar. (3) The amt. of reducing sugar is practically const. throughout the period of growth. (4) Allowing beets to remain exposed to the air for several hrs. does not increase the amt. of reducing sugar. (5) Beets grown in different seasons, in different countries,

and under varying climatic conditions show varying amounts of reducing sugar. (6) That earlier investigators had not been able to find any reducing sugar was due to the lack of a delicate chem. method. The method used was as follows: Treat 100 cc. of fresh juice with 4.5-6.0 cc. $\text{Pb}(\text{OAc})_2$, make to 110 cc. and filter. Remove the Pb from 55 cc. with satd. Na_2CO_3 soln. and filter. Heat to boiling 2 cc. of freshly mixed alk. Cu tartrate soln. (1 cc. = 0.005 g. reducing sugar). Introduce the sugar soln. from a buret into the boiling soln. in 2 cc. portions, allowing the mixt. to come to a boil between each addition. (7) Fodder beets low in sucrose do not contain more reducing sugar than do sugar beets. (8) Beets stored 5 or 6 mo. under favorable conditions do not develop more than 0.18% reducing sugar.

H. R. SMITH.

The formation of sucrose in beets. H. PELLET. *Bull. assoc. chim. suc. dist.* 32 159-165(1915).—A résumé of the long-continued discussion between Peligot, Girard, Vivien, Colin, Aulard and Pellet concerning the chemistry of the formation of sucrose in beets. The following points are made: (1) There is always reducing sugar in fresh beets which is contrary to the conclusions of Peligot, Girard, and others. (2) In the beet foliage there is always present with the sucrose a considerable amt. of reducing sugar—usually 3 or 4 parts to 1 of sucrose. (3) It has been asserted by various investigators that the amt. of sucrose in the leaves diminished during the night. P. finds that in 3 separate expts. under conditions favorable for accurate observations the diminution of sucrose was small and was accompanied by a corresponding diminution in reducing sugar. (4) The root is capable of transforming the reducing sugar into sucrose without the aid of the foliage. It is evident that there is formed in the leaf during the day both reducing sugar and sucrose, and that both of these pass to the root during the night where the sucrose is stored and the reducing sugar converted to sucrose and stored.

H. R. SMITH.

Cultural methods for inducing increase of sugar in stems of maize. O. MUNERATI AND G. MEZZADROLI. *Boll. dell'assoc. ital. dell'industria dello zucchero dell'alcool* 8, 25(1915-16); through *Ann. chim. applicata* 4, 365.—Expts. carried out in the low Padano valley in 1913-14 confirm the theory of Pallas Stewart that the extirpation of immature ears and of male flowering brings about a noteworthy increase of sugar in the stems of maize. The extirpation of the ears should be done without removing the bracteal involucre, and that of the male flowerings should be continued till fecundation occurs.

S. LEVY.

Progress of beet sugar manufacture in 1915. EDMUND O. VON LIPPMANN. *Chem. Ztg.* 40, 69-71(1916).

J. H. MOORE.

Factors affecting economy in vacuum pans. E. W. KERR. *Intern. Sugar J.* 18, 24-9(1916); cf. *C. A.* 10, 130.—Tests on vacuum pans were made with a view to obtaining data regarding heat transmission and economy under regular operating conditions; different types of pans were used with varying grades of products. The av. coeff. of heat transmission in the express pan tests was 40% greater than the av. coeff. in coil pans. The rise in temp. of boiling due to hydrostatic head, d. and purity was shown to be less in an express pan than in the coil pans, which is again an advantage in that the smaller the temp. rise the greater the temp. fall for a given steam pressure and means that there is a corresponding increase in capacity.

A. GROSS.

Use of germicides in sugar mills. W. E. CROSS. *Rev. industrial agr. Tucuman*, 6, 87-9(1915).—C. discusses the expts. of W. L. Owen on the relative germicidal value of formol, chloride of lime, milk of lime, NaHSO_3 , NaF and NH_4F in sugar mill work. Cf. *C. A.* 9, 2991.

H. S. PAINE.

"Natalite" 21. Simple sodium lamp for polariscope (FORESMORE) 1. Automatic scale for liquids (FENARD) 1.

Purifying sugar solutions. F. R. BACHLER. U. S., 1,170,868, Feb. 8. Sugar solns. are purified by mixing with kieselguhr and colloidal clay, heating to 50-60° and adding cottonseed or flaxseed ext. or other reagent to ppt. the clay, which settles out with the impurities and kieselguhr.

Utilizing bagasse. M. W. MARSDEN. U. S., 1,170,487, Feb. 1. Bagasse is prep'd. for use as newspaper stock by thoroughly drying it to prevent fermentation and decay, digesting it with warm H₂O to recover the extractive material, and reducing the residue to fiber.

Packing for heat-insulation. M. W. MARSDEN. U. S., 1,170,488, Feb. 1. Bagasse is ext'd. with a solvent to remove residual sugar and other fermentable constituents and the fiber after sepn. from the outer shell is rendered noncombustible by treatment with NH₄Cl, ZnSO₄, MgSO₄ or Na silicate.

29. LEATHER AND GLUE.

LLOYD BALDERSTON.

Destruction of anthrax spores on skins and pelts by sodium hydroxide. E. HAILER. *Arb. kais. Gesundh.* 50, 96-121(1915).—Anthrax spores in cattle skins, sheep and goat pelts are killed by 0.5-1% NaOH at a temp. of 15-20°, the toxic action of the NaOH being increased by the addition of 5-10% NaCl; nearly all spores are dead in 72 hrs. Even after treatment with NaOH and pickling a few spores may remain alive in isolated pieces of skin. Treatment of skins with NaOH before pickling has the advantage that soaking, liming and disinfecting may be done in one process. The combination of NaOH with the constituents of skins does not show a definite relation, as is the case with HCl. Extensive directions for the bacteriologic work are given, the method of Conradi being used (cf. *C. A.* 7, 355). It is shown that the wt. of dil. NaOH used should be at least 10 times that of the skins treated. L. W. RIGGS.

Pure salt for the preservation of hides. ANON. *Conceria* 22, 332(1914).—An English patent (18,890,1913 (*C. A.* 9,394)) based on the Abt theory of the inorganic origin of salt spots has recently been issued; the procedure involved requires the use of practically pure salt. According to the theory, the substance of the hide, because of its colloidal nature and amphoteric property, absorbs the salts of Mg and Ca which are present in common salt with consequent detriment to the hide and production of spots. By means of a special process it is possible to obtain common salt containing 99.99% of pure NaCl and it is claimed that when this product is used the amount of liquor which exudes from the hide is less than in cases where the impure salt is employed; the amt. of alk. substance dissolved from the hide is also reduced to a min. NaCl does not form a hydrate under the usual conditions of temp. and pressure, while the following hydrates are formed by salts which constitute the usual impurities in common salt: CaCl₂·6H₂O, MgCl₂·6H₂O, CaSO₄·2H₂O, Na₂SO₄·10H₂O. It is further claimed that the alk. substance which is formed by the action of pure salt on hides is removed by washing prior to liming, while the amount of nitrogenous material which passes into solution is reduced to a min. because of the absence of sulfates and salts which form hydrates. When impure salt is used, the above alk. substance probably reacts with salts of Ca and Mg with production of complex neutral salts and formation of insol. protein compds. The salts of Ca and Mg are further capable of reacting with the natural fatty substance (a portion of which is present in the form of free fatty acids) of the hide, thus producing insol. soaps. These soaps, being distributed irregularly in the hide, obstruct the pores, thereby producing spots, as well as a decrease in the vol. of leather which is obtainable. If the above claims are found to be justified, this

pure salt should find a wide application, provided it can be produced with sufficient cheapness.

H. S. PAINE.

30. RUBBER AND ALLIED SUBSTANCES.

R. T. STOKES.

A worthless guttapercha "substitute." *Utz. Pharm. Zentralhalle* 56, 481-2 (1915). —The substitute was claimed to be a pure nitrocellulose but proved to be an inferior grade of guttapercha, artificially colored.

C. O. EWING.

Chemistry of amorphous solids (LEWIS) 2.

Vulcanizing frothy tire fillers, etc. *F. FLEUMER. U. S.*, 1,167,518, Jan. 11. Balata or gutta-percha "froth fillings" for tires, etc., are vulcanized with hot gas under a pressure of 320 atm., cooled under a higher gas pressure, placed in a casing, heated to 79-90° and subjected to a vacuum to expand the filling.

Devulcanizing rubber. *G. STAUNTON. U. S.*, 1,169,437, Jan. 25. Dry ground rubber waste is mixed with dry K_2CO_3 and the dry powdery mixt. is spread in thin layers and exposed to the action of steam under 60 lbs. pressure per sq. in., or a somewhat lower pressure.

Recovering rubber from vulcanized waste. *G. STAUNTON. U. S.*, 1,168,230, Jan. 11. Comminuted vulcanized waste rubber is dried at a temp. of 110-150° with 20-25% its wt. of K_2CO_3 , and washed with H_2O and dil. acid.

Rubber substitute. *A. A. GLIDDEN. U. S.*, 1,171,187, Feb. 8. Rubber waste 30 is mixed with β,γ -dimethylerythrene 100 and with stearic acid 1 part; and heated in a sealed vessel at 100-120° for 1-3 weeks, to form a rubber substitute suitable for vulcanization.

Isoprene. *H. S. A. HOLT. U. S.*, 1,168,070, Jan. 11. The oil obtained as by-product in the manuf. of caoutchouc from 2,3-dimethyl-1,3-butadiene is distd. with steam and then vaporized and slowly passed through a tube containing an elec. heated Pt wire at a temp. of 500-700°. The distillate consists principally of 2,3-dimethyl-1,3-butadiene with small amts. of hydrocarbons of higher b. p. The oil is preferably sepd. from any unchanged residual hydrocarbon at the beginning of the process, before distg. with steam.

Waterproof fabrics. *F. E. BARROWS. Ger.*, 285,138, Oct. 26, 1912. The material to be waterproofed is treated with hydrocarbons yielding synthetic gums, such as isoprene, erythrene, diisopropenyl or other substituted erythrene, or a mixt. of these, whereupon these hydrocarbons are converted, by the known process of polymerization, into synthetic gums. A more uniform and thorough impregnation with gum is effected in this manner than is possible with the use of gum solns.

Chemical Abstracts

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Abstracts of patents are included under the appropriate divisions of the journal: those on organic compounds, unless they pertain especially to some other division, are under Pharmaceutical Chemistry. The abstracts of U. S. patents are prepared by Earl T. Ragan, those of Canadian patents by Russell S. Smart, of Fetherstonhaugh & Smart, Ottawa (50 Queen St.), and all others by O. D. Swett. Most German patents are prepared, with permission, from the abstracts in *Chemiker-Zeitung* and Italian patents from those in *Annali di chimica applicata*. All other patents are obtained direct from the specifications.

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CHEMICAL ABSTRACTS

Vol. 10.

APRIL 20, 1916.

No. 8

I. APPARATUS.

L. C. JONES.

Conductivity cell for electro-titration. H. E. ROBBINS. Mass. Agr. Coll., Amherst. *Am. J. Sci.* 41, 249-50(1916).—The advantages sought were: robustness, free access for titrating directly into the cell, adequate mixing without the complications of mechanical stirrers, economy of material. The cell is connected by a narrow U-tube with a bulb into which the liquid can be sucked and returned, in order to mix it. The electrodes are inserted at the open top of the cell. They are supported and protected by an open-ended cylinder of glass, which allows liquid to be run in from a buret.

W. P. WHITE.

The oxide resistance thermometer. S. L. BROWN. Univ. Texas. *Phys. Rev.* 6, 499(1915).—B. points out the practical necessity of using const. current with resistance thermometers of the type described in *C. A.* 9, 1137.

W. P. WHITE.

Note on the construction of a short vacuum gage. E. KARRER. United Gas Improvement Co., Phila., Pa. *Phys. Rev.* 6, 49-52(1915).—Detailed description of a short McLeod gage with swivel joint, similar to Rheden's, and simpler than Reiff's. No data are given as to performance, and especially nothing as to leakage through the swivel joint, the great weakness of this type.

W. P. WHITE.

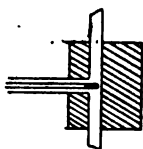
An electrically heated bomb furnace. D. F. CALHANE AND H. A. LAVENE. *Met. Chem. Eng.* 14, 140-3(1916).—The furnace consists of a central 1.75 in. iron pipe on which is wound a part of the heating coil, then 8 $\frac{1}{4}$ in. iron pipes to contain the tubes to be heated, and outside these a 6 in. iron pipe carrying the rest of the resistance. Alundum cement is used to insulate the wire (No. 18 nichrome ribbon $\frac{1}{8}$ in. wide) from the pipes. For 110 volts, 20 ft. of wire are wound on the inner tube and 98 ft. on the outer tube. Examples are given of the method of calcg. the radiation and hence the current input necessary to maintain a desired temp. (in this case 350-400°). Instead of the usual ballistic door to protect against explosions, a flat hinged door with any simple clamp is used, except that provision for explosions is made by cutting out a circular piece from the center and holding it in place by springs bearing against strips fastened to the edges of the door but raised in their central part. The action is similar to that of a poppet valve. Advantages claimed are: more uniform heating than with gas with less attention and no danger to other tubes in the furnace or to the operator in case of an explosion.

W. L. BADGER.

A practical apparatus for the preparation of alkyl iodides. NAGAVOSHI NAGAL. *J. Pharm. Soc. Japan* 1916, No. 407, 1-3.—The app. consists of a round-bottomed flask, a Soxhlet extractor (with syphon removed) and a return condenser. A porcelain plate is placed in the extractor and covered with a thin layer of asbestos. Alc. and yellow P are placed in the flask and I in the extractor. During the progress of the expt. the condensed alc. serves to wash the I into the flask. In the case of a higher alc. $\frac{1}{2}$ vol. Et₂O is added in order to increase the soly. of the I. Traces of alkyl iodide escaping from the condenser are collected by means of a bent tube, the end of which dips into water. Yields higher than 90% can be obtained. An abstract in German precedes the Japanese article.

H. W. DAUBY.

Apparatus for determining melting points above 270°. P. RASSFELD. *J. prakt. Chem.* 92, 467-8 (1915).—To obviate the disadvantages of the H_2SO_4 -bath, "Maquenne block" (cf. *Bull. Soc. Chim.* [3], 57, 471-4 (1903)), and Thiele "Cu block" methods (cf. *Z. anorg. Chem.* 15, 780), R. has devised a method in which a metal bath (e. g., Sn) is substituted for the metal block, using a box or crucible-shaped retaining vessel. A horizontal tube passes through 2 sides of the vessel, and has a vertical arm that passes up through the center of the bath (see fig.); the thermometer with a capillary tube (containing substance) attached is placed in this upright arm, the bulb reaching nearly to the bottom. One end of the horizontal tube is directed towards a window or other source of light. The substance in the tube darkens just before melting, and clears instantly with melting. The app. may be quickly heated, and is not subject to ready temp. changes, as is the Cu block by radiation. Cf. Muther and Tollens, *Ber.* 37, 313.



F. W. SMITHER.

The Hodges pneumatic trough. ANON. *Chem. News* 113, 61 (1916).—An app. by which a number of jars may be charged with gas quickly and easily. The jars are inverted on a table capable of rotation under water so that each may be brought in succession over the delivery tube.

F. A. HARVEY.

Acetylene generator. E. M. ROSENBLUTH. U. S., 1,173,122, Feb. 22.

Acetylene generator. H. W. JACOBS and H. H. LANNING. U. S., 1,173,430, Feb. 29.

Electrical plate condenser of phenol resin and paper. M. MEIROWSKY. U. S., 1,173,452, Feb. 29. Superposed sheets of paper treated with a synthetic phenolic resin and reinforced by metal plates are firmly compacted together by heat and pressure.

Fractional distillation. M. A. ROSANOFF. U. S., 1,171,464, Feb. 15. App. and method are specified. Const. temp. zones are utilized to obtain products of the desired compn.

Regulable stopper for a butyrometer. P. FUNKE & Co. Ger., 286,156, July 16, 1914.

Thermostat. K. WILKENS. Ger., 286,139, Oct. 24, 1914. The app. comprises 2 metals of different coeffs. of expansion, and a regulable contact screw.

Pyrometer with immersible stem. R. MARZ. Ger., 286,002, July 21, 1914. In the immersible end of a hollow quartz glass stem is arranged a short expansion member, the expansion of which actuates a second quartz glass rod member in connection with the usual indicator.

Spectrometric apparatus for determining color shades. F. SCHMIDT & HAENSCH and M. STANGE. Ger., 285,410, Jan. 20, 1914. The light coming from two spectra produced by a common source of light is reunited and compared, each for itself, whereby the light of the one spectrum serves for illuminating the shade being tested while that from the other spectrum is used for examg. the comparison shade.

Detection of gases by means of electrically preheated catalytic wire. E. HMOU. Ger., 286,042, Sept. 2, 1913. A Pt alloy is used for both the heated wire and the wire which effects the contact.

Device for preventing the escape of vapors from containers for volatile liquids. E. LEDERER. Ger., 286,123, Mar. 14, 1914.

Impregnating liquids with gases. A. HAUPT. Ger., 286,121, Dec. 11, 1913. An app. is specified.

Mixing machine. C. THOMANN. Ger., 286,105, June 17, 1913. The surface carrying the material is inclined at a suitable angle to the horizontal, and is provided with discharging devices in order that the material may be introduced, mixed and discharged without other mechanical means.

Filter with suspended asbestos as filtering medium. L. BOHLIG. Ger., 286,211, Aug. 14, 1913. The asbestos is stirred up in the liquid to be filtered and then allowed to settle upon the sieve. The sieve is supported at an angle of about 85° , is slightly convex, but lies more flatly against the side wall near the top, so that the suspended filter material is divided uniformly upon the sieve, lying lightly thereon but clinging firmly thereto. A similarly formed filter of cellulose may be superposed in order to provide a double filtration.

Electromagnetic separator. E. OPPEN. Ger., 296,207, Oct. 6, 1912. Different zones of increasing strength of magnetic field are arranged in the direction of flow of the material under treatment.

Furnace for manufacturing chemical or metallurgical products under pressure. E. BARTHELMESS. Ger., 286,136, July 27, 1913. The reaction chamber consists of a heat-insulated vessel constructed to withstand high pressure and adapted to be rotated around its axis in order to secure movement of the charge and uniform heating.

Tube burner for heating purposes. J. H. ACKROYD. Ger., 285,988, Nov. 7, 1913.

Burner jet for inverted lamps. AUTOGEN-WERKE FÜR AUTOGENE SCHWEISS-METHODEN. Ger., 285,577, Nov. 15, 1913.

2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS AND E. B. MILLARD.

Atomic weight of bismuth. W. OECHSNER DE CONINCK AND GERARD. *Compt. rend.* 162, 252(1916).—Bi, purified from S and As, was melted under KNO_3 , then changed to chloride and reduced to metal with H which had been passed through warm KMnO_4 soln., concd. NaOH and H_2SO_4 . From the weights of chloride and Bi the at. wt. was calcd. Only 4 detns. have been made, using each time about 0.5 g. BiCl_3 , and weighing to 4 places. The at. wts. were 208.55, 208.52, 208.48, 208.46, mean 208.50. (The value for 1916 is 208.0.) No other details of purification, methods of experimentation or weighing have been given.

E. B. MILLARD.

Some physical properties of elements and simple compounds. W. HERZ. Breslau. *Z. anorg. allgem. Chem.* 94, 1-22(1916).—A collection of data in regard to a number of physical properties which vary in harmony with the periodic system. Contains neither new material nor a new point of view.

GEORGE W. MOREY.

The relation between the boiling point and the constitution. L. CASALE. *Gazz. chim. ital.* 45, I, 567-79(1915); see C. A. 10, 301.

E. J. WITZEMANN.

The second virial coefficient for rigid spherical molecules whose mutual attraction is equivalent to that of a quadruplet placed at its center. W. H. KESOM. Leiden. *Proc. Akad. Wetenschappen* 18, 636-46(1916).—Previously the 2nd virial coeff. (B) in the equation of state was derived for rigid spheres of concentric structure whose mutual attraction is equiv. to that of a couplet placed at the center. Recent work has made it evident that the mol. of diatomic gases does not possess such a moment, and in the present paper an expression for B in terms of $1/T$ is developed on the assumption that the mutual attraction is equiv. to a quadruplet composed of 2 doublets whose axes lie in the same line and have opposite directions. Above $0.75 T_{\text{inv}}$ (the temp.

of inversion for small d .) the values of B obtained nearly coincide with that calcd. on the previous basis of attraction equiv. to a doublet, and neither differs much from those derived by means of the assumptions of Clausius and Berthelot; values calcd. on the basis of van der Waals' equation are lower. The values of B detd. for H from -100° to $+100^\circ$ are represented with sufficient accuracy by the theoretical equation.

GEORGE W. MOREY.

Two theorems concerning the second virial coefficient for rigid spherical molecules which besides collisional forces only exert Coulomb-forces and for which the total charge of the active agent is zero. W. H. Keesom. Leiden. *Proc. Akad. Wetenschappen* 18, 868-71 (1916).—K. previously developed (cf. *C. A.* 8, 1046) an expression for the 2nd virial coeff. (B) in terms of $1/T$ for rigid spherical mols. which carry a doublet at the center, in which terms containing odd powers of $1/T$ did not appear; recently (cf. preceding abstract) a similar expression was developed for the case that the mols. carry a quadruplet, and in it the term $1/T$ did not appear, but the higher odd inverse powers of $1/T$ do occur. In this paper it is shown that if the term $1/T$ does not occur the following conditions must be fulfilled: (1) the mols. behave in their collisions as rigid spheres; (2) the attractive or repulsive forces between mols. originate from a fixed point in the center, and follow the inverse-square law, so that these forces might be ascribed to an elec. agent; (3) the total quantity of the above agent in each mol. = 0 (the mols. behave as if electrically neutral). If no odd powers of $1/T$ occur, the following additional condition must be fulfilled: (4) the mol. possesses, as regards its attractive and repulsive forces, at least "1 axis of inverse symmetry," i. e., each vol. element contains a quantity of the above agent equal and opposite to that of the vol. element with which it coincides after a revolution through an angle of $2\pi/k$, k being a whole even number. If the 1st set of conditions holds true, Berthelot's equation of state will hold for high temp. at d . for which only collisions between 2 mols. have to be considered; if condition 4 is fulfilled the agreement will be better. G. W. M.

Critical end points in ternary systems. A. Smits. Amsterdam. *Proc. Akad. Wetenschappen* 18, 793-807 (1916).—A continuation of S.'s theoretical treatment of critical end points in ternary systems (cf. *C. A.* 7, 3694). The following cases are treated: (7) component A does not give crit. end points with either B or C , but does with the ternary compd. D ; (8) the ternary compd. D , decomposes into the binary compd. D , before the 2nd crit. end point q is reached; (9) in addition to the conditions given in (8), crit. end points are also found in the system $A-C$; (10) A and B both volatile, but neither give crit. end points with C , although they do with the compd. D ; (11) similar to (10) except that crit. end points occur in the system $A-C$; (12) all 3 components are volatile, but form a ternary compd., melting at a high temp., and yielding crit. end points with each of the 3 components. In each of the above cases the relations are discussed by means of projections on the basal triangle; in addition the sequence of $P-T$ curves around an invariant point is discussed, the conclusions reached being identical with those reached by Schreinemakers (cf. *C. A.* 10, 307). Projections of the 4-phase lines on the $P-T$ plane for certain systems are also drawn. G. W. M.

Investigation of the equilibrium liquid-vapor of the system argon-nitrogen. G. HOLST AND L. HAMBURGER. Eindhoven. *Proc. Akad. Wetenschappen* 18, 872-94 (1916).—An investigation of the compn. of coexisting liquid and vapor phases as a function of temp. and pressure of the system $A-N$, undertaken with reference to the technical sepn. of the 2 gases. Analyses of $A-N$ mixts. were made by fixing the N by means of a glow discharge in K vapor; the method was accurate to 0.1%, and is capable of higher accuracy. Comparison of results obtained by the above method and with a baroscope gave systematic differences when the value 0.0017809 was used for the normal d . of A , but when Schultze's value 0.00178376 was used these differences

disappeared; this value is confirmed by a preliminary expt. which gave 0.001783 for the d. of A. The methods used in the investigation were those of Onnes and his co-workers. The end points of condensation and the points of beginning condensation were detd. to 0.02°. The results obtained are presented in tables and curves, but cannot be briefly abstracted. The triple point of A is at 83.81°, 521.4 mm.

GEORGE W. MOREY.

Invariant, monovariant, and divariant equilibria. III. F. A. H. SCHREINEMAKERS. Leiden. *Proc. Akad. Wetenschappen* 18, 820-8 (1916); cf. *C. A.* 9, 2728; 10, 307.—Continuation of S.'s theoretical study of the sequence of the curves and regions representing the mono- and divariant equil. which may proceed from an invariant point in a P - T diagram, the present discussion being confined to quaternary systems. The method of derivation does not lend itself to abstracting; it is similar to that of previous papers, and to that used by S. in the discussion of the same problem in ternary systems in "Die Heterogenen Gleichgewichte." In the present case, on the basis of the shape of the solid figure formed by the points representing the compn. of the 6 phases (when the 4 components are represented as usual by a tetrahedron) the possible cases are referred to 4 types, which are all in accordance with each other in that in each the 6 monovariant curves succeed each other in the same definite succession.

GEORGE W. MOREY.

Effect of general mechanical stress on the temperature of transition of two phases, with a discussion of plasticity. P. W. BRIDGMAN. *Phys. Rev.* 7, 215-23 (1916); cf. *C. A.* 9, 2479, 2617, 3000; 10, 710.—The question at issue was: what is the effect on a transition (or melting) point of unknown extra stresses not hydrostatic in nature? A thermodynamic formula has been derived for the general case, and some special cases of it have been discussed. It was shown that if a liquid and solid are in equil., and a change dp , supposedly equal on both phases, be applied, but if on account of some imperfection of the app. an additional stress not hydrostatic was applied to some portion of the surface of equil., the melting or freezing would take place at the free surfaces with such changes of vol. as would tend to produce throughout the mass just that change of hydrostatic pressure which was supposed to have been applied. In the case of 2 solids in equil. this re-distribution of stress might not take place, on account of a protective coating of one solid over portions of the other. Objections are raised to the ordinary theory of plasticity on the grounds that plastic flow of a well annealed metal begins at the same numerical value of stress whether in compression or tension, while the theory demands that the m. p. be raised, and that there should, therefore, be no plastic flow at all under tension. B. modifies the theory so as to state that a solid subjected to any stress whatever experiences a *depression* of the m. p. at the *unstressed* surface (or at a surface stressed by less than the average amount) and melting will take place at that surface if the stress is high enough. Thus, flow is produced by a condition of actual local melting followed by regelation with equalization of pressure on all the grains. This theory is then discussed. Values of the flow point calcd. by Johnston (*C. A.* 6, 560, 1873) are from 8 to 40 times too low, when compared with the exptl. values of Faust and Tammann (*C. A.* 5, 233).

E. B. MILLARD.

Diffusion of electrolytes in gelatin. B. L. VANZETTI. *Atti r. ist. veneto* 73, II, 1385-1408; 74, II, 805-11, 1229-33. I and II. See *C. A.* 9, 406. III.—V. has carried out expts. in single tubes 2-3 mm. in diameter filled with gelatin containing AgNO_3 , into which equiv. solns. of HCl and KCl were allowed to diffuse. It was found that the relation (h'/h) between the height (h') reached by the ppt. of AgCl formed from the acid and that (h) from the salt is a constant. It was also shown that, during the same interval of time, the salt and the acid diffuse at about the same speed through gelatin containing AgNO_3 at low concns. IV. A series of expts. was carried out to det. the concn. which HCl and KCl reach at various intervals of time in diffusing through

pure gelatin. A 0.1 *N* soln. of the electrolyte was allowed to diffuse through 10% gelatin in a tube of 15 mm. diameter. Portions of the gelatin were removed at intervals and analyzed. The value of the relation h/q (height reached/quantity diffused) is const., as is also $h/\sqrt{\text{time}}$. When the concn. of AgNO_3 is fixed and that of the electrolytes diffusing in is varied, the difference in speed of diffusion of the salt and acid is explained on the basis that with low concn. of KCl there is retardation in the sepn. of solid AgCl , this latter tending to remain in the colloidal condition, whereas with HCl pptn. occurs and the acid diffuses through more rapidly than the salt. This is independent of the counter-diffusion of the Ag salt. L. T. FAIRHALL.

Adsorption. V. G. C. SCHMIDT AND B. HINTELER. Münster. *Z. physik. Chem.* 91, 103-23 (1916); cf. *C. A.* 7, 2879 (1913).—The adsorption of the vapors of C_6H_6 , C_6H_{14} , CS_2 , CHCl_3 , Me_2CO , EtOH , MeOH and H_2O by charcoal has been studied. The satn., in the case of normal liquids, is approx. inversely proportional to the mol. vol. in the liquid condition. In the case of associated liquids, the product of the satn. and the mol. vol. is sometimes larger and sometimes smaller than in the case of normal liquids. The satn. is expressed by the formula, $c_1 = kc_2^\alpha$ or $\pi(c_1/S)^\alpha$, where c_1 is the concn., c_2 the quantity adsorbed, π the vapor tension, S the satn., k and α are consts. H. JERMAIN CREIGHTON.

Theory of adsorption. IRVING LANGMUIR. *Phys. Rev.* 6, 79-80 (1915).—The valency of an atom appears to be divided among several surrounding atoms. There is thus an unbalanced force on the surface of a crystal, so that the atoms may be considered in an unsatd. state. An adsorbed film consists of atoms (or mols.) of the adsorbed material chem. held by the atoms of the solid so as to form a continuation of the space lattice of the solid. The amount of material adsorbed depends upon a kinetic equil. between the rate of condensation and the rate of evapn. from the surface. Practically every mol. striking the surface condenses (independently of the temp.). The rate of evapn. depends upon the temp. (van't Hoff's equation) and is proportional to the fraction of the surface covered by the adsorbed material. Mols. striking a surface already covered also condense, but usually evap. much more rapidly than from the first layer. Hence, except when the vapor is nearly satd., the amt. of material adsorbed on a plane surface rarely exceeds that contained in a layer one atom (or mol.) deep. The theory seems to be in quant. accord with observed effects. E. B. MILLARD.

Adsorption. TADEUSZ. *Elektrochem. Z.* 22, 176 (1916).—Polemical. Williams' work (cf. *C. A.* 8, 2093) on negative adsorption is criticized as differing in many points from the findings of T., who holds that the cond. measurements alone do not give a correct idea of the course of the C adsorption. T.'s expts. on the adsorption of $\text{K}_2\text{Cr}_2\text{O}_7$ have shown that the adsorption of K is much weaker than that of Cr_2O_7 . This is also confirmed by the work of others. It is becoming more generally believed that C adsorption is a displacement adsorption. He has also found that even the purest C, with a KCl soln., always gave off small amts. of NH_4 ions. W. E. RUDER.

Law of solubility. H. LECHATELIER. *Compt. rend.* 162, 245-6 (1916).—Polemical. Cf. A. Colson, *C. A.* 10, 304, 415, 711. E. B. MILLARD.

Chemical activity of the ions of hydrochloric acid determined by electromotive force measurements. Preliminary paper. J. H. ELLIS. Mass. Inst. Tech. *Proc. Nat. Acad. Sci.* 2, 83-7 (1916).—The e. m. f. and free energy decrease of HCl solns. of different concns. have been measured at 18°, 25° and 35°. The activity coeffs. of the solns. have been calcd. at 18°, on the assumption that at the smallest concn. (0.00167 *M*) the activity coeff. is equal to the ionization coeff. derived from the ratio of the equiv. cond. at that concn. to that at infinite diln. The values obtained show that the activity coeff. first falls more rapidly than the cond. ratio. H. JERMAIN CREIGHTON.

The dissociation and formation of sulfuryl chloride. M. TRAUTZ. *Chem. Ztg.* 39, 100(1915).—Between 18° and 100° the reversible reaction, $\text{SO}_2 + \text{Cl}_2 \rightleftharpoons \text{SO}_2\text{Cl}_2$, could not be maintained as a pure gas reaction without exposure to light; only on the addition of animal charcoal could reproducible results be obtained. The reaction in either direction then behaved as an absorption reaction, without any disturbing effect due to diffusion. The order of the reaction was roughly normal in either direction, but more exactly so in the case of the dissociation than in the case of the formation. The formation was almost independent of temp.; the dissociation had a temp. coeff. of about 1.5. These and other observations could all be explained by the restricted sphere of the reaction (confined to the absorption layer), as compared with a normal gas reaction. The formation of SO_2Cl_2 under the influence of the light of the quartz and "uvioi" lamp was studied at 18° and 99° at various concns. At the higher temp. it took place fairly normally as a reaction of the second order. The accumulation of by-products both in this reaction and, after a time, in the reversible reaction in the dark, has a disturbing effect on the constants. The dissociation under the action of light gave no constants at all on this account. The velocity of formation of SO_2Cl_2 in light was almost independent of temp. and in that respect normal. The velocities of the reaction in presence of charcoal and in presence of light were of a similar order of magnitude.

L. T. FAIRHALL.

The recognition of complexes in solution by the electrical conductivity method. C. SANDONNINI. Univ. Padoa. *Atti r. ist. Veneto* 74, 519-34(1915).—The detn. of the elec. cond. of mixts. of electrolytes has been largely used as a method of detg. the existence of complexes in soln. The theoretical and experimental material on this subject is very abundant and 2 methods have been principally used. (1) The detn. of the cond. of a mixt. of solns. of the simple salts in suitable concns. and in mol. ratios such as correspond to the compn. of the supposed complex, to see if such cond. is equal to or different from that calcd. additively. If a lower value is found, it is concluded that a complex is formed. (2) The isotherms of cond. are constructed to see if the formation of complexes is disclosed by the appearance of particular points corresponding to their concn. Much of the work that has been done is reviewed and a bibliography is given. The principal purpose of the present expts. was to det. whether the cond. curves of pairs which are known to give compds. are characteristic. The cond. was detd. at 25° in the Kohlrausch app. Rather concd. solns. of the pure salts were made which were mixed in the requisite proportions and dild. to the desired extent. *Pairs of salts that do not give complexes.* As a type of salts having nearly equal dissociation values KCl and NaCl (Noyes and Falk, *C. A.* 6, 1562) were taken. For the same reason BaCl_2 and SrCl_2 were taken. The % variations from the calcd. value for both mixts. are small and though they agree very well with the calcd. values the observed values are always a little low. As a type mixt. in which the 2 salts have a differing degree of dissociation $\text{NaCl} + \text{Na}_2\text{SO}_4$ was taken for which the data show a max. difference of -2.2% as compared with the calcd. values. *Pairs of salts that give complexes.* As types of compds. known to form complexes mixts. of $\text{KCl} + \text{HgCl}_2$ and $\text{NaCl} + \text{HgCl}_2$ were studied which are known to give $\text{KCl}_2\text{HgCl}_2 \cdot 2\text{H}_2\text{O}$ and $2\text{KCl} \cdot \text{HgCl}_2 \cdot \text{H}_2\text{O}$ (Foote, Levy, *Am. Chem. J.* 53, 239(1906)) and $\text{NaCl} \cdot \text{HgCl}_2 \cdot 2\text{H}_2\text{O}$. With the pair $\text{KCl} \cdot \text{HgCl}_2$ 11 mixts. gave a max. difference of -7.0% at 5 mol. % KCl. For the pair $\text{NaCl} \cdot \text{HgCl}_2$ the max. difference of -7.3% was observed with 10 mol. % NaCl. With $\text{KCl} + \text{CdCl}_2$ (forms $4\text{KCl} \cdot \text{CdCl}_2$ and $\text{KCl} \cdot \text{CdCl}_2 \cdot \text{H}_2\text{O}$) according to Sudhaus (*C. A.* 8, 1714) the max. differences of -8.2% was obtained at 25 mol. % KCl. Such deviations were also found by Jones and Ota (*Am. Chem. J.* 22, 11(1899)) and Lindsay (*Am. Chem. J.* 25, 64(1901)). For the mixt. $\text{KCl} + \text{CdI}_2$ Jones and Caldwell found great deviations as compared with calcd. values. Cqpd. detns. on solns.

of $v = 2.8$ and 32 equivs. per l. showed a max. difference at 25 mol. % KI in the more concd. soln. and at 40 mol. % for the soln. $v = 8$ and at 25 mol. % for the soln. $v = 32$. The curve plotted for these values shows no break corresponding to the complex but simply a convexity in the cond. curve. This coincides with the result of Woitaszewsky. In fact the presence of a sharp break in a curve of this type appears to be possible only when the 2 components combine to give a perfect complex that is itself practically not dissociated into its components as in the complex acids studied by Miotati. If, however, the complex is dissociated not only into its ions but also to a large extent into the single salts of which it is composed then the break will naturally be more and more rounding the more extensive is this dissociation, but the cond. will always be less than the calcd. values. But this convexity is not characteristic since it is also shown by mixts. in which complex formation is known to be absent. Thus from the absence of breaks in such curves one cannot conclude that complexes do not exist. The % differences between the observed and the calcd. values are greater in cases in which salts combine but this would only be qualitative evidence of the existence of such compds. and fails to indicate their exact compn. The results show that complexes in soln. are in part dissociated into their components. The results obtained by Costacescu and Apostoi may be due to error in expts. E. J. W.

The viscosity of liquefied gases. I. The rotational oscillations of a sphere in a viscous liquid. J. E. VERSCHAFFELT. Leiden. *Proc. Akad. Wetenschappen* 18, 840-56(1916).—A mathematical discussion of the relation between the time of vibration of a sphere rotating in a liquid and the viscosity of the liquid; it is preliminary to the study of the viscosity of liquefied gases. The general cases discussed are: (1) the liquid is externally unlimited, (2) the liquid is limited by a stationary concentric spherical surface. From the relations obtained (they cannot be briefly abstracted) the most favorable exptl. conditions are discussed, and an example of the application given. The general subject is given a rigid mathematical discussion, and the expts. and equations of others considered and criticized. II. Similarity of the oscillations of spheres in viscous liquids. *Ibid* 860-7.—A study of the conditions that must be fulfilled if 2 spheres, swinging in 2 different liquids, are to have "similar" motion. It is concluded that "the radius of the 2nd sphere may even be chosen arbitrarily, but the moment of inertia of the vibrating system (K) and the rotational moment (M) are then completely detd. That there is no similarity in general is due to the fact that the motion depends on 5 quantities, η , μ (viscosity and density of the liquid, resp.), R (radius), K and M ." GEORGE W. MOREY.

Relation between surface tension and other quantities. MASAO KATAYAMA. *Sci. Reports Tohoku Imp. Univ.* [1] 4, 373-91(1916).—A formula has been derived for the surface energy of liquids which is independent of the influence of the vapor above the liquid, $E = \gamma(M/(D_l - D_g))^{1/2} = a(T_k - T)$, where γ is the surface tension, M the mol. wt., D_l the d. of the liquid, D_g the vapor d., T_k the abs. crit. temp., T the temp. at which γ and the mol. vol. are detd., and a a const. This equation has been applied to calcs. of the data of Ramsay and Shields on C_6H_6 , C_6H_5Cl , CCl_4 , Et_2O , $EtOAc$ and $MeCOOH$. If the difference between the d. of liquid and vapor is used in calcg. values from the Eötvös equation, no contradiction is found between the equation and the theory of corresponding states, and the calcd. values agree with the exptl., even at temps. near the crit. temp. When the liquid under consideration is associated, the temp. coeff. of its mol. surface energy may be greater or less than the normal value of a , and the degree of association cannot, therefore, be detd. in this way. Van der Waals' equation for surface tension is also discussed mathematically. It is confirmed by expts. From it and the modified Eötvös equation (above) the following expression may be derived: $D_l - D_g = 3.03(1 - \theta)^{0.361} D_h$. A relation

exists between the Röntgen const. (σ) and that of the van der Waals' equation. The following relation between the temp. coeff. of surface tension and the Celsius temp. scale was obtained: $(1/\gamma_0)(d\gamma/dT) = B[1 - (t/t_h)]^{B-1}$, where $B = 1.234$, and the simple relation between the total surface energy and the free surface energy $\sigma/\gamma = (1 + 0.234\theta)/(1 - \theta)$ was derived and confirmed by the exptl. data. A math. discussion of total surface energy is also given. E. B. MILLARD.

A method of measuring surface tension and angles of contact. A. ANDERSON AND J. E. BOWEN. Univ. College, Galway. *Phil. Mag.* 31, 143-8 (1916).—The method depends on the measurement by optical means of the radius of curvature of the meniscus in a tube immersed in a vessel of the liquid, and of the height of the center of curvature above or below the surface of the liquid outside. To det. the radius a microscope is used, measuring the distances of an object and its image from the center of the meniscus.

G. L. WENDT.

The kinetics of the accelerated oxidation of phenylthiourea by charcoal. H. FREUNDLICH AND A. BJERCKE. Braunschweig. *Z. physik. Chem.* 91, 1-45 (1916).—The decompn. of phenylthiourea by animal charcoal consists in its oxidation by O_2 with the formation of free S and an org. base. This latter substance is in all probability the so-called Hector base. The process probably occurs in accordance with the equation: $2SC(NH_2)NPh + O_2 = PhN:C.NH.C(:NH).NPh.S + 2H_2O + S$.

The progress of the reaction with time is expressed by the equation: $k = v_0(x + \xi)^2/2m_0t\sqrt{(O_2)_L}$; where x is the decrease in the phenylthiourea concn., t the time, m_0 the original quantity of charcoal, v_0 the initial volume, $(O_2)_L$ the concn. of the O_2 in the soln., and ξ the decrease in the concn. of phenylthiourea which occurs while adsorption takes place. The velocity of the process is, therefore, independent of the concn. of the phenylthiourea, proportional to the square root of the O_2 concn., proportional to the ratio m_0/v_0 and inversely proportional to the quantity of phenylthiourea transformed, calcd. per unit weight of charcoal. The temp. coeff. is fairly large, $k_{35^\circ}/k_{25^\circ} = 2.3$. The kinetic progress of the reaction may be explained on the assumption that the process is one of diffusion, in which the strongly adsorbable phenylthiourea is always present in excess at the surface of the charcoal, while the O_2 diffuses through it. The magnitude of the temp. coeff. confirms this conception, since the equil. const. is not only proportional to the diffusion const., but is also dependent upon other quantities influenced by temp., such as the soly. of the O_2 in the diffusion layer. The adsorption of phenylthiourea by animal charcoal takes place in accordance with the usual adsorption isotherm. The adsorption decreases with increase in temp. It is shown that the progress of the oxidation of $(CO_2H)_2$ by animal charcoal (cf. Warburg, *C. A.* 8, 1437) may be regarded as a diffusion process. In support of this conception, it is pointed out that the retardation of the reaction by urethans is proportional to the quantity adsorbed, and that their influence increases in the homologous series, in conformity with the Traube rule. The equation given above agrees within wide limits with the Schütz rule, for many enzyme reactions. If the O_2 concn. is regarded as remaining const. during the expt. and v_0 as const. for the enzyme reaction, then the foregoing equation can be written in the form: $(x + \xi)^2 = n.m_0t$. However, according to the Schütz rule: the quantity of the reacting substance transformed is independent of its concn., proportional to the square root of the quantity of enzyme and to the time. It is merely necessary, therefore, to put the quantity of enzyme equal to the quantity of charcoal.

H. JERMAIN CREIGHTON.

The dynamics of the splitting off of carbon dioxide from organic compounds. E. BAUR AND R. ORTHNER. Zürich. *Z. physik. Chem.* 91, 75-102 (1916).—The decompn. of the basic ferric oxalate of Eder into ferrous oxalate and CO_2 has been mea-

sured at temps. between 160 and 200°. It has been found that an equil. is established. Attempts to convert ferrous oxalate to ferric oxalate with CO₂ have not been successful. The value 2.7×10^{-4} has been found for the equil. const. for the decompn. of salicylic acid into phenol and CO₂ at 203°. It has not been possible to synthesize salicylic acid from phenol and CO₂. The dissociation pressure of the CO₂ produced by the decompn. of Na salicylate is 183.5 mm. at 230° and 143 mm. at 220°. H. J. C.

Measurement of very low temperatures. XXVI. The vapor pressure of oxygen and nitrogen according to the pressure measurements of v. Siemens and the temperature determinations of Kammerlingh Onnes. G. HOLST. Leiden. *Proc. Akad. Wetenschappen* 18, 829-39(1916).—A discussion of the temp. scale of the Leiden Physical Lab. which seems to be about 0.05° lower than that of the Reichsanstalt, at the f. p. of Hg, though over the rest of the range considered (up to 0°) the max. difference between the two is 0.02°. The results of v. Siemens (cf. *C. A.* 8, 608) on the v. p. of O and N are recalcd. to the present temp. scale. G. W. MOREY.

Experimental technics of calorimetric measurements at high temperatures. S. TAMARU. Tokio. *J. Soc. Chem. Ind.* 35, 81-8(1916).—This paper deals only with gas calorimetry, and is an improved repetition of the German paper on the heat of formation of NH₃ (*C. A.* 9, 2619), with additional details as to exptl. procedure, especially in the measurement of the gas flow. A form of reducing valve, or gas pressure regulator, is also described, in which the valve is opened and closed by the falling or rising of a floating bell, the gas beneath which is in communication with the gas stream whose pressure is to be regulated. The bell obviously tends to rise and fall very greatly with small changes of pressure, so that the arrangement is very sensitive, but no data of its performance are given. W. P. WHITE.

The true temperature scale for tungsten and its emissive powers at incandescent temperatures. A. G. WORTHING. Nela Lab., Cleveland, O. *J. Franklin Inst.* 181, 417-8(1916).—A hollow W filament, with small holes revealing the interior, served as the black body, whose radiation was compared (using a few corrections) with that of the exterior surface. The radiation coming normally from a W surface is 0.467 times that from a black body at 1200° K. and 0.406 at 3200° K., varying linearly between the two. The corresponding differences in degrees (red light) are 33° and 375° between the true temp. of the W, and the "effective" temp., i. e., the temp. obtained by considering it to radiate as a black body. The m. p. is placed at 3630° K. W. P. WHITE.

"Color temperature" scales for tungsten and carbon. E. P. HYDE, F. E. CADY AND W. E. FORSYTHE. Nela Lab., Cleveland. *J. Franklin Inst.* 181, 418-20(1916).—The "color temperature" of a body is the temp. for which, in the radiation of a black body, 2 selected wave lengths have the same ratio of intensity as the same 2 wave lengths in the body investigated. This "color" temp. is above the true temp. of the body, and much closer to it than the effective temp. or the (lower) temp. at which the total radiation from a black body equals that from the other. This color temp. scale "accurately and very readily" defines the temp. of radiating W. W. P. WHITE.

The effective wave length of transmission of red pyrometer glasses and other notes on optical pyrometry. E. P. HYDE, F. E. CADY AND W. E. FORSYTHE. Nela Lab., Cleveland, O. *Phys. Rev.* 6, 70-5(1915).—Pyrometer glasses are not strictly monochromatic, but the theory relates to monochromatic radiations. It is, therefore, necessary to find the effective, or equiv., wave length of the glass used. The effective wave length has been incorrectly defined and measured. It is the wave length such that the ratio of the total transmission at 2 temps. is the same as the ratio of the intensities of that wave length at the 2 temps. This was measured by 3 methods, with a black body as source, for a sample "probably" of Jena "Rotfilter" glass, Na

F 4512. The effective wave length varied from 665μ for $1336-1600^\circ \text{K.}$ to 0.662μ for $2400-3100^\circ$. Other glasses can easily be compared with this carefully calibrated glass. It was also found that the transmission changes with the temp. of the glass, falling, for 0.65μ , to less than half between 20 and 80° . W. P. WHITE.

The movement of ions (and electrons) in an electric and magnetic field. A. RIGHI. *Ann. phys.* 4, 229-70(1915).—R. discusses the movement of ions and electrons in elec. and magnetic fields from a math. standpoint. In the cases of electrolytes and gases, a few expts. of a qual. nature are included. L. T. FAIRHALL.

Mechanical strain and thermoelectric power. W. P. WHITE. *Geophys. Lab., Washington. Phys. Rev.* 6, 234-6(1915).—The effects on the thermoelec. power of permanent strain (*i. e.*, hardening) of metals bear no relation to the temporary effects produced by strains which are below the elastic limit. Alloying usually lowers the thermoelec. power of metals. Pt, however, is an exception. Permanent strain usually raises the thermoelectric power, thus acting oppositely to alloying; it lowers the thermoelec. power of some Pt alloys, thus again acting oppositely to alloying. But it raises pure Pt, just as alloying does. No theoretical application is made of these facts. Serious confusion has occurred in the study of thermoelec. power from uncertainty as to the convention used regarding the sign of the effect. That metal should be counted positive which gives current at the cold junction. W. P. WHITE.

Tests of thermoelectric formulas based on bismuth and bismuth-tin alloys. A. E. CASWELL. *Univ. Oregon. Phys. Rev.* 7, 269-77(1916).—By a method already described (*C. A.* 6, 452) the Peltier effect was detd. for Bi and 3 alloys of Bi and Sn. The results, taken together with Schulze's data on elec. and thermal conds. of such alloys, give values for certain electronic const's. which agree better with Drude's than with Thomson's or Lorentz's form of electron theory. W. P. WHITE.

The spontaneous electron emission of glowing metals and the electric glow element. W. SCHLICHTER. *Göttingen. Ann. Physik* 47, 573-640(1915).—Metals heated *in vacuo* usually emit at first positive ions, but with an increasing proportion of negative electrons as time goes on. To measure the discharge an elec. p. d. is usually applied between the emitting and the receiving electrode which prevents any of the electrons from returning whence they started. This p. d., however, may also cause more electrons to be emitted. Hence, to det. the true spontaneous emission it is necessary to omit the applied p. d. S. accomplishes this by having the sending and receiving electrodes sepd. by a distance less than the mean free path of the electrons in the gas present (this requires a high vacuum), by having one electrode inclose the other, and by heating the emitting electrode by radiation through the wall of the vacuum tube, since direct elec. heating usually employed introduces p. d.'s which affect the motions of the electrons. The following experimental results were obtained: (1) Electrons were not given off appreciably until most of the ionic (positive) emission had ceased, as if that inhibited the emission of electrons. (2) As the metal Pt through protracted heating became freer from gas, the emission under applied p. d. shows less excess over the spontaneous emission. Since there is practically no p. d. within a good conductor, the author holds that in a perfectly pure metal the spontaneous and the assisted emission (spontaneous and "saturation" current) would be identical. Absorbed gas probably forms a layer within which is a p. d. due to the applied p. d. and this aids in the escape of electrons. Equality of spontaneous and assisted emission is thus a test of the purity of the metal. In one case, after 24 hours at 1100° the assisted was still more than twice the spontaneous emission. By longer heating at 1200° the ratio was reduced to 1.1. (3) The spontaneous emission itself also became less as the metal became purer. (4) As the emission changes with temp., the spontaneous and assisted

emissions change (for Pt) in the same ratio. There are theoretical reasons for thinking that this indicates that for both the same energy is required to liberate an electron. (5) The admission of air to the tube *at first* diminishes the spontaneous emission, which then increases after heating. The conclusion is that a very superficial layer of gas retards the escape of the electrons, while occluded gas promotes it. (6) In this case the assisted emission was increased, that is, with the help of the applied p. d., even the superficial layer gave off more electrons. (7) Treatment with HNO_3 brought back a very persistent positive emission. Since this was not removed by treatment with H, S. believes that the effect produced is not superficial. He considers that it differs only in degree from the effect of air. (8) After long heating the spontaneous emission finally ceases to fall. This is evidence of a pure electrical emission, characteristic of the pure metal, and not due to chemical action. (9) With Ni there is almost no positive emission. (10) The assisted (saturation) emission is enormously greater than the spontaneous, shows no tendency to become equal to it and varies with temp. according to a different law; this shows that it (the saturation current) is not a pure thermal phenomenon. It is doubtless due to a skin of NiO or similar compd., behaving somewhat like a Wehnelt (CaO) cathode. The saturation current cannot, therefore, be taken as any indication of the emission of Ni itself. (11) When the spontaneously emitting tube is operated as a generator of electric current, its efficiency is almost perfect if loss of heat by radiation, etc., is not taken into account, but is of the order of 10^{-11} .

W. P. WHITE.

Accurate method for the measurement of the conductivity of electrolytes. W. A. TAYLOR AND H. L. CURTIS. *Phys. Rev.* 6, 61-4(1915); cf. *C. A.* 9, 3019.—Continuation of the work before announced. A Vreeland oscillator with a range of frequency between 150 and 3000 cycles and a max. voltage of 54 v. was cut down by means of a transformer to voltages suitable for cond. measurements. The apparent capacity of an electrolytic cell in an arm of an a. c. bridge is very large, about 25 microfarads per sq. cm. for bright Pt electrodes, and several times that value for platinized Pt. The cell to be measured was placed in an arm of the bridge in series with a substitution resistance. With this resistance R set at zero, the resistance and inductance in the bridge are balanced until there is no sound in the telephone. Then the cell is short-circuited and the value of R is adjusted until there is again no sound in the telephone. R is then the resistance of the cell. The oscillator and transformer had to be taken to another room in order to avoid the effects of their fields. Another source of error was the const. temp. bath which, when filled with H_2O , acted as a capacity and changed the apparent resistance of the cell as much as 0.1 ohm. If the solns. and cells were scrupulously clean there was no change in R when the voltage was changed, but if a slight trace of grease was present the value of R varied with the voltage, over the range 0.25 to 4.0 v. There was a slight change of resistance with changing frequency and the difference depended upon the size of the electrodes. The smallest change was found with the largest electrodes, but the change becomes smaller as the resistance of the cell increases. This is doubtless an electrode effect which becomes a smaller factor as the resistance is increased. Change of frequency had very little effect when the electrodes were platinized. Values of R with bright Pt electrodes were obtained with 3 different frequencies and extrapolated to infinite frequency. The difference observed was only 0.02%, all of which may have been due to exptl. error. The work is being continued by S. F. Acree.

R. B. MILLARD.

The conductivity of acids in absolute and aqueous alcohol. II. H. GOLDSCHMIDT. Univ. Christiania. *Z. physik. Chem.* 91, 46-74(1916); cf. *C. A.* 9, 745(1915).—In all the cases investigated, the dissociation of weak acids in alc. is changed in the same manner by additions of H_2O . This change is governed by the equil. const. of the system

H^+ -alc.- H_2O , and by the factor, $1 + 0.9n + 0.3n^2$, which holds for all acids. Here, n represents the normality of the H_2O content of the soln. The conds. at infinite diln. and the dissociation consts. of the following acids have been detd. at 25° : $o\text{-C}_6\text{H}_4(\text{OH})\text{CO}_2\text{H}$ $\lambda_\infty = 86$, $k = 2.2 \times 10^{-8}$; $\text{CHCl}_3\text{CO}_2\text{H}$ 94, 5.2×10^{-8} ; $\text{C}_6\text{H}_5\text{Cl}_2\text{CO}_2\text{H}$ 87, 1.04×10^{-7} ; $\text{C}_6\text{H}_5(\text{NO}_2)_2\text{CO}_2\text{H}$ 86.5, 7.0×10^{-7} ; $\text{CCl}_3\text{CO}_2\text{H}$ 88, 1.5×10^{-8} ; $\text{C}_6\text{H}_5(\text{NO}_2)_2\text{OH}$ 93, 1.75×10^{-4} .

H. JERMAIN CREIGHTON.

The action of the solvent and of the electrolyte on the electromotive force of the alloy copper-zinc. LIVIO CAMBI. Milan. *Rend. r. ist. Lombardo* [2] 48, 826-40 (1915).—A review and bibliography are given of the work that has been done on the electrolytic tension of various binary alloys. C.'s work is divided into a study of the influence of the solvent and the influence of electrolytes. *The influence of the solvent*: The Zn-Cu alloys were prepd. from pure Zn and electrolytic Cu melted in a graphite crucible; those more rich in Zn were fused under a eutectic mixt. of LiCl-KCl (Pushin and Ryazhskii, *C. A.* 7, 1345, 2920); those rich in Cu under a layer of powdered C in an atm. of N. The ingots were turned and filed to a diam. of about 5 mm. and the compn. was detd. by analysis. The ingots were then roasted in a sealed tube for 5 days at 360° for those with 0-50% Cu, at 500° for those with 50-100% Cu. The electrodes were constructed by using receivers similar to those used with Ca and Mg amalgams (*C. A.* 9, 2182, 2834, 3024). The electrodes of the various alloys were opposed to well known normal electrodes. The detns. were made at 25° with a potentiometer graduated to 0.0001 v., with a reflecting galvanometer, and using a standard Cd element. The materials were all carefully purified. The pair $[-\text{Zn}_{100}\text{Cu}_{100} - x | \text{ZnSO}_4 \text{ 0.5 } M | \text{KCl 0.1 } N; \text{HgCl} | \text{Hg} +]$ in H_2O was studied again. The data are given in full for 34 alloys. The e. m. f. dropped from -1.136 v. for pure Zn to -1.064 v. at 31.89% Cu, then sharply to -0.343 v. for 39.60% Cu, then slowly to -0.290 v. for 49.90% Cu, sharply again to -0.195 at 51.80% Cu and then somewhat raggedly to -0.106 at 98.79% Cu. The cell $[-\text{Zn}_{100} - x\text{Cu}_x | \text{ZnCl}_2 \text{ 0.124 } M | \text{KCl 0.02698 } N; \text{HgCl} | \text{Hg} +]$ showed an analogous e. m. f. curve (e. m. f. Cu 0.963 v. in MeOH) up to 45.38% Cu in MeOH soln.; the results for higher Cu alloys are not given. The cell $[-\text{Zn}_{100} - x\text{Cu}_x | \text{ZnCl}_2 \text{ 0.184 } M | \text{AgNO}_3 \text{ 0.1 } M | \text{Ag} +]$ in pyridine soln. gave e. m. f. values beginning at -1.185 v. for pure Cu which show a sharp drop from -1.179 v. at 10.63% Cu to -0.899 v. at 12.65% Cu and was only studied up to 36.90% Cu at which its e. m. f. is -0.630 v. *Influence of electrolytes*: The cyanides were selected for these expts. as representing an extreme case. The results of Spitzer (*Z. Elektrochem.* 11, 345(1905)) show the nature of the variations in the e. m. f. depending on the changes in the concn. of the cyanide solns. C. detd. the e. m. f. for alloys from 0% Cu to 78.63% in the cell $[-\text{Zn}_{100} - x\text{Cu}_x | \text{K}_4\text{Zn}(\text{CN})_6 \text{ 0.25 } M | \text{KOH } N, \text{HgO} | \text{Hg} +]$ (for the Hg electrodes cf. Wilshire, *Z. physik. Chem.* 35, 325(1900)) in which Zn is -1.183 v. Likewise the cell $[-\text{Zn}_{100} - x\text{Cu}_x | \text{KCN 0.25 } M | \text{KOH 0.1 } M, \text{HgO} | \text{Hg} +]$ was studied with 29 alloys from 0% to 100% Cu in which Zn is -1.348 v. and Cu -1.225 v. In both of these curves there is a more or less stepwise drop in the e. m. f. The curve of the e. m. f. of the alloy Zn-Cu toward aq. ZnSO_4 coincides with the data of Pushin (*Z. anorg. Chem.* 36, 232(1903)). P. saw indications of the compds. Zn_2Cu , Zn_3Cu , ZnCu and ZnCu_2 but C. considered that the e. m. f. shows the successive disappearance of the various phases composing the alloy and that the horizontal lines show the various miscibility breaks in the solid state that occur in the system Zn-Cu. Thus both the curves of P. and of C. show approx. the successive decompn. of the solid solns. η , ϵ , γ , β and do not show appreciably the homogeneous fields ϵ and γ . The e. m. f. is certainly too much influenced by secondary phenomena to give a perfect picture corresponding to the constitution of the alloy Zn-Cu. The greater variation in the e. m. f. at about 32% Cu has been attributed by P. and others to the compd.

Zn_3Cu , the existence of which is rendered probable by the ht. of formation of the alloy Zn-Cu, by the sp. vols. and by the detns. of the elec. cond. and thermoelec. force. Parravano has found that the miscibility break $\gamma + \epsilon$ does not extend beyond 30% Cu and in this respect the e. m. f. curve does not give a sufficient sign to distinguish where the bend marks the disappearance of the soln. ϵ , and thus indicates the above compd. in a characteristic way by the e. m. f. of γ . The expts. with electrolytes show a definite parallelism with the above results even in electrolytes as abnormal as the cyanides. The bends at about 14% Cu (limit of the break $\epsilon + \eta$) and at about 32% Cu were observed in all cases studied except in pyridine which did not show the 2nd, owing to passivity phenomena. The various curves show the enormous influence of electrolytes and solvents on the e. m. f. of Zn-Cu. At about 33% Cu there is a drop of 0.15-0.10 v. in cyanide solns., of about 0.70 v. in ZnSO_4 and about 0.56 v. in MeOH. The action of the passivity in these alloys was noted. E. J. WITZEMANN.

The constant c of the Wien-Planck radiation law. E. WARBURG AND C. MÜLLER. Physikalisch-Technische Reichsanstalt. *Ann. Physik* 48, 410-32(1915); cf. *C. A.* 7, 3700.—Using the method of isochromatics, the const. c of the Planck equation was detd. as follows: 14250 micron degrees when the temp. measurement is based on the Stefan-Boltzmann equation, and 14300 or 14400 when the temp. is detd. by the Wien displacement law according as the data of Carvallo or of Paschen are used for the displacement of quartz. PAUL D. FOOTB.

Determination of the Loschmidt number from extinction coefficients of sunlight by use of a photoelectric spectrophotometer. H. DEMBER. Tech. Hochsch., Dresden. *Ber. K. Sach. Ges. Wissenschaften* 67, 106-16(1915).—Using as a basis the formula derived by Planck, $n = 8\pi^2(\mu^2 - 1)^2/3h\lambda^4\mu$ where n = no. mol./ cm^3 at 0° and 760 mm., μ = refractive index, h = extinction coeff., λ = wave length, the value of n was found to be 2.89×10^{19} . Spectrophotoelec. measurements were made upon the solar intensity at wave lengths 0.285 to 0.480 μ from Peak Teneriffa, elevation 3280 m. h was found proportional to $1/\lambda^4$ in the range 0.480 to 0.320 μ but for shorter wave lengths this relation does not hold on account of the presence of absorption bands. The value of n observed is in agreement with detns. by other methods. This is a confirmation of the Rayleigh theory which relates atm. absorption to mol. diffraction. P. D. F.

Experimental evidence for the essential identity of the selective and normal photoelectric effects. R. A. MILLIKAN AND W. H. SOUDER. Univ. Chicago. *Proc. Nat. Acad. Sci.* 2, 19-24(1916).—Wiedmann (*C. A.* 9, 3166) has confirmed previous work by R. and S., showing that the photoelec. action by short wave lengths is relatively larger when the metal surface is fresh, but when some active gas is present a short exposure to it brings the emission of electrons by longer wave lengths (near the selective maximum) to preponderance. That there is no sharp demarcation between the normal and selective effects is shown by the facts: that the energy of emission is in all cases given by $mv^2/2 = h\nu - p$ (see following abstr.); that the amt. of emission is not dependent on the angle of incidence or the azimuth of polarization, but solely on the coincidence of the impressed frequency with a natural frequency; and that as a gas acts progressively on a fresh surface the normal effect merges gradually into the selective. No distinction could be drawn between the two in the case of Li. G. L. WENDT.

Quantum relations in photoelectric phenomena. R. A. MILLIKAN. Univ. Chicago. *Proc. Nat. Acad. Sci.* 2, 78-83(1916).—Curves are given which prove several deductions from Einstein's photoelec. quantum theory equation: $mv^2/2 = h\nu - p$, where h is Planck's constant, ν the frequency of the incident light, and p the work necessary to sep. an electron from the surface of the metal. There is a definite max. of electronic emission under the stimulus of a frequency, ν . There is a linear relation between ν

and V_0 , the opposing potential needed to stop emission. The slope of the $V_0\nu$ line, multiplied by e , the electronic charge, gives h , here found to be 6.57×10^{-27} . The intercept of the $V_0\nu$ line with the ν -axis is the frequency at which the illuminated substance first becomes photo-sensitive. The contact e. m. f. = $[(h\nu_0 - h\nu_0')/e] - (V_0 - V_0')$, where ν_0 ' and V_0 ' refer to the surrounding Faraday cylinder used in the measurements. These relations, with Schottky's proof (*C. A.* 8, 3746) that the contact e. m. f. is independent of the temp., evince the correctness of the quantum assumptions. G. L. WENDT.

Complete photoelectric emission. O. W. RICHARDSON. Univ. London. *Phil. Mag.* 31, 149-55(1916).—This term is used to signify the emission of electrons by a body under the photoelectric action of its own complete black-body radiation at high temps. The current density for this effect with Pt at 2000° K. is calcd. to be 2.1×10^{-11} amp./cm². This is at least 5000 times less than the observed thermionic current at that temp., so that this effect is relatively unimportant in the explanation of thermionic currents. G. L. WENDT.

✓ **A mathematical relation between the temperatures of liquefaction and the absorption coefficients of gases.** A. IMHOF. Zürich. *Z. physik. Chem.* 91, 124-8 (1916).—If the temp. -100° is taken as zero, it is found that for the majority of gases which obey Henry's law the temp. of liquefaction (b. p.) is approx. proportional to the logarithm of the absorption coeff. at 0° and 760 mm. pressure. The expression $T_0 = 27.4 \log a$ or $a = e^{T/27.4}$, where a represents the coeff. of absorption, has been found to hold for Ne, N, CO, A, O, CH₄, Kr, NO, O₃, N₂O, C₂H₂, CO₂ and H₂S, but not for He nor H. H. JERMAIN CREIGHTON.

Effect of temperature on the coefficient of absorption of certain glasses of known composition. K. S. GIBSON. *Phys. Rev.* 7, 194-202(1916).—Zn glass, non-Pb, and borosilicate, colored with Cd and Se, a Zn glass colored with CdS and a Pb glass colored with U were tested for change of absorption with temp. between -180 and 430° in a special app. The specimens ranged from red through orange, amber, lemon-yellow to canary. An enormous increase in the coeff. of absorption in certain parts of the spectrum was brought about by heating from -180 to 430° . A transparent glass for 0.66μ at the lowest temp. became nearly opaque when heated. In spite of these large changes there was a nearly complete recovery after heating, and room temp. curves taken a year after the heating were identical with those taken before. There was also a change of color in the specimens with increasing temp., the orange glass became yellow at -180 and brilliantly red at 430° . The absorption bands of U glass near the region of general absorption disappeared on heating and the specimen showed a green fluorescence, probably due to the band 0.49μ . E. B. MILLARD.

The distribution of energy in the normal radiation spectrum. LEIGH PAGE. Sloane Phys. Lab. *Phys. Rev.* 7, 229-40(1916).—Theoretical. Planck's radiation formula is derived from the expressions given by classical dynamics and electrodynamics for the absorption and radiation of energy with the aid of the supplemental assumption that the motion of an absorbing and emitting linear oscillator of frequency ν is stable only when the energy of its oscillations is an integral multiple of $h\nu$. This assumption avoids the necessity of replacing the emission of energy demanded by the electrodynamic equations by an emission that is discontinuous in time. The partition of energy among the different degrees of freedom in the ether is investigated and found to be the same as in material oscillators. PAUL D. FOOTE.

A comparison of the arc and spark spectra of nickel produced under pressure. E. G. BILHAM. Kew Observatory. *Phil. Mag.* 31, 163-70(1916); cf. *C. A.* 9, 882. —A criticism of Duffield's conclusions (*C. A.* 9, 3022) on the basis that the displace-

ments he observes are incorrect and too high. B. concludes that the behavior of lines which are easily reversed or tend to reverse is approx. the same whether developed in the arc or in the spark under pressure. Abnormalities are exhibited by reversed lines.

G. I. WENDT.

The X-ray spectrum of tungsten. W. S. GORTON. Johns Hopkins Hospital. *Phys. Rev.* 7, 203-8(1916).—Using a Coolidge tube excited by a 10 kw. interrupterless Snook Roentgen Co. generator, and calcite and rock salt analyzers, the X-ray spectrum of tungsten was observed photographically. The following lines were detd.: ($\lambda, 10^4 \text{ cm.}$) 1.476, 1.466, 1.292, 1.283, 1.275, 1.256, 1.237, 1.094, 1.057, 1.025. The value used for the spacing of the atomic planes of the 100 face of rock salt was that detd. by Bragg, $2.814 \times 10^{-8} \text{ cm.}$ The spacing for the rhombohedral (100) face of calcite as calcd. from the present work is $3.028 \times 10^{-8} \text{ cm.}$

PAUL D. FOOTE.

Magnetic properties of electrolytic iron deposited in magnetic fields. TAKÉ SONÉ. *Sci. Reports Tohoku Imp. Univ.* [1] 4, 313-21(1916).—The Fe was deposited in fields up to 2600 gauss. A magnetic field affects only the orientation of the mols. of the electrolytically deposited Fe, but not their relative configuration, and hence the initial magnetism, but not the form of the hysteresis loop is affected. The curve of initial magnetism of the Fe deposited in a magnetic field lies higher than the curve for specimens in zero field, and the hysteresis loop is considerably wider, though of the same general form.

E. B. MILLARD.

Theoretical considerations on hydrogenation on the basis of velocity measurements made on the hydrogenation of fumaric acid with palladium sol as catalyzer. A. KOREVAAR. Rijswijk. *Chem. Weekblad* 13, 98-107(1916).—A preliminary paper, containing no exptl. results. The rate of hydrogenation of fumaric acid in the presence of Pd sol is in accordance with Nernst's surface film theory of heterogeneous reactions. The velocity was found to increase as the $2/3$ power of the rate of stirring, and the temp. coeff. per 10° was 1.25, instead of 1.7, the theoretical for microheterogeneous systems. With small concn. of Pd sol, doubling the amt. of sol more than doubled the rate of hydrogenation; this has been explained by Bredig as a common property of microheterogeneous systems due to increased Brownian movement. Since in systems of this type the apparent rate of the reaction is detd. by the diffusion of the reacting mols. through the stationary film, at high initial concn. of fumaric acid the rate should be detd. by the rate of diffusion of the H, and hence should be const.; when the concn. of fumaric acid decreases below a value detd. by the H concn. and the ratio between the diffusion consts. of the 2 mol. species the rate should be detd. by the diffusion of fumaric acid, and hence should be that of a 1st order reaction. This is in harmony with the expts.

GEORGE W. MOREY.

Boiling and condensing points of alcohol-water mixtures. P. N. EVANS. *J. Ind. Eng. Chem.* 8, 260-2(1916).—An exptl. study to ascertain the relation between the b. p. (or condensing point) and the compn. of both the liquid and vapor phases. The procedure is given in detail. Results obtained with 43 mixts., ranging from 91 to 0% alc., are reported in a table. The relations existing between the b. p., or condensing point, and the compn. of the liquid and vapor phases are plotted and a convenient table of results (estd. from the curves) is given, which enables one to det. quickly the approx. concn. of any alc.-H₂O mixt. by noting its b. p., with corrections for barometric pressure and exposed Hg column. It is also possible to tell the approx. compn. of both liquid and vapor (or distillate) at any moment during the distn. of a mixt. The accuracy is less than by the usual and more difficult method of distn. and the detn. of the d. of the distillate with a pycnometer. Cf. Pohl, *Jahresber.* 1850, 455; Dupré and [Page], *Trans. Roy. Soc. London* 1869, 591; Wiley, *J. Am. Chem. Soc.* 18, 1063(1896); Noyes, *Ibid* 23, 463(1901); Haywood, *J. Phys. Chem.* 3, 318(1899).

F. W. SMITHER.

Rhythmic crystallization. R. E. LIESEGANG. *Naturwissensch.* 3, 500-2 (1915).

—Three kinds of crystals may be formed when a surface of a gelatin soln. containing salt is allowed to dry until it begins to crystallize at the edges. Those termed rhythmic crystals form in parallel cryst. bands around the edge and sepd. from each other by crystal-free or partially crystd. bands. Küster (*C. A.* 8, 2971) described a new crystn. of this form in which the crystal ring is formed somewhat laterally to the outside edge. L. offers an explanation for this formation. W. E. RUDER.

The formation of ozone in the upper atmosphere, and its influence on the optical properties of the sky. J. N. PRING. *Sci. Prog. Twentieth Cent.* 9, 448-70 (1915).—This article discusses some factors which det. the optical properties of the atm., chem. detn. of constituents of the atm., the action of ultraviolet light on air, the detn. of O_3 in the atm. at high altitudes, and the influence of O_3 on the nature of light from the sky. It is stated that "the optical properties of the atm. must lie in the precise detn. of the presence of such compds. as O_3 , H_2O_2 , and N peroxide," and methods for such detns. are described. Although the methods used were designed to detect very minute amts. of the substances named, they failed to show the presence of appreciable amts. of oxides of N or H_2O_2 resulting from the action of ultraviolet light on air, and they also failed to show the presence of detectable amts. of these substances in the air from high altitudes. While the tests do not preclude the possibility of the formation of these substances they show that the quantity formed is negligibly small when compared with O_3 . E. H.

The use of diagrams in chemical calculations. H. G. DEMING. *J. Ind. Eng. Chem.* 8, 264-72 (1916).—An address with numerous illustrations and examples showing the use of various charts. F. W. SMITHER.

BAHRDT, W.: *Physikalische Messungsmethoden.* 2. Aufl. Berlin: G. J. Goeschen. 147 ss.

BENEDIKT, M.: *Die latenten Emanationen der Chemikalien.* Vienna: C. Konegan. 51 ss. 2 M.

BILECKI, A.: *Gedanken ueber das periodische System der chemischen Elemente.* Troppan: Buchholz & Diebel. 31 ss. 2 M.

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FRIEND, J. N.: *The Theory of Valency.* 2nd ed. London: Longmans, Green & Co. 192 pp. 5s.

HOUSTON, R. A.: *The Rugby Course of Elementary Chemistry.* London: E. Arnold. 80 pp. 2s, 10d.

HOUSTON, R. A.: *A Treatise on Light.* London: Longmans, Green & Co. 490 pp. 7s, 10d.

JOB, A.: *La chimie.* Paris: Larousse. 40 pp.

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LIVING, G.: *Collected Papers on Spectroscopy.* London: Wm. Wesley.

LORING, F. H.: *Studies in Valency.* London: Simpkin, Marshall, Hamilton, Kent & Co. 2s, 9d.

LOWRY, T. M.: *Historical Introduction to Chemistry.* London: Macmillan & Co. 584 pp. 8s, 6d.

MEYER, R.: *Jahrbuch der Chemie.* Band 24. Braunschweig: F. Vieweg und Sohn. 478 ss. 40 M.

MOYER, J. A. AND CALDERWOOD, J. P.: *Engineering Thermodynamics*. New York: Wiley. 203 pp. \$2.00.

RIESER, H.: *Jahrbuch der technischen Zeitschriften-Literatur für die Literatur von 1914*. Berlin: Verlag für Fachliteratur. 4 M.

STEPHENS, J. S.: *Theory of Measurements*. London: Constable & Co. 81 pp. 6s.

VULTZ, H. T.: *Household Chemistry*. Easton, Pa.: Chem. Pub. Co. 233 pp. \$1.50.

WASHBURN, E. W.: *Principles of Physical Chemistry*. New York: McGraw-Hill Book Co. 445 pp. \$3.50.

YOUNG, G. A.: *Thermodynamics*. Rev. ed. Chicago: Haywood Pub. Co. 58 pp. \$1.00.

3. RADIOACTIVITY.

WILLIAM H. ROSS.

X-Ray wave-lengths. WM. DUANE AND FRANKLIN L. HUNT. Harvard Univ. *Phys. Rev.* [2] 6, 166-71 (1916).—The X-rays emitted under a const. difference in potential are not homogeneous, and both the coeff. of absorption and the effective wave-length decrease as the rays pass through matter. For any given potential there is a definite min. wave-length emitted in accordance with the equation: $Ve = h\nu$, where V is the voltage employed, e the charge on the electron, h Planck's radiation const. and ν the max. frequency emitted. The mean value for h was found to be 6.39×10^{-27} .

G. L. WENDT.

Emission quanta of characteristic X-rays. DAVID L. WEBSTER. Harvard Univ. *Proc. Nat. Acad. Sci.* 2, 90-4 (1916).—Duane and Hunt's quantum relation (cf. preceding abstr.) is verified for the general radiation, with 6.52×10^{-27} resulting as the value for Planck's const. But no characteristic lines are excited at a potential which is sufficient to give general radiation of the same wave-length unless the potential exceeds a critical value which would give a general radiation of wave-length 1.3% shorter than that of the characteristic γ -line. Since at just this wave-length absorption of the general radiation is very marked and is accompanied by a strong characteristic fluorescence, W. suggests that the characteristic rays, like fluorescence, result from the excitation of higher frequency oscillators and their subsequent drop on emission. The intensities of all lines in the characteristic spectrum increase in the same ratio with increase of potential above the critical value.

G. L. WENDT.

The influence of foreign substances upon the adsorption of uranium X_1 by charcoal. H. FREUNDLICH AND H. KAEMPFER. Braunschweig. *Z. physik. Chem.* 90, 581-716 (1915).—The expts. of Ritzel (*C. A.* 4, 1843) on the removal of $U X_1$ from animal charcoal by Th have been confirmed. The action occurs in the presence of small quantities; a content of about 0.0004 millimol. of $Th(NO_3)_4$ (equiv. to about 0.2 mg. per l.) increases the quantity of $U X_1$ remaining in the soln. after shaking with charcoal by about 20%. This action is not sp. for Th or the radioelements, but occurs with a large number of substances: Zr salts, BzOH, strychnine nitrate, basic dyes, etc. Investigation has shown that a difference exists between the adsorption of $Th(NO_3)_4$ and the other foreign substances. The adsorption of BzOH, strychnine nitrate and $ZrOCl_2$ by animal charcoal can be measured by the help of radioactivity as follows: the end concn. of these substances in the soln. is detd. on the basis of the displacing action which they exert upon the $U X_1$, when they are adsorbed together with this substance by the charcoal. In this way the usual adsorption isotherm has been found for BzOH and $ZrOCl_2$ in the

concn. region investigated; strychnine nitrate tends towards a satn. In all 3 cases an end point is reached which is independent of the time. The adsorption of $\text{Th}(\text{NO}_3)_4$ by animal charcoal differs from that of the above-mentioned substances, inasmuch as the end concn. appears to decrease considerably as the time increases. This increase is not confirmed, however, when the end concn. of $\text{Th}(\text{NO}_3)_4$ is measured with the nephelometer on the basis of the small solubility of $\text{Th}(\text{C}_2\text{O}_4)_2$. This contradiction is explained on the assumption that, after shaking with animal charcoal, a $\text{Th}(\text{NO}_3)_4$ soln. is able to remove the U X_1 to a much less extent. It has also been found that U X_1 is more strongly adsorbed from a soln. of $\text{UO}_2(\text{NO}_3)_2$ that has been shaken with charcoal and in which the U X_1 has formed anew, than from a soln. that has not been so treated. The preceding observations are best explained on the assumption that in the Th or the $\text{UO}_2(\text{NO}_3)_2$ soln. unknown substances, such as radioelements, are present, which in even small quantities bring about the removal of U X_1 from charcoal. $\text{Th}(\text{NO}_3)_4$ differs from the other active substances in that it does not merely bring about the removal of U X_1 in consequence of simultaneous adsorption, but also when it is subsequently added to a charcoal that has adsorbed U X_1 . The other substances do not remove U X_1 on subsequent addition. This difference in behavior may be explained by assuming that both $\text{Th}(\text{NO}_3)_4$ and the foreign substances contained in this substance are concd. not only on the surface of the charcoal but also in the interior. In consequence of this, subsequent additions of $\text{Th}(\text{NO}_3)_4$ can remove the U X_1 compressed in the interior of the charcoal, while those substances which are only concd. on the surface of the charcoal (such as BzOH) cannot do so. The results of the investigation lead to the conclusion that Soddy's view, that the removal of U X_1 from charcoal by Th depends on the isotopy of both substances, is not sustained. On the other hand, the fact that other substances remove U X_1 from charcoal does not contradict the isotopy of Th and U X_1 or the far-reaching chem. similarity of isotopic elements. The adsorption of $\text{Th}(\text{NO}_3)_4$ by animal charcoal has been measured by the detn. of the end concn. by means of the nephelometer. The exponent in the adsorption isotherm was, as in the case of the adsorption of U X_1 by charcoal, approx. equal to unity. The removal of U X_1 from charcoal by the other active substances depends chiefly upon their adsorbability. Not only is the removal due to the adsorption of the foreign substances, but also to the fact that they actually hinder the adsorption of the U X_1 .

H. JERMAIN CREIGHTON.

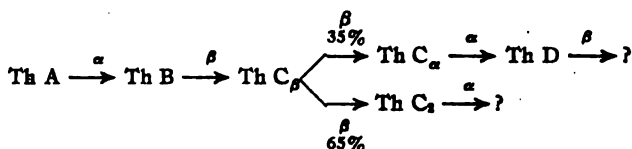
The question of isotopic elements. II. Rejoinder to the reply of G. v. Hevesy and F. Paneth. K. FAJANS. Karlsruhe. *Physik. Z.* 17, 1-4(1916); cf. *C. A.* 9, 1149.—F. admits the validity of the claims of v. Hevesy and Paneth (*C. A.* 9, 175, 1271, 2485) respecting the replaceability of isotopic elements in their electrochem. reactions, and of their deductions from these reactions. He raises further questions as to the degree of identity involved in replaceability in various kinds of reactions. Questions of terminology and of priority are also brought up.

S. C. LIND.

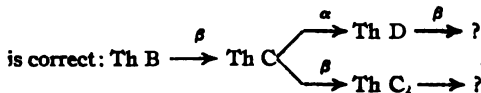
The question of isotopic elements. III. Reply to the foregoing paper of K. Fajans. G. v. HEVESY AND F. PANETH. Vienna. *Physik. Z.* 17, 4-6(1916).—Brief summary of points previously discussed and rejoinder to Fajans (cf. preceding abstract).

S. C. LIND.

The branching point of the thorium series. S. LORIA. Vienna. *Physik. Z.* 17, 6-9(1916).—Barratt and Wood (*C. A.* 8, 3530) have measured the % of Th C vaporized at temps. from 770 to 1200°. A pronounced change in curvature at the point represented by a temp. of 920° and 35% vaporization led them to believe that Th C is a β -radiator decomposing to the extent of 35% into the α -radiator, Th C_α , and into a second α -radiator, Th C_β , according to the scheme:



L. points out that the application of the Soddy-Russell-Fajans transformation rule to this scheme leads to the false conclusion that Th D belongs to the IV group and is isotopic with Pb instead of with Tl. L. has made a new and more accurate detn. of the vaporization curve of Th C and has supplemented it with a similar detn. for Ra C. He agrees with Barratt and Wood in finding a change of direction in the curve for Th C but further finds that the curve for Ra C is practically identical with that of Th C as would be expected for isotopic elements. Since, however, the ratio of the 2 branches in the Ra series is about 3 in 10,000 it seems impossible that it could be detected in a vaporization curve as was assumed for Th C by Barratt and Wood. But it is clear that the relations are parallel in the 2 series, and L., therefore, concludes that the assumption of Barratt and Wood was wrong and that the previously accepted scheme of branching



is correct. L. believes that the change in the

curve is to be explained on chem. grounds, probably by oxidation, rather than on radioactive grounds.

S. C. LIND.

Stereoscopic photography by Röntgen rays. II. B. ALEXANDER. *Physik. Z.* 17, 15-6(1916); cf. *C. A.* 9, 2485.—A. admits that the stereoscopic effects to be obtained in ordinary photography (Knipping, *C. A.* 10, 424) may have played a certain role in the photographs he obtained with X-rays, but holds that indirect radiation from the walls of the X-ray tube and other sources assists in bringing out the stereoscopic effect. A new photograph is presented which was made with the anticathode wholly screened by a thick lead plate; it is claimed to consist of 4 different images. S. C. LIND.

The penetrating radiation of the atmosphere. A. GÖCKEL. Freiburg, Switzerland. *Physik. Z.* 16, 345-52(1915).—Two kinds of penetrating radiations are found in the atm., one of undoubted radioactive origin coming from the earth's crust, and another which increases rapidly in intensity on going to higher altitudes and which may be of cosmic origin. A depth of water of 3.5 m. is not sufficient to absorb entirely the latter penetrating rays. Observations above glaciers show the same increase with altitude as that shown by balloon observations. The radiation is more intense above crystalline structure than over cultivated land of alluvial nature. Diurnal variations in the second kind of radiation could not be detd. at Freiburg (Switzerland). The fraction of the first radiation coming from the earth is greater in warm weather. Even at 2200 m., variations in the part of the radiation coming from the earth still occur from day to day. No satisfactory explanation of the origin of the cosmic(?) radiation can be offered as yet. The equality of the intensity day and night seems to preclude consideration of the sun as the possible source.

S. C. LIND.

Photographic measurement of the hardness of Röntgen rays. J. K. A. WERTHEIM-SALOMONSON. Amsterdam. *Physik. Z.* 16, 389-90(1915).—Reply to Voltz (*C. A.* 9, 424) who claimed the photographic method of measuring the hardness of X-rays to be inaccurate and that the method of measuring the implied voltage is preferable. According to W.-S. the use of the electrostatic voltmeter as employed by Voltz is allowable only when permanent static charging of the series condenser is carefully avoided and when a source of unvarying direct current is used to excite the X-ray tube. Under

less favorable conditions the electrical method is not suitable. Voltz's claim of the irregularities of the photographic method owing to differences in plates and developer have not been found by the author who still regards the photographic method as the most satisfactory under present conditions.

S. C. LIND.

The favorable form of discharge for Röntgen apparatus. B. WINAVER. Frankfurt a/M. *Physik. Z.* 16, 391-5(1915).—A deduction of the characteristics of the form of discharge for continued operation of X-ray tubes results in the establishment of 2 general requirements: (1) that the source of current is most favorable in which a definite allowable load is carried in a small number of current impulses of the shortest possible duration, that is, by a current with the "narrowest" possible curve dimensions; and (2) that of 2 sources of current, the one which at the same load produces the more heating of the anticathode is to be regarded as the more favorable. These 2 requirements were tested by expt. and found to be valid.

S. C. LIND.

The theory of the beta rays. H. TH. WOLFF. Dresden. *Physik. Z.* 16, 417-9 (1915).—A mathematical consideration of β -rays which have their origin in the nucleus of the atom, making use of the Rutherford conception of the atom and assuming further that no energy is radiated from the electron before its projection from the at. nucleus around the center of which it is revolving with great velocity. The general laws of mechanics, the theory of electricity, and the relativity principle are assumed. It is found that the work done upon the electron by the repulsive force of the negative charges of the nucleus is quite sufficient to account for the velocity of the most rapid β -rays.

S. C. LIND.

The periodic system of the elements, the radioactive transformations, and the structure of the atom. K. FAJANS. Karlsruhe. *Physik. Z.* 16, 456-86(1915); cf. C. A. 10, 421.—A very complete summary, with full references, which presents the historical development of the subject of atomistics from the radioactive and isotopic standpoints.

S. C. LIND.

4. ELECTROCHEMISTRY.

COLIN G. FINK.

Walther Löb. ANON. *Chem. Ztg.* 40, 145(1916).—Died Feb. 3, 1916. An obituary.

J. H. MOORE.

Water power and waste energy. MAX DU BOIS. *Lumière elec.* 32, 193-6(1916).—When the price (in France) is less than 1 centime per kw. hr. the energy now wasted at night, etc., can be utilized to advantage in certain electrochem. industries which are adaptable to intermittent service. Most of the Swiss water power plants furnish elec. energy 24 hrs. a day at less than 1 centime per kw.-hr. Statistics of the electrochem. industries of the world are tabulated; e. g., the annual world's production of H amounts to 63,000 tons (1913). The cost of current per kg. of fixed N is 75 centimes by the Birkeland and Eyde process, 37.5 by the Pauling, and 19 by the Moscicki.

C. G. F.

Operating data on an important electric furnace installation. W. J. KYLS. *Elec. Rev. West. Elec.* 68, 374-6(1916).—The Snyder single-phase, Rennerfelt 2-phase, and Heroult 3-phase furnaces are briefly described. The Treadwell Eng. Co. has a Heroult furnace of 2 tons capacity, operating 3-4 heats per 24-hr. day. Magnetic steel, auto parts, gear-cases, and cement-mill and special steel castings are made. The elec. furnace shows a 200-kw. demand per ton furnace capacity and with a cold charge, melting and refining, 800-850 kw. hrs. per ton of steel. Addition of hot or molten metal lowers the requirements to 350-400 kw. hrs. per ton steel and increases the output about 60%

An a. c., 3-phase, 60-cycle, is delivered at 11,000 v. and transformed to 80-85 v., 2500 amp. The raw material consists of equal quantities of heads and gates of previous heats, and purchased steel scrap. The furnace is lined with magnesite brick. The slag formed in the first period is removed by tilting the furnace; charcoal is added for re-carbonizing, together with lime, fluorspar and ferro-silicon. Castings may be poured directly from the ladle or by means of small ladles and shanks. Chem. analyses, fiber stress and tests of unannealed steel, of the same, annealed, and of 0.40% C annealed steel are given.

W. H. BOYNTON.

The behavior of magnesia in the carbide-furnace. I. N. KAMEYAMA. *J. Chem. Ind. Japan* 19, 41(1916).—The assumption that the MgO in the lime in the CaC_2 furnace is reduced to Mg and transformed to nitride so that the C_2H_2 evolved from such carbide contains NH_3 is erroneous. The reduced Mg is reconverted into MgO in the furnace atm. (mainly CO). This conclusion is based on the following: (1) The N content of carbides made with CaO and with CaO mixed with MgCO_3 was 0.12-0.42%; one sample very low in carbide contained 0.9%. (2) To detect and det. nitride in the presence of CaC_2 and CaCN_2 , the carbide is mixed with H_2O and distd. under reduced pressure over CaO. By this method NH_3 is formed only from nitrides and not from CaCN_2 . The carbide used yielded 0.04-0.09% of nitride N. No relation was found between nitride, MgO, and total N. The non-nitride N exists mainly as CaCN_2 . (3) The behavior of Mg vapor in the atm. of the carbide furnace was investigated. The dissociation pressure of Mg_3N_2 , reaching equil. from both sides, was found to be 4.0 cm. Hg at 730°. Other expts., in which equil. was not reached from both sides, at 720-800°, did not agree among themselves or with the above value. The cause of this deviation is perhaps the formation of a solid soln. of Mg_3N_2 and Mg, since one detn. in which 0.3 of the Mg was in the form of Mg_3N_2 showed a much higher dissociation pressure. Further work is in progress.

F. W. SMITH.

Fixation of atmospheric nitrogen. W. S. LANDIS. *Trans. Am. Electrochem. Soc.* 29 (advance copy); *Met. Chem. Eng.* 14, 260(1916); cf. *C. A.* 9, 1719.—Germany now has plants with an annual production of almost 500,000 tons of cyanamide and nearly 10,000 tons of arc-process HNO_3 , practically all of which have been built and set into operation within 18 mos. An investment of \$100,000,000 is represented in this work. On this continent most of the cyanamide is made in Canada under American direction and is carried on at a higher efficiency than in German plants and a higher grade product is produced. We have in this country an intimate knowledge of design and experience in operation of the successful NH_3 oxidation process and are to-day in as good, if not a better, position than Germany was to supply our own HNO_3 for munition purposes.

W. E. RUDER.

A new electrolytic oxygen and hydrogen installation in a shipbuilding plant. ANON. *Met. Chem. Eng.* 14, 288-9(1916); cf. *Elec. Rev. West. Elec.* 66, 1170(1915).—The National electrolyzer, which is of the improved filter-press type, consists mainly of a number of decompn. chambers connected in series. The chambers are formed by clamping together a series of insulated cast-iron electrodes so recessed and grooved that each plate forms a chamber with its neighbor. The electrodes are insulated from one another by means of patented rubber-bound asbestos diaphragms. The electrodes have corrugated surfaces and are composed of a special alloy heavily coated with Ni. The electrolyte is a 21% soln. of pure KOH in distd. H_2O . Under normal conditions, the voltage required is less than 2 v. per cell. Thus, an electrolyzer containing 55 cells can be operated on a 110-v. circuit. The electrolyzers will stand an overload of 50% without any ill effects. The gases produced are of very high purity; the O is 99.5%. (Cf. *C. A.* 10, 561.)

H. JERMAIN CREIGHTON.

Electrolytic zinc. W. R. INGALLS. *Trans. Am. Electrochem. Soc.* 29 (advance copy); *Eng. Mining J.* 101, 425-8(1916); *Met. Chem. Eng.* 14, 264-5(1916).—A description is given of the process used by the Anaconda Co. at Great Falls, Mont. The Zn ore is concd., preferably by flotation, and the concentrate is roasted at a temp. not exceeding 1350° F. so as to produce a calcine containing 2-3% of S. The calcine is treated with dil. H_2SO_4 (spent electrolyte plus fresh acid), MnO_2 is added to oxidize Fe, and the latter pptd. with $CaCO_3$. Sb and As are carried down with the $Fe(OH)_3$. Cu and Cd are removed by treatment with metallic Zn. The Zn is deposited on Al plates with a c. d. of 20-30 amp. per sq. ft. of cathode surface. The anodes are pure Pb. The voltage drop is 3.8-3.4 in 21 cells. The Zn deposit is stripped off every 48 hrs. and sent to the melting furnace. A brief history of previous work on the electrolytic recovery of Zn and descriptions of other plants are given. The essentials for the commercial success of electrolytic Zn are: (1) exceptionally cheap hydroelec. power, or (2) utilization of by-products such as Cl, or (3) exceptionally favorable conditions, such as high grade ore or high Ag content. High purity Zn (over 99.9%) is easily obtained with the electrolytic process. I. believes that the process will not revolutionize the metallurgy of Zn, and that when the war is over, the conditions in the Zn industry will return to normal. Great improvements have lately been made in the flotation treatment of the ore and in the roasting. E. W. BOUGHTON.

Metallurgical operations at the Chile Exploration Co. (Duriron anodes for copper cells.) C. A. ROSE. *Eng. Mining J.* 101, 321-6(1916).—A description with illustrations and flow sheet of the 10,000 ton leaching plant of the Chile Exploration Co., Chuquicamata, Chile. The process used, acid lixiviation and electrodeposition, was in detail especially devised for the type of ore (mainly brochantite). The plant comprises crushing, leaching, dechloridizing, pumping, pptg. and smelting and melting units. Large reinforced concrete leaching tanks, lined with a 1 to 1 1/4 in. layer of asphalt mastic, are used, and are discharged by 6-ton clamshell buckets. The dechloridizing plant contains 22 tube mills 4 ft. diam. by 30 ft. long. Magnetite anodes made in Germany had to be dispensed with on account of the war, and anodes of duriron were substituted. From 15 to 20 times its wt. of Cu can be deposited on a duriron anode in $CuSO_4$ soln. before it is entirely corroded away. Duriron anodes have an advantage over magnetite in their mechanical strength, but they have a much higher overvoltage, which is a decided disadvantage. About 15% more elec. energy is required with duriron than with magnetite anodes for the deposition of the same amt. of Cu; this necessitates cooling the electrolyte in a wide cascade launder after partial electrolysis, and then running soln. back into the tank house to complete the electrolysis. The purity of the Cu produced is somewhat higher than that from American electrolytic refineries; its cond. is from 100.5 to 101% Matthiessen's standard. Cf. C. A. 8, 2545. F. W. SMITHER.

Speeding up the electrodeposit. C. H. PROCTOR. *Metal. Ind.* 14, 73(1916).—The time required for electroplating may be decreased by increasing the metal concn. of the electrolyte. The advantages of the use of single Ni salts in Ni plating are discussed. H. JERMAIN CREIGHTON.

Cyanide versus acid plating solutions. C. DITTMAR. *Metal Ind.* 14, 78(1916).—A number of considerations in favor of the abandonment of the duplex Cu-plating process are discussed. H. JERMAIN CREIGHTON.

Development of the incandescent electric lamp. ERNEST COUSTET. *Rev. gen. sci.* 27, 88-93(1916). E. H.

Results obtained with nitrogen-filled lamps. R. PALMER. *Elec. J.* 13, 225 (1915); cf. C. A. 10, 18.—Many factors entering into the actual operation of flame

arc lamps, such as deposit on the globe, etching of the globes by the gases, etc., reduce considerably its advantage over the gas-filled incandescent lamps of supplying 17.5 lumens per watt as against 11 lumens per watt. Tests show that the av. efficiency during the life of the arc lamp inner globe is 55%, thus decreasing the actual efficiency to 9.6 lumens per watt. It has been demonstrated that the av. efficient illumination with the 325 watt 600 c. p. N-filled incandescent W lamp is practically equivalent to the a. c. flaming arc requiring 465 watts. Moreover, units of from 60 to 1000 c. p. may be used on the same circuit. A comparative table giving Chicago conditions shows a total annual cost per lamp of \$50.31 for the 465 w. flaming arc and \$40.66 for the 325 w. N-filled W lamp.

W. E. RUDER.

Electrical precipitation, Stokes law and the removal of particles from liquids. W. W. STRONG. Carnegie Inst., Pittsburg. *Ann. Physik* 48, 251-60(1915); cf. *C. A.* 7, 2107; 9, 1273.—Stokes law is applied to calc. the theoretical quantity of energy required for the removal of dust, smoke and vapor from gases. The process of the elec. sepn. comprizes a stage of elec. static polarization, a "nuclear coherer" stage, a charging stage and the Stokes stage. In order to make the charge of the smoke particles as general and as large as possible, the corona discharge must be made as intensive as possible, without having it become an arc discharge. In the Stokes stage currents very large ions occur, which charge the outer cylinder on passing it. It has been found in the case of fine smoke that about 4% of the elec. energy of the corona discharge is used in overcoming friction. In conclusion, it is pointed out that relations between the spark potential and the strength of the corona discharge must be detd.

H. JERMAIN CREIGHTON.

Bakelite-dilecto. A new insulating material. ANON. *Elec. Rev. West. Elec.* 68, 479(1916).—This is of exceptionally high dielec. strength, is waterproof, unaffected by O_2 , highly resistant to heat and acids, and exceptionally tough. It is easily molded, machined and tapped. It is built up of successive layers of fibrous material satd. with bakelite and compressed together at high pressure.

C. G. F.

Non-corrosive "binding post." H. T. LEAVENWORTH. *Metal Ind.* 14, 17(1916); see fig.—L. describes a corrosion-proof Hg cup connection, for Pt electrodes, to be used in place of the brass binding post which is readily attacked by acid spray resulting in poor elec. contact. The supporting arm (lignum vitae, bakelite, or hard rubber) is $\frac{1}{8} \times \frac{1}{8} \times 6$ in.; one end of this arm is fastened to an upright support. At the other end, on either side, is a clamp which serves merely as a rigid support for the electrode. Next to each clamp is a $\frac{1}{16}$ in. hole in the bakelite into which a short glass tube is fitted. Through the lower, closed end of each tube is fused a Pt wire. The outer Pt ends are soldered, resp., to the 2 Cu leads of the current supply. The inner ends contact with the Hg which is filled into the tubes or cups. The ends of the stems of the 2 electrodes are bent back into the shape of a hook and dipped, one into each of the cups. The elec. contact thus formed is not affected by the acid spray rising from the soln. during the course of a detn.

F. W. SMITHER.

Thermionic current generated in an electric lamp at incandescence (GRANDONE) 2. "Color temperature" scales for tungsten and carbon (HYDE) 2. True temperature scale for tungsten and its emissive power at incandescent temperatures (WORTHING) 2.

FRANKLIN, B. F.: Principles of Dynamo-Electric Machinery. New York: McGraw-Hill Book Co. 314 pp. \$3.00.

RASCH, E.: *Electric Arc Phenomena*. London: Constable & Co. 194 pp. 8s, 6d.

Storage battery. W. A. CROWDUS. U. S., 1,173,651, Feb. 29. Structural features.

Storage battery. J. W. EAST. U. S., 1,172,586, Feb. 22. Structural features.

Storage battery. J. N. DAVIS. U. S., 1,171,597, Feb. 15. The separator plates of the battery are formed of perforated hard rubber with an inner layer of asbestos.

Galvanic battery. W. HICKMANN. U. S., 1,173,965, Feb. 29. Acid manganite of Zn or other metal is used as depolarizer in cells of the Leclanché type.

Electrolytic cells for producing hydrogen and oxygen. G. HALTER. U. S., 1,172,-885-6-7, Feb. 22.

Cell for electrolysis of water. W. C. BUCKNAM. U. S., 1,172,932, Feb. 22.

Electrolytic meters. H. S. HATFIELD. U. S., 1,173,570, Feb. 29. A cathode of Au plated with Rh is used with a Pt anode in electrolytic measuring instruments of the Hookham and Holden type. The use of Rh gives a current in the cell which is practically proportional to the main current at all loads.

Device for supporting electrodes of electric furnaces. I. HECHENBLEIKNER. U. S., 1,173,960, Feb. 29.

Arc light electrodes. C. R. KRUEGER. U. S., 1,173,005, Feb. 22. Magnetite 57.25, rutile 28.75, Ti carbide 10, chromite 4 and LiF 1 part are added to arc lamp electrodes to obtain high luminosity without "puddling." Cf. C. A. 9, 3176.

Arc lamp electrodes. W. R. MOTT. U. S., 1,173,370, Feb. 29. ThF_4 is added to arc lamp electrodes with at least 1.5 times its wt. of other rare earth fluoride to increase the efficiency of the light for photography. Cf. C. A. 9, 2488.

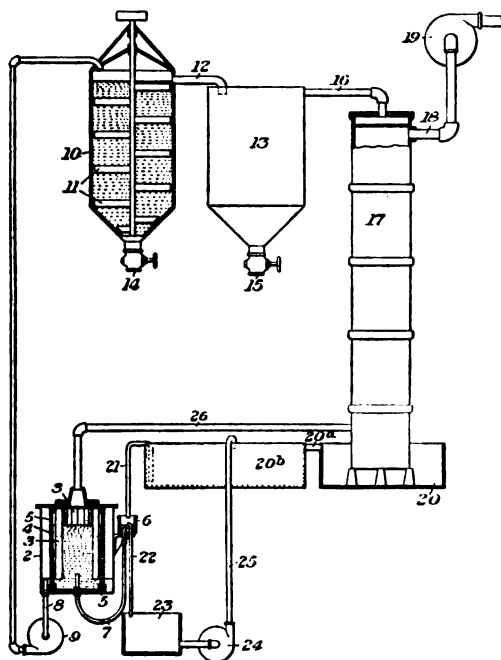
Electrodeposition of metals from ore solutions. R. R. GOODRICH. U. S., 1,171,-782, Feb. 15. Solns. of metals, *e. g.*, from extg. Cu ores, are electrolyzed while the soln. is maintained in circulation throughout the entire series of electrolytic cells employed and simultaneously an independent circulation of electrolyte is maintained in part of the series of cells to insure substantial uniformity of concn. of the soln. in each such subdivision of the series, *e. g.*, where electrolysis of Cu solns. is carried out in stages in each of which 1-1.5% of Cu may be taken out of a soln. carrying 6%.

Electrolysis of sulfur ores. H. S. MACKAY. Can., 156,097, Sept. 28, 1915. From the elements of the ore is produced a solvent for the metal, the soln. is electrolyzed and during the process the ore is continuously treated so as to produce and maintain a high efficiency of the solvent and electrolyte.

Electrolysis. B. B. CROMBIE and C. J. A. KALZIEL. Brit., 21,513, Oct. 26, 1914. Electrodes for use in purifying liquids consist of plates of Al-Pt alloy, the proportions of the two metals being, *e. g.*, 1 lb. to 3 g., resp.

Electrolysis. G. PLANCO. Brit., 21,727, Oct. 29, 1914. A thick insulating border is cast on to a diaphragm so as to serve as a distance piece between electrode plates. Preferably, the same material is used for both diaphragm and border. A frame of portland cement, preferably reinforced, may be used with a diaphragm of asbestos fabric. Wire or other gauze, stiffened by thick strands or by vertical or radiating ribs, may be coated with liquid cement by brushing or dipping, and then tapped to clear the holes, these operations being repeated, with intermediate hardening of the cement, until the holes are of capillary size. Ebonite may also be used. If the electrode plates are ribbed or corrugated, they also have thickened edges. Passages

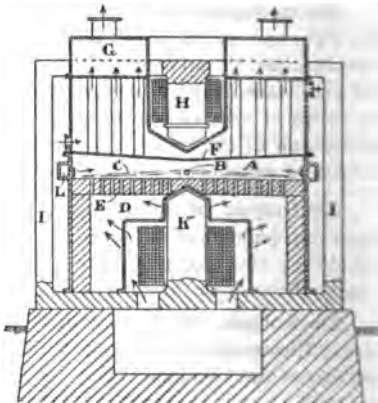
for gas and electrolyte are provided. In the production of O and H, a dil. soln. of NaOH or KOH or K_2CO_3 is used.



Chlorates. A. E. GIBBS. U. S., 1,173,346, Feb. 29. In making $NaClO_3$, a soln. of NaCl from the cup 6 passes to the anode compartment of the electrolytic cell 2. After electrolysis, the cathode liquor is pumped to the tank 10, and passes through the tank 13 to the tower 17, where it meets an ascending current of Cl supplied through the pipe 26 from the anode compartment of the electrolytic cell. The excess of Cl used forms $NaClO_3$, the reaction being promoted by heating if necessary. The liquor passes to the tank 20b and is circulated through the app. repeatedly until a sufficiently concd. $NaClO_3$ soln. has been formed. Fresh NaCl is added to the tank 10. Pptd. impurities, *e. g.*, $CaCO_3$ and $MgCO_3$, settle in the tanks 10 and 13. In making $KClO_3$, the latter is removed as a sludge at 14 or 15.

Electrical flame-arc furnace for oxidizing atmospheric nitrogen. H. BONNEVIE. U. S., 1,173,699, Feb. 29. Air is supplied from the chamber D to the flaming arcs C between electrodes B and the gases produced pass through flues of a tube boiler F just above the arc chamber. H and K are magnets which give a vaulted form to the arc flame.

Ferrosilicon. H. C. HARRISON. U. S., 1,171,719, Feb. 15. SiO_2 agglomerated with somewhat more C than required to reduce the SiO_2 is electrically smelted with Fe_2O_3 . The CO produced in the final stage of the smelting serves to reduce the Fe, in a preliminary stage, and is also used to preheat the charge. By the time the charge reaches the twyers its temp. is raised to 1500° and in the final stage of the process a temp. of 2000° is maintained. Cf. C. A. 9, 1278.



Reducing tin chlorides. F. MEYER and H. KIRSTEIN. U. S., 1,173,012, Feb. 22. $SnCl_4$ is reduced by passing it into the app. through the tube b, passing H in through the tube c and maintaining the temps. of the zones "A," "B" and "C" at 250° , $500-600^\circ$ and $600-1000^\circ$, resp. The Sn is gradually reduced as it passes to the hottest zone and excess of H and HCl escapes at the top of the app. The Sn flows off at d. In reducing $SnCl_2$, the tube b is omitted and H and molten $SnCl_2$ are both admitted

through the tube *c* (Fig. 1). TiCl_4 is reduced in the app. of Fig. 2 when supplied through the tube *b* with H fed through the tube *c*. Reduction to TiCl_3 is effected when the zone "C" is kept at 700° and to metallic Ti at $800\text{--}900^\circ$. Zone "B" is kept at 500° and a C rod *d* in zone "A" is kept at incandescence by elec. heating. *e* and *f* are lead-in wires.

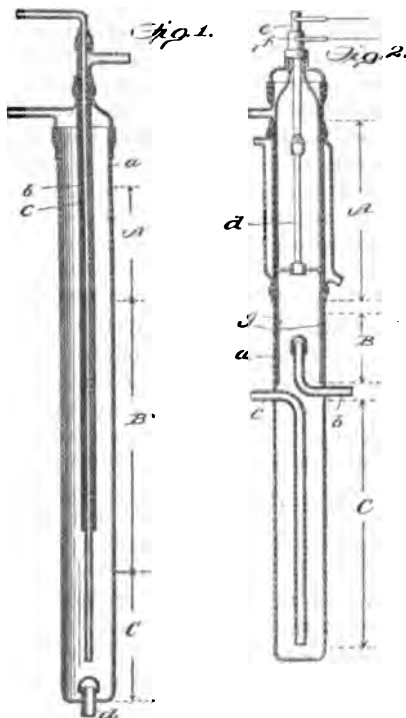
Electric arc soldering. E. H. JONES. Brit., 21,822, Oct. 31, 1914. Arc soldering electrodes are coated with materials which form a cement on drying. Suitable materials are 3 parts of finely powdered slag sand, 1 part of slaked lime, and small quantities of a siliceous material such as silicate of soda, and H_2O . Or a ready made cement may be used with the siliceous material. The coating is extruded under pressure and may be made thin or removed on one side of the electrode to confine the arc.

Electric endosmosis; gelatin. GES. FÜR ELEKTRO-OSMOSE. Brit., 21,484, Oct. 24, 1914. Gelatin freed from salts, reducing agents, albumin, and fat by the process of 21,448, 1914, is used for the prepn. of photographic emulsions. Cf. C. A. 9, 1156.

Electric endosmose; gelatin, glue. GES. FÜR ELEKTRO-OSMOSE. Brit., 21,483, Oct. 24, 1914. A material yielding glue or gelatin, e. g., ossein or hide or leather waste, is purified from acids, salts, lime, and other substances by moistening it or suspending it in H_2O and subjecting it to an elec. current while between diaphragms, in the same way as glue itself is treated according to 21,448, 1914. The heat produced by the current, aided, if necessary, by additional heat and chemicals, may be utilized for simultaneously converting the material into glue or gelatin.

Electric endosmose; tanning. GES. FÜR ELEKTRO-OSMOSE. Brit., 21,190, Oct. 19, 1914. An electrolytic tanning or other impregnating process of the kind described in 19,849, 1914 (C. A. 10, 563), is modified to allow of preliminary purification of the impregnating liquid. Tannin exts. otherwise incapable of direct employment can thus be used. The tan liquor is placed between the cathode diaphragm and a third positive diaphragm sepg. the liquor from the hides. All the other compartments are filled with H_2O . The new diaphragm may be of leather, while the anode diaphragm may be of parchment paper, which is feebly negative. Acid and basic impurities collect, resp., in the anode and cathode compartments before the tannin passes through the positive diaphragm.

Electric endosmosis. GES. FÜR ELEKTRO-OSMOSE. Brit., 21,448, Oct. 23, 1914. Gelatin, glue, or the like, in soln. or in a softened condition, is purified and fractionated by elec. current between indifferent diaphragms impervious to glutin. Inorganic ions migrate through the diaphragms, while albuminoids are pptd. and may be sepd. In a modification, the anode diaphragm is of an electropositive substance, such as pig's bladder or gelatin, hardened by HCHO . Colloidal and other acids pass through this diaphragm, and albuminoids are partly deposited on it. Viscose or parchment, which



is feebly negative, is used for the cathode diaphragm. In another modification, an additional highly electronegative diaphragm of cotton, felt, burnt SiO_2 , or other material, and a body of H_2O , are placed between the negative diaphragm and the glue or like soln., to which may be added chemicals, such as acid salts, increasing the charge capacity on the positive side. Pure glue or the like passes into the H_2O compartment, the soln. thus obtained being, if desired, replaced by fresh H_2O after a time. The residual glue has a high viscosity. Impurities such as albuminoids, fats, and pigments partly migrate to the anode if the anode diaphragm is permeable. The albuminoids may be either rendered sol. again or sepd.; when dried they form a tough, elastic mass. Several additional diaphragms of selected potentials may be arranged between the glue and the electrodes to produce further fractionation.

Tungsten filaments. E. R. GROTE and J. W. H. REYNOLDS. Brit., 22,057, Nov. 5, 1914. A binder consists of gelatinous $\text{Al}(\text{OH})_3$, mixed with tungstic acid or a compd. such as Na tungstate or paratungstate. $\text{Al}(\text{OH})_3$ is dissolved in a soln. of tungstic acid in NaOH and heated until sticky, whereupon powdered W metal or compds. are incorporated, and the paste is squirted into filaments or made into rods to be drawn, the subsequent steps being ordinary.

Vapor lamp. EHRICH & GRAETZ and E. PODSZUS. Ger., 286,268, Mar. 17, 1914. The lamp is provided with two metallic electrodes and with vapors which are not generated by the electrode material. A constant flow of vapor is maintained upwards in the direction of the long arc, which is thereby rendered stable. This flow of vapor is obtained by providing in the lamp a condensible constituent, which is collected at cooler points and returned to the vaporizing chamber from whence it again passes upwards around the lower electrode, producing there an increased pressure.

Generation of light by highly heating solid refractory incandescent materials in the path of the electric current. J. E. LILIENFELD. Ger., 286,296, Mar. 15, 1912. This heating is effected in a gas under reduced pressure, through which high tension discharges are passed. O is used as the gas. A metal oxide, e. g., the Auer Ce-Th mixt., is used as the incandescent body.

5. PHOTOGRAPHY.

LOUIS DERR.

Colloid chemistry and photography. LÜPPO-CRAMER. Frankfurt. *Kolloid-Z.* 17, 105-6(1915); cf. C. A. 9, 3178-9-80.—Vegetable gums, colophonium, shellac, turpentine or Canada balsam will act as a preservative for collodion plates, making it possible to use them as dry plates if added to the amount of 0.5% of the collodion emulsion; but as they will not prevent fogging they cannot displace gelatin or sugar as preservatives.
H. I. MATTILL.

Toning with cobalt sulfide. R. NAMIAS. *Rev. gen. sci.* 27, 72(1916).—The image is bleached in 5% $\text{K}_4\text{Fe}(\text{CN})_6$, washed, and toned in 2% CoCl_2 slightly acidified with HCl, then washed again 30 min. Development with a weak metol or metol-hydroquinone developer gives brown tones superior to the usual S tones, and the result is still better if, instead of development, the print is treated with 10% Na_2S . If the Co bath is followed by a hypo bath to remove the Ag, only the Co image remains; this gives the process ceramic possibilities, in view of the well known color effects produced by Co in vitrification.
L. DERR.

Artificial illuminants for use in practical photography. C. E. KENNETH MEES. *Trans. Illum. Eng. Soc.* 10, 947-62(1915); cf. C. A. 9, 3180.—The photographic efficiency of artificial illuminants depends upon their quality and upon their visual

efficiency, but must be considered from the point of view of the materials used, which are of 3 chief kinds: (1) panchromatic materials sensitive to the whole spectrum and used with filters to give a rendering similar to that seen by the eye, or for color photography; (2) ordinary materials having their max. sensitiveness in the blue-violet; (3) materials sensitive only to the ultraviolet. For panchromatic materials the efficiency of the illuminant will depend almost entirely upon its visual efficiency while for ordinary materials the chief point of importance is the efficiency in the blue-violet; but since the latitude and freedom from halation increase with shorter wave lengths it is better to use light sources having their max. near 400μ rather than near 470μ . Nearly all artificial illuminants have application in some branch of photography or other.

C. G. F.

Color photography. F. E. IVES. U. S., 1,173,429, Feb. 29. Color selection negatives are used, which may be made by resensitizing to red a plate previously sensitized to green and similarly making negatives from both the red-sensitized and from a green-sensitized plate (as originally prepd., without resensitizing).

Cinematograph for producing colored pictures. L. CASAR VAN RIPEN. Ger., 285,558, Apr. 5, 1913.

Frame for holding cinematographic films during developing, washing, drying. A. ZIMMERMANN. Ger., 285,215, June 15, 1913.

Developing apparatus for photographic plates. J. HEINEN and T. HEINEN. Ger., 285,214, Sept. 22, 1914. The app. is designed for daylight developing.

Sizing photographic paper. M. ROTH. Ger., 285,562, Dec. 25, 1912. The difficulty sol. or insol. fat soaps are employed as an addition to the size, thereby preventing the reaction between the Ag salt emulsion and the metallic impurities present in the paper fiber. This effect is enhanced if the insol. fat soaps contain still other compds. which tend to convert the sol. Ag salts into insol. or at least difficultly sol. salts. If these compds. are in themselves sol., they are nevertheless enclosed by the insol. soap, so that the conversion of the sol. Ag salts into the insol. salts occurs only at the points of contact proportional to the amt. of the penetrating sol. Ag salts, whereby a reverse action on the emulsion film itself, as by capillarity, is prevented. Such fat soaps may be employed also with finished paper, by applying them directly to the paper in combination with gelatin soln., or adding them to the dressing used in mfg. baryta papers. The preferred mixt. contains 2 parts gelatin to 1 part so-called fatty acid, and sufficient solvent to give to the mixt. a content of about 10% gelatin. The salts (bromides or chlorides, as well as acetates, tartrates, or citrates) may be incorporated with the prepd. soap mixt. or directly with the soaps as they are made.

Photography. M. ROTH. Brit., 21,884, Nov. 2, 1914. In prepg. paper for photographic purposes, use is made of emulsions of insol. or sparingly sol. fatty soaps prepd. with gelatin, rosin soln., etc., either in the fiber as a sizing in the paper-making machine, or in or upon the finished product. In addition, there may be added alkali chlorides or bromides or other compds. capable of pptg. the sol. Ag which has not been pptd. by the fatty acid of the soap. The emulsion can be added to a baryta surfacing medium.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

Potassium metabisulfite. A. A. BESSON. Basel. Chem. Ztg. 40, 165-7(1916).—Eight com. samples are described. The SO_2 was detd. in the dry compd. and in fresh

and old solns. by titration with I, and with caustic soln. after oxidizing with I or with H_2O_2 in the cold without addition of alkali and in the warm with addition of alkali. The SO_3 was detd. before and after oxidizing with I and H_2O_2 . The conclusions are that $K_2S_2O_8$ is the correct formula for the normal compd.; that in the normal salt the SO_3 may be detd. iodometrically or alkalimetrically with equal accuracy, although the former is preferable because the com. salt may contain other acid salts or neutral salts with active SO_3 groups; that in titrating the SO_3 the salt should not be dissolved in H_2O , but the 0.1 N I added direct and the excess detd. after the reaction; that the % SO_3 falls 1.69-3.21 below the theoretical; that SO_3 is always present, the clearer the crystal the less the amt.; that the normal salt does not smell of SO_3 , but is slowly decomposed by atm. moisture with evolution of SO_2 . J. H. MOORE.

The system lead sulfate-sulfuric acid-water at different temperatures. A. D. DONK. Utrecht. *Chem. Weekblad* 13, 92-7(1916).—An investigation of the above ternary system at temps. from 0 to 200°, made to obtain information in regard to the formation of the compd. $PbSO_4 \cdot H_2SO_4$, met with in the evapn. of H_2SO_4 in lead pans. At 0°, as the H_2O content is increased from 0, first H_2SO_4 , then $H_2SO_4 \cdot H_2O$, is solid phase in the binary system; the concn. of $PbSO_4$ in the soln. is less than 0.1%, except at the invariant point $PbSO_4 \cdot H_2SO_4$, where it is 0.3%. Isotherms were also detd. at 50, 100, 150, and 200°; in each case the soly. of $PbSO_4$ is about 0.1% or less, except in solns. containing more than 90% H_2SO_4 ; the max. soly. found was 1.1% in 98.9% H_2SO_4 at 200°. $PbSO_4 \cdot H_2SO_4$ was not met with as solid phase in any portion of the system. GEORGE W. MOREY.

A rapid method of converting scrap platinum into chloroplatinic acid. J. B. TINGLE AND A. TINGLE. *J. Soc. Chem. Ind.* 35, 77(1916).—By alloying the Pt with a suitable base metal, the time necessary for converting it into chloroplatinic acid can be shortened so that a prepn. normally occupying days can be completed in a few hrs. For this purpose it is advantageous to use Zn, as this can be most easily sepd. from the Pt. The Pt is fused with Zn under a layer of some flux, the alloy thus formed being treated with dil. HCl in which the Zn dissolves, leaving the Pt as a black powder. The latter is almost instantly soluble in aqua regia. This soln. is evapd. to dryness, dil. HCl added and treated with a strip of pure Zn, by which means the Pt is pptd. out and may be sepd. from traces of Zn by thorough washing. The pptd. Pt dissolves at once in aqua regia. L. T. FAIRHALL.

7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Microchemical toxicology. O. TUNMANN. *Apoth.-Ztg.* 30, 678-9, 686-8(1915).—A series of papers is promised under the above caption, a title chosen for the reason that the investigations, at first planned to cover only poisonous plant products, were gradually extended to include metals and volatile poisons as well as artificially prepd. toxic products, in short all substances treated in the toxicological practicum at the university and in handbooks on toxicology. The present paper deals with *aconitine* and its identification by means of micro-sublimation, the technic followed and cryst. products obtained being quite fully described. W. O. E.

Action of mercury salts on sheet aluminium. Application of this reaction in general analysis and toxicology for detection of mercury salts. S. MINOVICI AND E. GROZHA. *Bull. sci. acad. Roumaine* 4, 227-30(1916).—A few drops of Hg salt soln. (also Hg albuminate) on Al foil leaves in a short time an efflorescent residue, which grows rapidly in small stalagmites of $Al(OH)_3$. The reaction is sensitive to about 1:100,000.

Foreign salts do not interfere. The Hg salt is reduced as is shown by using red HgI_2 . This is changed into green HgI , then into metallic Hg. The authors propose this reaction as a test in general analysis and toxicology. L. H. CHERNOFF.

Metallic calcium and its use in gas analysis. A. SIEVERTS. *Z. Elektrochem.* 22, 15-8(1916); *J. Soc. Chem. Ind.* 35, 119-20(1916).—While some specimens of commercial Ca combine with N only above 800° , the majority exhibit a second zone of activity between 300° and 660° , with its optimum about 440° , at which temp. 2-4 g. pieces of the metal can be quantitatively converted into nitride without any difficulty; on raising the temp. the rate of absorption diminishes, becoming zero between 660° and 800° . S. designates these 2 kinds of commercial Ca as "inactive" and "active." The former can be transformed into the latter by melting and cooling slowly so as to produce a relatively coarse-grained cryst. structure; it then absorbs N even below 300° and above 650° . The reverse change is effected by chilling melted Ca from 840° . Mechanical powdering of the metal does not increase its reactivity but may render it "inactive." The varying "activity" of commercial specimens is obviously due to manufg. processes. No indications of polymorphic transformations were obtained with cooling curves. The absorption of H by com. Ca also depends on the cryst. structure of the metal, though no samples were found quite "inactive" towards H at all temps. below 800° . Samples which absorbed N only between 300° and 660° absorbed H only between 150° and 300° , and above 600° . Samples of coarse-grained cryst. structure reacted at the ordinary temp., the absorption rate increasing with temp. A superficial layer of hydride (or nitride) facilitates the further absorption of H (or N). Above the m. p. of Ca (810°) the absorption rate of either gas increases very rapidly with rise of temp. Ca nitride absorbs H and forms the compds., $\text{Ca}_3\text{N}_2\text{H}_2$ and $\text{Ca}_3\text{N}_2\text{H}_4$ (cf. Dafert and Miklausz, *C. A.* 4, 31; 8, 636), of which only the second undergoes appreciable dissociation below 600° . Measurements at 480° indicate that the compds. form solid solns. with each other. Ca nitride also absorbs CO_2 , CO, and CH_4 , with liberation of C. "Active" com. Ca can be applied to the detn. of inert (rare) gases in gas mixts., at temps. attained with a Bunsen burner. An app. devised for this purpose consists of a manometer open to the atm., with narrow glass tubes, and an easily replaceable absorption tube of 50-75 cc. capacity connected by a joint rendered air-tight with sealing wax; 3-5 g. pieces of Ca are used. The app. is first evacuated with the H_2O pump and then completely by heating the Ca. It is filled with the gas to be analyzed, and the pressure difference before and after absorption is measured at const. vol. and const. temp. The detn. of A in air, com. N or O, or even in crude A can be effected in about 1.5 hrs. For gases containing CO_2 , CO, or CH_4 , an absorption mixt. of Ca and Ca_3N_2 is used. For more exact analyses, e. g., detn. of inert gases in minerals, an app. provided with a spectral tube is used, and the pressure and vols. are measured. Cf. *C. A.* 3, 746; Brandt, *Z. angew. Chem.* 27, I, 424(1914). F. W. SMITHER.

The separation and determination of phosphoric acid as ammonium magnesium phosphate. H. LÉSCOEUR. *Bull. soc. ind. Nord France* 42, 93-7(1914); *Z. angew. Chem.* 27, II, 459(1914).—L. calls attention to Varrington's method in which the copptn. of Ca, Fe, and Al phosphates is prevented by the addition of citric acid (cf. *Ann. chim.* [4] 1, 447). Joulie's method of sepn. is described. L. has found by expt. that the phosphate ppt. always contains an excess of Mg, varying directly with the excess of precipitant (MgCl_2 or MgSO_4) used. To obtain a ppt. of theoretical compn., the ppt. obtained with an excess of the precipitant is filtered off, washed, dissolved in HCl, and repptd. by the addition of NH_4OH . F. W. SMITHER.

Determination of sulfur dioxide and sulfur trioxide in flue gases. R. J. NIXTELL AND E. ANDERSON. *J. Ind. Eng. Chem.* 8, 258-60(1916).—This method is adapted

to work in various departments of a smelter, such as multiple hearth roasting furnaces, the app. being capable of convenient transportation. After estg. the SO_2 by Hawley's method (C. A. 7, 461) the SO_2 is detd. in the same sample by aspirating through a measured excess of Na_2CO_3 soln., adding H_2O_2 , and titrating back with standard HCl .

H. M. LANCASTER.

Methods of determining iron and alumina in mineral phosphates. V. P. KOCHETKOV AND D. N. KASATKIN. *Is Result. Veget. Opylov Lab. Rabot* 9, 71-80 (1913); *Expt. Sta. Record* 34, 112-3.—Comparisons are reported of methods of quant. analysis of Viatka and Smolensk phosphates and of artificial mixts. of the principal salts found in natural phosphates for sesquioxides of Fe and Al. The methods compared were (1) Glaser's method, (2) pptn. of Fe and Al phosphates by Na acetate after neutralization of the acid phosphate soln. by Na_2CO_3 , (3) pptn. of the Fe and Al phosphates by NH_4 acetate, and (4) Grandeau's method of pptn. of the hydrates of the sesquioxides by NH_3 after treatment of the acid phosphorite soln. with acetic acid for the elimination of a large part of the Ca phosphate and by NH_4 molybdate for the elimination of the remainder of the H_3PO_4 . The method of Grandeau (4) was found to give the best results. Glaser's method (1) gave results slightly inferior; they are considered suitable for industrial analysis. The second method gave good results when an excess of acetic acid was used, but the third method apparently does not merit use.

E. J. C.

Improved method for determining iron in Prussian blue. J. E. HECKEL. *Drugs, Oils and Paints* 31, 328-9 (1916).—H. enumerates the sources of error in existing methods and proposes the following as a satisfactory procedure: Heat the sample in an open crucible gently at first, but ending with strong heat. It is unnecessary to use the blast lamp. Cool, and place the crucible and contents in a beaker. Add 25 cc. concd. HCl and 3 cc. SnCl_2 soln. and heat for 15 min. or until soln. is complete. Remove and rinse crucible. Transfer the soln. to a 500 cc. graduated flask, wash the beaker and make up to the mark with distd. H_2O . Concentrate a 100 cc. aliquot portion and reduce with SnCl_2 . Stir constantly, adding the material drop by drop from a buret until an apple-green color is produced—from chrome oxidized blues. For chlorate oxidized blues, the SnCl_2 is added until the yellow color completely disappears. At once pour in 50 cc. cold HgCl_2 soln. and 50 cc. MnSO_4 soln., dilute with cold H_2O to about 600 cc. and titrate with KMnO_4 soln.

E. W. BOUGHTON.

Contribution to the analysis of copper, aluminium and zinc alloys. H. GRAEFE. Hanover. *Chem. Ztg.* 40, 102 (1916).—Dissolve 0.5 g. borings in 15 cc. strong HNO_3 , dil., filter off any SnO_2 and exam. for SiO_2 . Warm the filtrate (about 150 cc.) to 60-70° and electrolyze for 30-40 min. with a current of 0.2-0.4 amp. at 2-3 v. Cu and Pb, if the latter is present, are deposited. Then nearly neutralize the soln., which now contains Al, Zn and Fe (if present), with solid KOH , but leave distinctly acid. Ppt. with Na_2CO_3 , wash the ppt. with hot H_2O , transfer to a 300 cc. beaker, dissolve with a very little H_2SO_4 (1:4), add a large excess of satd. KOH soln. till ppt. redissolves and electrolyze the soln. (about 150 cc.), best with a coppered gauze cathode at 700-800 r. p. m., beginning with 1 amp. and raising the current 1 amp. every 10 min. for 40 min. Wash the Zn ppt. without breaking the current, dry with alc. at a low temp. and weigh. Al and Fe in the soln. are detd. in the usual way. The method is rapid and accurate even with alloys containing 90% Zn and only 5-7% Cu and less than 5% Al.

J. H. MOORE.

The determination of titanium in ferrotitanium. G. RÖHL. Mülheim. *Chem. Ztg.* 40, 105-6 (1916).—Gravimetric and volumetric methods were tried out on the same sample of Fe-Ti; of the former, Gooch's method as modified by Thornton (cf. C. A. 6,

3245) was found to be the most rapid and accurate. The best volumetric method is a modification of Knecht's method with methylene blue as indicator, using a standard FeCl_3 soln., as follows: Intimately mix 0.5 g. of finely ground Fe-Ti with 2.5-3 g. Eschka's mixt. in a Pt crucible whose bottom is covered with a thin layer of the mixt., heat over a Bunsen burner for 30 min., then 1 hr. over a blast or Méker burner, moisten the cooled sintered mass with a very little H_2O in an Erlenmeyer flask, crush and dissolve in 200 cc. concd. HCl with warming. Then make the soln. to 500 cc., remove 100 cc. to a 500 cc. Erlenmeyer flask with a 2-hole stopper and Bunsen valve through which CO_2 is passed, add 60-70 cc. concd. HCl and reduce the Ti for 30 min. by adding 4 or 5 pieces of granulated Zn as fast as it is dissolved, then adding 3 g. Zn filings and after the violent evolution of H is over heating carefully just to the b. p. (the soln. must not boil). After the Zn is all dissolved disconnect the CO_2 tube and through the hole in the stopper add a few drops of dil. methylene blue soln. Then titrate the hot soln. at once with standard FeCl_3 soln., allowing the point of the buret to extend through the hole in the stopper. The blue end point is very sharp. Cf C. A. 7, 3581; 8, 308, 882.

J. H. MOORE.

A rapid method for the analysis of red lead and orange mineral. J. A. SCHAEFFER. *J. Ind. Eng. Chem.* 8, 237-8(1916).—Treat 1 g. of the sample with 15 cc. of HNO_3 (d. 1.2) and stir until all red color disappears. Add 10 cc. of a soln. of H_2O_2 made by mixing 1 part of 3% H_2O_2 with 3.5 parts of H_2O . Stir until almost all PbO_2 is decomposed, and then add a little hot water and stir again until all PbO_2 has dissolved. Dilute with hot H_2O to 250 cc. and titrate with standard KMnO_4 soln., having an Fe value of 0.005. A blank titration is made in the same manner. The difference in the titrations multiplied by 3.058 = % of Pb_3O_4 , or multiplied by 1.067 = % of PbO_2 . S. has devised a chart, a cut of which is shown, whereon the % of Pb_3O_4 can be read directly.

E. W. BOUGHTON.

Chromium oxide analysis. A. J. FIELD. *J. Ind. Eng. Chem.* 8, 238-9(1916).—The fusion of the sample with Na_2O_2 can be satisfactorily effected in a Pt crucible placed inside a larger porcelain crucible heated by a low flame. After the fused mass is dissolved in H_2O , boiling during 20 min. is more than sufficient to remove excess Na_2O_2 . The volumetric iodide method gives excellent results.

H. M. LANCASTER.

A method for the determination of alcohol in the presence of phenol. J. EHRLICH. *J. Ind. Eng. Chem.* 8, 240-1(1916).—Conversion of $\text{C}_6\text{H}_5\text{OH}$ into $\text{C}_6\text{H}_5\text{Br}_2\text{ONa}$ is simple and rapid. It prevents the contamination of the EtOH distillate and consequent interference with the usual pycnometer method.

H. M. LANCASTER.

The determination of nitrogen in organic compounds by the microchemical method and by the ordinary method. G. FISCHMAN. *Rend. accad. sci. fis. et mat. Napoli* [3] 21, 135-42(1915).—From the data given it appears that the results of microcombustion are more accurate than those of the macrocombustion. The precautions at first seem laborious but are much less so after practice. The former requires only about $\frac{1}{2}$ as much time as the latter and can be carried out with very much less substance. The details of technic cannot be briefly abstracted. E. J. WITZEMANN.

Alloys of silver and platinum and their analysis (KOIFMANN) 9. Non-corrosive "binding post" (LEAVENWORTH) 4.

RIDSDALE, C. H. AND N. D.: Analyst and Client. Middlesbrough, Eng.: Ridsdale & Co. 198 pp. 10s, 6d.

8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

Classification and composition of manganese ores. ANON. *Iron Coal Trades Rev.* 91, 604(1915).—Tabulated analyses of Mn ores of India. H. L. OLIN.

Geology of tungsten deposits. J. J. RUNNER. S. Dak. Sch. Mines. *Pahasapa Quart.* 5, 13-22(1916).—A summary covering the mineralogy and occurrence of W. E. T. W.

The quantitative relations in the hydrothermal metamorphosis of the chief salts in the Stassfurt potash salt deposits. M. RÓZSA. Budapest. *Z. anorg. allgem. Chem.* 94, 92-4(1916); cf. *C. A.* 9, 2862.—A number of analyses showed that the compn. of the "hartsalt" layers at Stassfurt corresponds closely with that calcd. from the hydrothermal metamorphosis of the carnallite layers, after subtraction of the $\text{MgCl}_2 \cdot 6\text{H}_2\text{O}$. The same holds true of the kainitite layers, apparently excluding the hypothesis of intermediate stages. GEORGE W. MOREY.

Evaporation of brine from Searles Lake, California. W. B. HICKS. U. S. Geol. Survey, *Professional Paper* 98A, 1-8(1916).—1000 g. of brine from Searles Lake, Calif., were evapd. in stages on the steam bath at 78° and the deposited crystals were sepd. from the soln. by filtration. The filtrate was cooled to 30° and a second fraction of crystals was obtained. Seven such successive stages reduced the brine to about 55 g. and yielded 14 fractions of crystals; 7 deposited from the hot soln. and 7 deposited as the soln. cooled from 78 to 30° . Each fraction of crystals as well as the original brine and the final filtrate was analyzed. Most of the sulfate was deposited from hot soln. in the first few fractions, and more than 60% of the K was deposited as the soln. was cooled to 30° in the last 3 fractions. Tabulated results give the compn. of the crystals deposited, the % of each constituent deposited, and the changes in the compn. of the soln. during evapn. W. B. H.

Extension of the Montana phosphate deposits northward into Canada. F. D. ADAMS AND W. J. DICK. *Proc. Nat. Acad. Sci.* 2, 62-4(1916).—Two beds of phosphate rock were found in the Banff region near Stony Squaw Mountain, the larger bed showing a thickness of 2 ft. The specimen analyzed contained 54% of $\text{Ca}_3\text{P}_2\text{O}_8$. The search is to be continued. L. W. RIGGS.

Pneumatolytic hornfels from hill countries of Siak (Sumatra). H. A. BROUWER. *Proc. Akad. Wetenschappen* 18, 584-91(1915); cf. *C. A.* 9, 2049.—Polysynthetically twinned feldspars and untwinned ones, or feldspars showing cross-hatching, can each dominate so as to exclude the others. Crystals are often untwinned, and may show parallel extinction, and contain gradations from microcline to orthoclase. The lack of feldspathization in the contact rocks can be explained by crystn. at lower temps and pressure and less mineralizers—especially alkalis. R. L. SIBLEY.

Submarine solution of limestone in relation to the Murray-Agassiz theory of coral atolls. A. G. MAYER. Carnegie Inst. *Proc. Nat. Acad. Sci.* 2, 28-30(1916).—M. refers to the work of Dole, Drew, Tashiro, and Kellermann and Smith (cf. *C. A.* 8, 2766, 3545; 9, 1343, 1357). Since the validity of the Murray-Agassiz theory depends upon the rate of the soln. of limestone in atoll lagoons, expts. were made to det. the soly. of weighed pieces of the shell of the mollusc *Cassia*. The specimens used had a sp. gr. of 2.88 and areas ranging from 57.6 to 85 sq. cm. Losses were detd. by subjecting pieces of shell to the action of sea water for a year under varying conditions, and, to approach most nearly the natural conditions, a 15.22 g. piece was placed in a 15 liter bottle into which the tide could ebb and flow, while shielded from light to prevent the growth of plants. This bottle was deposited between tides surrounded by open sea.

at Tortugas. The shell lost 0.047 g., or a superficial thickness of 0.0019 mm. in 1 year. Taking the rate of this expt. as the max. rate of soln. of CaCO_3 by sea water, over 19 million years would be required to dissolve a layer of 20 fathoms, this being the av. depth of atoll lagoons. As most, if not all, such lagoons have been formed since the beginning of Tertiary times, it is apparent that they owe their origin to other agencies than the soln. of CaCO_3 by sea water. In fact CaCO_3 is being pptd. from the sea water of the Florida and West Indian regions.

L. W. RIGGS.

9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

The chemistry and metallurgy of tungsten. M. L. HARTMANN. *Pahasapa Quart.* 5, 25-34(1916).—An excellent, concise review. A bibliography is appended.

F. W. SMITHER.

Counter-migration of pulp and solution in cyanidation and acid leaching. B. MACDONALD. *Met. Chem. Eng.* 14, 283-4(1916).—An explanation is given of the manner in which the sepn. of pulp and value-bearing soln. is effected in the Parral tank system. It is suggested that this tank might be used to advantage in the acid leaching of copper ores, since it would obviate the necessity of filtering the extd. ore.

E. A. TSCHUDY.

Coal, coke, and limestone efficiency in blast furnace operation. B. F. BURMAN. *Met. Chem. Eng.* 14, 256-8(1916); cf. *C. A.* 9, 3046; 10, 737.—*Limestone efficiency:* The value of a limestone is dependent on the amt. of its net available base. A pure limestone containing 100% carbonates may be considered 100% efficient, and another with less carbonates as less efficient. S and P should be kept to minimum amts. In making the efficiency detns., Al_2O_3 should be considered equal to SiO_2 as acid, and MgO equal to CaO as base. The difference between 100 and summated acid thus found should be considered as summated carbonate. If the slag runs with summated acid equal to the summated base, the wt. of useless stone must be summated acid plus the wt. of that CO_2 which accompanies the base of the same wt. as the summated acid. The aid of the laboratory must be enlisted to improve or keep up the quality of limestone at the quarry. Standards are necessary for figuring the relative value of the limestone, and the av. analysis of the material for the past year should be adopted as a basis for comparisons. As S plays such an important part in blast furnace operations, where its presence in the slag must not exceed a certain limit, more or less dependent on local conditions, great care must be taken to produce sufficient quantities of slag in order to keep the S on hand in a safe soln. For calculating the relative cost of anything entering the blast furnace it will therefore be convenient to have standard figures on hand relative to the amts. of coke, flux, etc., necessary to put a unit of S into the slag, thereby producing a standard S soln. The S in question is the surplus amt. left over after the slag on hand has been satisfied. Methods of making the calcs. are given.

E. A. TSCHUDY.

The dry blast in the manufacture of iron and steel. ANON. *Engineering* 101, 125-8, 152-3(1916).—A review and discussion together with descriptions and illustrations of plants.

F. W. SMITHER.

The Newcastle steel works, New South Wales. ANON. *Iron Coal Trades Rev.* 91, 275-7(1915).—A description of a new plant producing 170,000 tons of steel annually.

H. O. OLIN.

The Washoe reduction works, Anaconda. II. L. S. AUSTIN. *Mining Sci. Press* 112, 304-9(1916); cf. *C. A.* 10, 739.—A detailed description with illustrations

flow sheet, etc., of the coarse concentrator and flotation plant. The system consists of graded crushing with jig concn. for the removal of coarse concentrates, and a tailing that is progressively crushed, no part of the tailing being wasted, but all of it finally recrushed for flotation. The flotation consists in finely grinding the concentrator-tailing, adding oil and acid to the pulp, agitating this mechanically (finally with the aid of air), skimming the mineral-bearing froth produced (this being the concentrate), settling it out in Dorr thickeners, and from them removing the thickened underflow for filtration by the Oliver filters. The resultant product, still retaining 10% H₂O and containing 6% Cu, is sent to the smelter. F. W. SMITHER.

Refining cupriferous precipitate. J. A. PEARCE. *Mining Sci. Press* 112, 270-2 (1916).—The Argo Mill, at Idaho Springs, Colo., treats ores containing 3-4% of Cu which interferes with the refining of the ppt. By the ordinary method of refining (acid treatment, drying and melting) the bullion obtained is never better than 750 fine, and frequently as low as 550. Cu elimination by a wet method has proven satisfactory. The sludge from the zinc boxes is treated with an excess of H₂SO₄ until action ceases, and then finely pulverized pyrolusite is added (4-6 lbs. remove 1 lb. of Cu). The charge must be kept distinctly acid, hot, and agitated. The nascent O evolved oxidizes the Cu and the CuO formed immediately dissolves in the excess of acid. Due to the presence of finely divided electropositive Cu in suspension, the Ag is at once reprecipitated as metallic Ag. With removal of the Cu the Ag makes its appearance in the soln. and constitutes the end point of the reaction, which is complete in a few minutes. Some Ag goes into soln. but this can be reprecipitated by adding some of the original cupriferous ppt. After precipitation of the Ag the charge is drawn into the filters, washed, dried, and melted. All app. (tanks, pipes) should be lead-lined and centrifugal pumps with brass runners are preferable. The filtrate assays 0.005 oz. Au, 0.003 oz. Ag per ton. It is treated with scrap iron while hot to remove the copper, and then goes to waste. Bullion that assayed 500 to 750 fine now assays better than 900. By the process Pb is not removed, and at present, 95% of the base metal in the bullion consists of Pb. E. A. TSCHUDY.

International smelter at Miami. R. W. KERNS. *Eng. Mining J.* 101, 421-4 (1916).—A detailed description with illustrations of the works of the Intern. Smelting Co., at Miami, Ariz. It is essentially a reverberatory smelting plant and handles the concentrates from the Inspiration and Miami mills. The concentrates, largely produced by the flotation process, are very fine and carry more than 10% of H₂O and about 40% Cu; they resemble black mud, their stickiness and fineness being detg. factors in the design of the plant. No roasting action is permitted, as it is necessary to ship sulfide ore from Bisbee in order to obtain sufficient S for mat formation. Two Cottrell pptn. plants are used, one for the drier plant and one for the converter gases. F. W. SMITHER.

Preferential flotation of galena and blende. ANON. *Australian Mining Eng. Rev.*; through *Met. Chem. Eng.* 14, 279(1916).—A description of the sepn. of galena and blende at the Sulphide Corporation works, Broken Hill. The Hebbard-Harvey under-drive machines (capacity about 4000 tons per week) are used. The flotation plant handles tailings (carrying 4.2% Pb and 18% Zn) from the Pb mill, where the major portion of the galena is sepd. The pulp is first agitated with eucalyptus oil; the froth carries 57% Pb, the residue 3% Pb and 18.5% Zn; in the next flotation treatment oil and acid are used, the concentrate assaying 6% Pb and 47.5% Zn. The final tailings contain 1% Pb and 2% Zn. The process is conducted in the cold. It effects the recovery of an additional 15% of Pb and Ag as compared with the process previously used. The new process permits the fine tabling in the Pb mill to be discontinued. Rhodonite forms the principal obstacle to successful tabling (its d. being be-

tween that of galena and blende), but flotation gets rid of it as well as of other gang matter, and makes possible an easier sepn. of the 2 minerals in subsequent tabling operations.

F. W. SMITHER.

The determination of grain size in metals. Z. JEFFRIES, A. H. KLINE AND E. B. ZIMMER. Case School Applied Science. *Bull. Am. Inst. Mining Eng.* 1915, 2359-69. —A method has been developed, by means of which grain size can be detd. in much less time than by the planimetric method. The method has for its object the rapid detn. of the number of grains included within a circular portion of an image. The grains completely included need no correction factor but the boundary grains lie partly within and partly outside the field of observation. The grains completely within the circle are first counted and checked. Then the boundary grains are checked with a different mark and counted. If the area of the included grains is known by planimetric measurement, it is easy to compute the av. area per grain. The results of 187 detns. showed the max. error to be 6.4%, the av. error 2.1% and the av. algebraic deviation from the planimetric measurements $\pm 0.25\%$. It is believed that the intercept method and Heyn's method are less accurate.

W. T. HALL.

The principles underlying methods for the production of malleable iron. KART. BRISKER. *Montan. Rundschau* 7, 563-8(1915); through *Chem. Zentr.* 1915, II, 765-6. —All malleableizing processes, either upon solid or on liquid cast Fe, are concerned first of all with the mass of metal itself and from it difficultly fusible scales are formed. These oxides combine with SiO_2 , which is always present, forming readily fusible Fe silicates which can dissolve SiO_2 and FeO. The dissolved FeO, which is present in every freshly formed Fe-silicate slag, diffuses into the fluid Fe and gives up its O to the foreign substances present, forming Fe silicates, Mn silicate, FePO_4 , etc., which pass into the slag with liberation of considerable heat as a result of the chemical action. The malleableizing action of the FeO on C requires heat and can only take place when sufficient heat has developed. Then the CO that is formed causes the melt to swell or "boil." If earth bases are present, the conditions are favorable for their uniting with all the SiO_2 and P_2O_5 ; the acid constituents are thus made inactive and the metal oxides are not reduced. If the oxidation of the C takes place with sufficient supply of heat, finally not only the metal oxides but even the silicates and phosphates are reduced. Consequently, if there is not sufficient metal or earth bases to combine with the acids present, the P can go back as such into the liquid metal; the certain removal of this element, therefore, is accomplished only when a slag rich in metal or lime is present. The FeO remaining in the metal mass after the completion of the malleableizing process must be reduced by the addition of metallic Mn or, in some cases, Si or Al. The removal of the S from the Fe is a result not of the oxidation action but of the liquation of the metal sulfides, which, as far as the fluidity of the slag permits diffusion, pass into it. To prevent any return of the S to the metal bath, the sulfides must be destroyed by combustion or some constituent, such as CaO, must be present in the slag which will hold the S firmly.

W. T. HALL.

The effect of nitrogen on steel. B. STRAUSS. *Iron Age* 97, 432-3(1916); cf. C. A. 9, 433. 905.—At the Krupp plant in Essen, N in acid and basic Bessemer steel was found to vary from 0.012 to 0.30% and in open hearth steel from 0.001 to 0.008%. In nitrogenizing steel with NH_3 , the action begins at 300° and is most active between 600° and 800° . Above 800° the rate of absorption decreases. The limit of absorption is 11.1%, corresponding to Fe_4N_3 . Pure electrolytic Fe treated in NH_3 for 12 hrs. at 750° shows under the microscope a shell of nitride, then a structure resembling pearlite, and then ferrite crystals crossed by needles. The pearlite structure is due to both N and C; the latter comes from pyridine in the NH_3 fumes. The needles are supposed to be slip bands due to the brittleness of the ferrite caused by N. Low C

steel annealed in NH_3 at 700° absorbed N up to 0.10% in 24 hrs., 0.11% in 48 hrs., 0.16% in 72 hrs. and 0.22% in 96 hrs. The elastic limit and ultimate strength were slightly increased and the elongation and reduction of area decreased. N may be removed by heating *in vacuo* at 620° or in H at 400° . In thin sheets blow holes may be caused by the decompn. Nitrides of some of the alloying elements such as Si, Cr, etc., are formed on heating the steel to 800° . CARLE R. HAYWARD.

Vacuum-fused iron with special reference to effect of silicon. T. D. YENSEN. *Bull. Am. Inst. Mining Eng.* 1916, 483-512; cf. C. A. 9, 906, 1892.—The electrolytically refined Fe used in the investigation, containing less than 0.01% C and about 0.01% Si, was melted in a vacuum furnace with the alloying Si under a finishing pressure of 0.5 mm. Hg. Si, like B, besides forming a solid soln. with Fe, reduces any FeO that may be present. The max. tensile strength of the vacuum-fused alloy is 105,000 lbs. per sq. in. with a Si content of 4.5% while its limit of forgeability lies between 7 and 8% Si, except that between 2.50 and 2.60% Si there is a critical state of extreme brittleness which corresponds to the compn. Fe_{10}Si . From the standpoint of magnetic properties the optimum Si contents are 0.15 and 3.40% and the most favorable annealing temp. 1100° . The max. permeabilities for both these alloys are above 50,000 and the hysteresis losses for B max. = 10,000 and 15,000 are 300 and 1000 ergs per cc. per cycle, resp., values $\frac{1}{8}$ and $\frac{1}{8}$ of the corresponding loss for com. Si steel. The sp. elec. resistance increases about 13 microhms for the first % of Si added and for each additional %, 11 microhms. H. L. OLIN.

A chemical explanation of the effect of oxygen in strengthening cast iron. W. MCA. JOHNSON. *Bull. Am. Inst. Mining Eng.* 1916, 233-5; *Iron Age* 97, 309 (1916).—The work of J. E. Johnson, Jr. (cf. C. A. 9, 194) shows that cast Fe with an O content of 0.06% has a breaking strength of 3,500 lbs. per sq. in. while that with 0.01% has a strength of only 2,500 lbs. Photomicrographic evidence shows that the graphite particles of the first are dense and spherical while those in the second are flaky. The author explains these conditions by the postulate that the particles of any ppt. are made denser and harder by the presence of a reagent having a solvent action on the ppt. and cites as an example the coagulation of BaSO_4 in a soln. having an excess of HCl through the solvent action of the latter and the reformation of BaSO_4 in larger crystals. Similarly O acts on C, forming CO, which is dissolved in the Fe. H. L. OLIN.

The effect of carbon on the physical properties of heat-treated carbon steel. J. H. NEAD. *Bull. Am. Inst. Mining Eng.* 1915, 2341-58.—The expts. described were undertaken at the Watertown arsenal with a view of detg. the influence of C on the tensile and impact properties of steel. The original plan was to investigate a series of steels with varying C content over a wide range of heat treatments with regard to static tensile qualities and resistance to shock. The Charpy tests and metallographic examn. have not been completed but all the heat treatments and the static tensile tests are finished. A series of steels was prepd. with C varying from 0.14 to 1.46%, with approximate increments of 0.1% C, excepting the 0.9 and 1.1% C steels. The Mn varied from 0.20 to 0.67%, as is normal for commercial steels. With each heat treatment, 1 specimen was reserved for the tension test and 4 for the Charpy impact bending test. The specimens were tested: (a) as received, hot-rolled; (b) after annealing; (c) hardened in water; (d) hardened in oil and drawn at 375° ; (f) hardened in oil and drawn at 460° ; (g) hardened in oil and drawn at 560° ; (h) hardened in oil and drawn at 650° . As regards the max. strength of the specimens, it was found that this was reached in the annealed condition at the eutectoid compn. (0.83% C). With heat-treated steels, however, the falling off in strength does not begin until 1.2% C is present. The tensile strength curves show a rapid rise with increasing C to eutectoid compn., then a less rapid rise to 1.2% C, followed, as a rule, by a slight fall with

increasing C. Except in the hot-rolled condition, the unit stress of the yield point reached a max. at the eutectoid compn., falling off slightly or remaining constant with more C. The curves for Brinell hardness are very similar to those of tensile strength. In general, the curves for elongation and contraction show decreasing values with increasing C. The tendency of the curves is to be concave upward but they are straighter in the heat-treated than in the hot-rolled steels. Twenty-four photomicrographs show the characteristic structure of 12 steels as received, hot-rolled and normalized, or annealed, from 1000°. In the case of the hot-rolled steels, the structures consist of sorbito-pearlite and ferrite for the hypo-eutectoid steels and sorbito-pearlite with cementite for the hyper-eutectoid steels. With the annealed specimens, the grains are considerably larger and the constituents are pearlite and ferrite for hypo-eutectoid steels and pearlite and cementite for hyper-eutectoid steels.

W. T. HALL.

Proposed revisions in present standard specifications for steel and steel products. ANON. *Proc. Am. Soc. Testing Materials* 15, Pt. I, Appendix 2, 111-4 (1915).—Changes to be applied to the 1914 year-book. D. B.

Report of committee A-1 on finishing temperatures of rails. E. F. KENNEY, *et al.* *Proc. Am. Soc. Testing Materials* 15, Pt. I, Appendix 1, 91-110; Discussion, 115-20 (1915).—From actual tests it seems that there are not such decided differences in the quality of rails rolled at different temps. as the theory indicates. It does not seem justifiable to go to the expense of detg. finishing temps. any more accurately than possible with the shrinkage clause. D. B.

Neglected phenomena in heat treatment of steel. M. E. LEEDS. *Proc. Am. Soc. Testing Materials* 15, Pt. II, 5-26 (1915); see C. A. 9, 3210. D. B.

Experiments on the rusting of iron in water which has been softened by the permutite process and means for preventing corrosion. O. BAUER AND E. WETZEL. *Mitt. k. Materialprüfungsamt.* 33, 1-29 (1915); through *Chem. Zentr.* 1915, II, 499-501. —The corrosive effect of softened water was compared with that of ordinary tap water. Clean, polished plates of cast Fe and ingot Fe were used for the expts. The cast Fe contained 3.7% C (3.08% graphite), 2.40% Si, 0.89% Mn, 0.66% P, 0.09% S and 0.07% Cu. The ingot Fe contained 0.04% C, 0.01% Si, 0.59% Mn, 0.03% P, 0.03% S and 0.16% Cu. The expts. were carried out at room temp., at 50° and at 80°. In each case 2 series of expts. were performed with each metal and with each water; in one series the water was changed every working day and in the other the plates of metal were kept immersed in the same portion of water during the entire duration of the expt. (25 days). The polished metal strips were weighed at the beginning and again at the end of the expt. after brushing off all the rust. In the expts. at room temp. in which the water was renewed frequently, there was but little difference in the extent of corrosion observed with either material or either water, approx. 0.06 g. being lost by corrosion in every case. At 50° and 80°, however, both the cast Fe and the ingot Fe were attacked more by the softened water than by tap water. The water was kept at these temps. only during the working day and loss of water was prevented by use of condensers. The original plates weighed from 19.35 to 23.51 g. in the case of cast Fe and 7.77-9.91 g. in the case of ingot Fe. The losses in wt. at 50° were about the same as at 80° but approx. 3 times as much as at room temp. When the water was not renewed, the cast Fe was more strongly attacked at room temp. and at 50° and the ingot Fe was in every case more strongly attacked by the softened water than by tap water. The attack by the softened water was always more localized than in the case of tap water, which caused a fairly uniform attack. The cause of the corrosion is primarily the presence of dissolved oxygen. This dissolved O will

react with Na_2SO_3 and, for this reason, corrosion may be prevented by adding Na_2SO_3 . Tap water when treated with Na_2SO_3 soon lost all its dissolved O but the softened water reacted much longer. Corrosion expts. were carried out with introduction of air at room temp., in the absence of air at room temp., at 50° and at 80° , and also under 20 atm. pressure. The results showed that there was no tendency to corrode as long as unused Na_2SO_3 is present, but when this is completely oxidized to Na_2SO_4 , corrosion at once starts.

W. T. HALL.

Investigation of the behavior of iron in the presence of water and aqueous solutions in steam boilers. E. BOSSHARD AND R. PFENNINGER. Zürich. *Chem. Ztg.* 40, 5-6, 46-8, 63-4, 91-2 (1916).—Expts. were made in a specially constructed boiler on 7 pieces of boiler plate, analyses of which are given. The expts. lasted 24 hrs. at about 15 atm. pressure, and were made with freshly distd. H_2O , distd. H_2O containing O and CO_2 in soln., city H_2O , and with these containing, as a rule, 0.1, 1.0, 5.0, 10.0% Na_2CO_3 and up to 50% NaOH ; also with 1.0% solns. of Na_2CO_3 , NaOH , NaCl , NaNO_3 , Na_2SO_4 , CaCl_2 , $\text{Ca}(\text{NO}_3)_2$, CaSO_4 , MgCl_2 , $\text{Mg}(\text{NO}_3)_2$, and MgSO_4 , with 1.0% solns. of NaCl , NaNO_3 and Na_2SO_4 in the presence of varying amts. of Na_2CO_3 and with NaHSO_3 with and without Na_2CO_3 . The data are fully tabulated. The conclusions drawn are: CO_2 -free H_2O has the least action; all the compds., especially chlorides and Mg salts, attack the Fe, but when more than 10% Na_2CO_3 is present the action is reduced; 1.0% NaOH gives the best protection; 17.44% of the total alkali in a Na_2CO_3 soln. at 15 atm. for 24 hrs. was found to exist as NaOH , and 72.66% at the end of 96 hrs. This explains the protective action of Na_2CO_3 . NaHSO_3 in small amts. (0.6%) protects Fe; larger amts. are injurious even in the presence of Na_2CO_3 . J. H. MOORE.

Segregation in gold bullion. JAMES H. HANCE. *Bull. Am. Inst. Mining Eng.* 1916, 299-326.—The investigation described was undertaken with the view to det. the cause of frequent irregularities in the assay of cyanide bullion. In alloys of Au with basic metals, notably Pb and Zn, the Au segregates toward the central and lower portions and the bar cannot therefore be assayed with accuracy. If the base metal content is less than 30% the addition of Ag produces a homogeneous soln. and this expedient is suggested as a means of overcoming the difficulty, although it does not solve the problem.

H. L. OLIN.

The alloys of silver and platinum and their analysis. I. KOLFMANN. *Arch. sci. phys. nat.* 40, 12, 509-13 (1915).—In preparing these alloys by cupellation of weighed amts. of Ag and Pt, some Ag is lost. To prepare alloys of definite compn. it is better to fuse weighed amts. in a crucible with NaCl . It was found impossible to form alloys richer than about 5% in Pt. When treated with concd. HNO_3 all the alloys, ranging from 0.2 to 5% in Pt, left a black residue, more or less bulky, according to the Pt content, and gave a brown soln. of colloidal appearance. The residue, when treated with H_2O , gave a similar brown soln. and disappeared completely. The more concd. the acid the greater is the residue. It was apparent that there was no true soln. of Pt because Pt could be sepd. by centrifugalization. The residue was found to consist of pure Pt. Thus it is impossible to attack a Ag-Pt alloy and obtain a partial soln. of the latter; nor is it possible to sep. Ag from Pt by this means. The presence of AgNO_3 was found to have no effect in the formation of the colloidal soln. D. B.

Electrolytic zinc (INGALLS) 4.

FRANKE, R.: *Mansfeldsches Hüttenwesen*. Halle: W. Knapp. 37 ss. 2 M.

Metallurgical Calculations. Vol. 1. Chemical and Thermal Principles. New ed. New York: McGraw-Hill Book Co. 208 pp. \$2.00.

ROSS, T. K.: *The Metallurgy of Gold*. 6th ed. London: C. Griffin & Co. 601 pp. 22s, 6d.

SAUVEUR, A.: *Metallography and Heat-Treatment of Iron and Steel*. Rev. ed. New York: McGraw-Hill Book Co. 500 pp. \$6.00.

STANSBIE, J. H.: *Elementary Practical Metallurgy for Technical Students and Others*. London: J. & A. Churchill. 151 pp. 3s, 6d.

Muffle furnace for heating metals. T. W. MUCKLE. U. S., 1,172,222-3, Feb. 15.

Ore-roasting furnace. H. T. BENSON. U. S., 1,171,583, Feb. 15.

Ore-roasting furnace. W. H. MOTTER. U. S., 1,172,479, Feb. 22.

Ore amalgamator. A. ALLEN. U. S., 1,172,099, Feb. 15.

Ore amalgamator. K. SENN. U. S., 1,172,171, Feb. 15.

Treating complex zinc ores. C. C. TITUS and W. J. BARENSCHERR. U. S., 1,173,467, Feb. 29. Zn ores which may contain Fe, Mn, Au, Ag, Ca, Mg, Pb or Cu, are chloridized, leached and the soln. obtained is treated with oxidized Zn ore to ppt. Fe and Mn. Zn is used to ppt. Au, Ag, Cu and Pb if present and Zn is pptd. as basic carbonate by the addition of NaCl and Na₂CO₃ soln. formed by carbonating a soln. formed by electrolysis of NaCl. Any Ca and Mg present are pptd. as carbonates after sepn. of the Zn carbonate and the exhausted liquor is electrolyzed for further use in the process.

Obtaining zinc from ores. F. C. W. TIMM. U. S., 1,172,321, Feb. 22. Air is passed through a hot mixt. of carbonaceous fuel and roasted Zn blende or similar Zn-bearing material for a short time. The charge is then remixed evenly and the passage of air continued to drive off additional Zn and obtain a sintered residue.

Obtaining zinc from a liquid slag bath. F. THARALDSEN. Ger., 286,228, Mar. 28, 1914. Addition to 261,188 (C. A. 7, 3310). The app. specified in the parent patent is modified in that under the hearth is provided a net-work of canals connected laterally with chambers from which the accumulated Pb alloy is tapped from time to time. In this manner the Pb alloy is prevented from strongly attacking the floor of the furnace hearth and opening up holes through the joints by corrosion, through which the Pb may escape. The sepn. of the Pb and Zn may be effected by remelting. Upon charging the slag into the furnace, Pb is added in such quantity that the chamber is filled to the height of the bottom of the hearth, so that the canals may not be stopped with slag.

Separation of mixed sulfide ores. R. T. D. WILLIAMS. Can., 165,390, Oct. 12, 1915. The finely ground ore is mixed with H₂O containing in soln. bleaching powder and a small proportion of a frothing agent, the mixt. is agitated to form a froth and the froth sepd.

Concentrating ores. L. BRADFORD. Brit., 21,880, Nov. 2, 1914. A process for the preferential sepn. of PbS or pyrites or both from ZnS consists in submitting the ores to flotation in an acid medium which wets the ZnS particles so that they sink while the PbS or pyrites particles or both are permitted to float, such medium consisting of an acid soln. to which is added a small quantity of a reducing gas, or a soln. of such gas, or a substance capable of evolving a reducing gas, such as thiosulfates, sulfites, bisulfites, sulfides, or polysulfides; *e. g.*, the medium may be a dil. soln. of SO₂. A frothing agent is used in cases in which a reducing gas is introduced; when the reducing gas is generated in the medium by reaction, a frothing agent need not be used. In some cases, the ore may be digested with H₂SO₄ and reducing agent before effecting the flotation operation. When the concentrate of PbS or pyrites or both has been ob-

tained, the ZnS may be floated after treatment of the medium by the addition of an oxidizing agent, or by agitation with steam and air, or by draining the residues and resubmitting them to flotation. Cf. *C. A.* 10, 585.

Separating and dressing mixtures in the electrostatic field. J. KRAUS. Ger., 285,209, Feb. 5, 1914.

Recovery of tin from tin scrap. G. O. SEWARD and F. VON KÜGELGEN. U. S., reissues 14,070-1, Feb. 15. See original patent 851,946; *C. A.* 1, 2040.

Dephosphorizing pig iron. P. L. T. HEROULT. U. S., 1,172,597, Feb. 22. Blast-furnace pig Fe high in P is treated in an elec. furnace with basic slag containing Fe oxide at a temp. just high enough to keep the slag molten and cause it to combine with the P in the Fe, without changing materially the % of C.

Alloys. L. GOLDMERSTEIN. Ger., 286,556, Apr. 15, 1913. Cf. Brit., 7,103, 1913 (*C. A.* 8, 3005). The alloys are prepd. by fusion, while at the same time the melt is freed from impurities such as P, S, and the like.

Reducing hysteresis of sheet metal alloyed with silicon. O. GRAEF. U. S., 1,173,951, Feb. 29. The permeability of plates or sheets of Si alloys is increased and the hysteresis loss reduced by annealing, pickling in a dil. acid soln., neutralizing and drying.

Iron united to copper-aluminium alloy. I. LANGMUIR. U. S., 1,171,856, Feb. 15. Fe or steel is united with an alloy of Cu with Al in an atm. of H by use of a cryolite flux at a temp. but slightly above the m. p. of the alloy. A firm union of the metals is effected which renders the composite article susceptible to mechanical working.

Copper-clad steel or iron. W. M. PAGE and W. TASSIN. U. S., 1,171,637, Feb. 15. A Cu-clad billet of Fe or steel is heated to nearly the m. p. of Cu and then rolled between blunt-edged oval rollers to reduce it to wire rod size while maintained at a temp. of 700-900°. Cf. *C. A.* 9, 591.

Coating aluminium or iron with other metals. F. MOENCH. U. S., 1,172,160, Feb. 15. An elongated vessel containing Pb, Sn or Zn to be used as the coating metal is heated near one end to a temp. sufficient to melt a portion of the metal adjacent this end and the articles to be plated, e. g., Al sheets, are plunged into the molten metal and rubbed against the semi-fluid metal at the junction of the molten and still unmelted metal and then withdrawn through the molten metal. Fe may be similarly coated with Al.

Annealing, tempering or hardening metals. F. L. BISHOP. U. S., 1,171,832, Feb. 15. Bar steel or other metal in the solid state is heated to 750-800° and subjected to the magnetic field of an a. c. while protected against oxidation, to alter the molecular structure of the metal at a lower temp. than would be effective without the action of the magnetic field.

Pickling and scouring plates. J. A. PARKER and A. PARKER. Brit., 21,621. Oct. 28, 1914. A rocking vessel for holding the plates is specified.

10. ORGANIC CHEMISTRY.

CHAS. A. ROUILLER.

Preparation of ethyl bromide. ALFRED HOLT. Liverpool. *J. Chem. Soc.* 109, 1-2 (1916); cf. Weston, *C. A.* 10, 43.—The object of the method is to obtain the greatest possible amt. of EtBr from a given weight of KBr or NaBr, a moderate waste of alc or H₂SO₄ being relatively unimportant, owing to the prevailing high price of the bromides. 900 cc. H₂O are gradually added to 1500 cc. H₂SO₄ and, after cooling, 1500

cc. abs. alc. run in, taking care to prevent too great a rise in temp. When cold, 1100–1200 g. KBr are added. (If the equiv. amt. $\text{NaBr} \cdot 2\text{H}_2\text{O}$ is used, the vol. H_2O added to the acid is slightly diminished.) The whole mixt. is then heated on a sand bath in a 4 l. flask at the lowest temp. at which EtBr will distil over, the process taking 8 or 9 hrs. The EtBr is caught in H_2O , washed with this, and dried over CaCl_2 . Owing to the fact that Et_2O and EtBr form a const. boiling mixt., the best criterion of the purity is the d. Yields: 90–96%, based on the anhydrous bromide used. Practically no HBr distils over when this method is used. M. HEIDELBERGER.

Cholesterol and coprosterol. III. The ozonides of cholesterol. IV. The action of bromine on cholesteryl benzoate. CHARLES DORÉE AND LIONEL ORANGE. *Borough Polyt. Inst., London. J. Chem. Soc.* 109, 46–55(1916).—The contradictory and uncertain results obtained by others in studying the action of O_3 on cholesterol (A) led the authors to reopen the subject. The "ozone number" method as used by Fürth and Felsenreich (*C. A.* 9, 2881) is valueless, as CHCl_3 , which they used as solvent, is strongly attacked by O_3 . The ozonized O was passed through H_2SO_4 and then 5% aq. NaOH to remove the O_4 present. The final concn. of O_3 was 0.8%, and this was passed into a suspension of (A) in HOAc at the rate of 1 mol. per hr. (0.12 g. per g.) (A). To test the extreme action of O_3 , it was passed through the soln. for 24 hrs. per g. (A). An equal vol. petr. ether was added and the whole poured into twice the vol. of H_2O , the ozonide sepg. as a clot. This was added to the alkali-washed Et_2O ext. of the aq. layer, dissolved in a little Et_2O , and pptd. with light petroleum. This was repeated several times, after which the viscous clot was dried in a high vacuum, whereupon foaming took place, and the product formed a brittle solid which could be easily powdered. The analysis indicated the addition of O_6 ; $[\alpha]_D^{18}$ 31° . All the other ozonization expts. mentioned below were worked up in the same way. Using a shorter ozonization period (3–10 hrs. per g.) and no NaOH washing soln. values were obtained indicating the addition of 6–7 atoms O; $[\alpha]_D^{18}$ 21° . The use of acetone as solvent did not change these figures. In expts. in which the ozonization was stopped as soon as the (A) went into soln. (1.5–4 hrs.), washed O_3 gave products averaging 3 atoms added O, $[\alpha]_D^{18}$ 43° , while crude O_3 gave products with 4 atoms O and $[\alpha]_D$ varying from 23° to 35° . Limited action of O_3 (passed first through H_2SO_4) on the acid $\text{C}_{27}\text{H}_{44}\text{O}_4$ (Diels, *Ber.* 36, 3177(1906)) indicated the addition of 4 atoms O, $[\alpha]_D^{18}$ 29° , while prolonged action showed that 7–8 atoms were combined, $[\alpha]_D^{18}$ 13° . All the ozonides m. $85\text{--}95^\circ$ and decompd. above 100° . Resinous acids and neutral substances were formed by their decompn. The amts. of O_3 added, and the manner of the addition confirm the authors' view that the secondary unsatn. is due to an opening up of a bridged ring under the influence of the O_3 . Attempts to form a thio-ozonide (Erdmann, *C. A.* 2, 3069) by heating (A) and S to $160\text{--}5^\circ$ for 8 hrs., dissolving the red mass in CS_2 , evapg., removing the free S with HPh , and purifying by repeated pptn. from HPh with alc., gave dark red, brittle solids, m. indefinitely 111° , and containing 19–21% S ($\text{C}_{27}\text{H}_{44}\text{OS}_2$ requires 20%). The fact that cholesteryl benzoate (B), with Br in CS_2 , gives a mono-Br deriv. (Obermüller, *Z. physiol. Chem.* 15, 42(1891)) was confirmed, but from the acetone mother-liquors, on keeping, were obtained flat hexagonal tablets, m. $168\text{--}9^\circ$, which had the compn. of cholesteryl benzoate dibromide, and were quant. reduced by Zn dust and HOAc to (B). Cholesteryl *m*-nitrobenzoate (C), from (A) and the acid chloride at 165° for 5 min., m. 137° to a turbid liquid which clears at 170° and gives a characteristic play of violet, green, red, and orange colors on cooling. Cholesteryl *p*-nitrobenzoate forms plates, m. 185° to a turbid liquid which decomp. 250° ; on cooling the melt the play of colors, violet, green, and red, was observed. (C) required 2 atoms Br for complete reaction in CS_2 , but the only cryst. product capable of isolation was bromocholesteryl *m*-nitrobenzoate, $\text{C}_{24}\text{H}_{40}\text{O}_4\text{NBr}$, leaves,

m. 149°. It is concluded that the negativity of the acyl nucleus hinders the reactivity of the unsatd. linking in the mol. M. HEIDELBERGER.

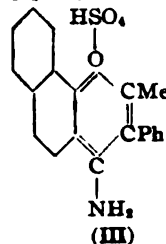
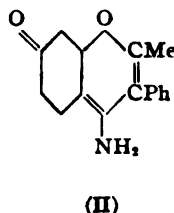
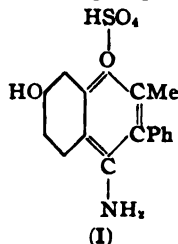
Polymorphism in halogen-substituted anilides. FREDERICK D. CHATTAWAY AND GEORGE R. CLEMO. Oxford. *J. Chem. Soc.* 109, 89-105 (1916); cf. *C. A.* 10, 755.—An extension of previous observations. If precautions are taken to exclude HBr and H₂O, 2,4-Br₂C₆H₃NH₂ is easily prepd. as follows: 1 mol. *p*-BrC₆H₄NHAc (or PhNHAc, using twice the given amts. of NaOAc and Br) and 1 mol. fused, powdered NaOAc are suspended in enough HOAc to make a thick paste, and 1 mol. Br in 8-10 vols. HOAc is slowly added, the mixt. being heated 5-6 hrs. on the H₂O bath until the color of Br almost disappears. On cooling and dilg. with H₂O, 2,4-Br₂C₆H₃NHAc seps.; this is immediately filtered off and hydrolyzed by boiling with aq.-alc. HCl. Yield, 90%. 2,4-ClBrC₆H₃NHAc is easily prepd. by passing 1 mol. Cl into a cooled suspension of 1 mol. each of *p*-BrC₆H₄NHAc and fused, powdered NaOAc in HOAc; it may also be prepd. from 2-ClC₆H₄NHAc, by heating in HOAc with Br in the presence of NaOAc. If a hot, satd. soln. in HOAc or alc. is rapidly cooled, the needle form seps.; this may require several days for conversion into the stable, compact form, unless the mixt. is seeded, when the change takes place very rapidly. 4,2-ClBrC₆H₃NHAc also crysts. similarly, but changes into the stable form more slowly than its isomer. The butyranilides described below were prepd. by heating (PrCO)₂O with equivalent amts. of the amines. *Butyro-2-chloro-4-bromoanilide*, needles, m. 110°, extinction 21°; *butyro-4-chloro-2-bromoanilide*, needles, m. 111.5°, extinction 31°. The phenylacetyl-anilides were prepd. from the chloride and the amine in the presence of C₆H₅N. *Phenylaceto-2-chloro-4-bromoanilide*, needles, m. 150°, extinction variable; *phenylaceto-4-chloro-2-bromoanilide*, needles, m. 148°; *phenylaceto-2,4-dibromoanilide*, needles, m. 160°. The nitrobenzoyl derivatives were prepd. from the chlorides and the amines in Et₂O in the presence of C₆H₅N or concd. Na₂CO₃ soln. *o-Nitrobenzo-2-chloro-4-bromoanilide*, needles, m. 165°, extinction, 25°; *o-nitrobenzo-4-chloro-2-bromoanilide*, plates, m. 166°, extinction, 18°; *o-nitrobenzo-2,4-dibromoanilide*, pale yellow plates, m. 178°, extinction, 24°; *o-nitrobenzo-2,4-dichloroanilide*, plates, m. 153.5°. *m-Nitrobenzo-2,4-dichloroanilide*, plates, m. 183°, straight extinction; *m-nitrobenzo-2-chloro-4-bromoanilide*, needles, m. 191°; *m-nitrobenzo-4-chloro-2-bromoanilide*, plates, m. 167.5°; *m-nitrobenzo-2,4-dibromoanilide*, needles, m. 165°, extinction variable. *p-Nitrobenzo-2,4-dichloroanilide*, seps. first from alc. as fine, almost colorless needles, slowly changing (3 weeks in 1 expt.) into compact plates; both forms m. 174°, the needles transforming below the m. p. *p-Nitrobenzo-2-chloro-4-bromoanilide*, almost colorless, felted hairs from alc., rapidly changing into pale yellow plates with straight extinction, m. 199°; *p-nitrobenzo-4-chloro-2-bromoanilide*, fine, almost colorless needles with straight extinction from alc., changing slowly into stout, pale yellow, hexagonal plates with diagonal extinction (about 3 days), both forms m. 174°; *p-nitrobenzo-2,4-dibromoanilide*, almost colorless hairs from alc., changing during 3 days to pale yellow, hexagonal plates with straight extinction; both forms m. 194°. The phthalanils were obtained by heating the amine and C₆H₄(CO)₂O to about 180° for several hrs. *Phthalo-2,4-dichloroanil*, prisms, m. 155°, straight extinction; *phthalo-2-chloro-4-bromoanil*, prisms, m. 165°, straight extinction; *phthalo-4-chloro-2-bromoanil*, prisms with straight extinction, m. 140°; *phthalo-2,4-dibromoanil*, prisms with straight extinction, m. 153.5°. The carbanilates were prepd. by slowly adding the chloroformic ester to an Et₂O soln. of the aniline containing 1 mol. C₆H₅N. *Methyl 2,4-dichlorocarbanilate*, Cl₂C₆H₃NHCO₂Me, needles, m. 70.5°; *ethyl ester*, needles, m. 89°; *methyl 2-chloro-4-bromocarbanilate*, needles, m. 76.5°, extinction 42°; *ethyl ester*, needles, m. 96°, extinction 38°; *methyl 4-chloro-2-bromocarbanilate*, needles, m. 87.5°; *ethyl ester*, needles, m. 90°; 2,4-Br₂C₆H₃NHCO₂Me; 2,4-Br₂C₆H₃NHCO₂Et, needles, m. 101°, extinction 40°; *s-2,2'*-

dichloro-4,4'-dibromodiphenylurea, needles with oblique extinction from PhNO_2 , m. 279° ; *5,4,4'-dichloro-2,2'-dibromodiphenylurea*, needles, m. 274° , extinction 40° . In prepg. the oxanilic esters from the anilines and 5 mols. $(\text{CO}_2\text{Et})_2$ at 220° for 1 hr. some of the oxanilide is formed and may be sepd. by its insoly. in boiling alc.; in the prepn. of the acids, the esters were suspended in H_2O containing a slight excess of Na_2CO_3 and treated with steam until dissolved, after which the Na salts of the acids sep. on cooling. The acids all sepd. with 1 mol. H_2O when crystd. from H_2O , but could be dehydrated by heating and obtained in anhydrous crystals from HPh or C_7H_8 . The oxanilamides were obtained from the esters and dry NH_3 in warm alc. *Ethyl 2-chloro-4-bromo-oxanilate*, needles, m. 124° ; *acid*, needles, m. 131° (decompn.); *amide*, needles, m. 243° ; *5,2,2'-dichloro-4,4'-dibromo-oxanilide*, needles, from PhNO_2 , m. 285° . *Ethyl 4-chloro-2-bromo-oxanilate*, needles, m. 121° ; *acid*, needles, m. $126-7^\circ$ (decompn.); *amide*, needles, m. 236° ; *5,4,4'-dichloro-2,2'-dibromo-oxanilide*, needles from PhNO_2 , m. 295° . *Ethyl 2,4-dibromo-oxanilate*, curved hairs, m. 130° ; *acid*, slender prisms from H_2O , needles from HPh, m. 138° with decompn. into CO_2 and $\text{Br}_2\text{C}_6\text{H}_4\text{NHCHO}$; *amide*, needles, m. 250° ; *2,4,2',4'-tetrabromo-oxanilide*, needles, m. 298° , straight extinction. At its b. p. $\text{H}_2\text{C}(\text{CO}_2\text{Et})_2$ reacts with anilines similarly to $(\text{CO}_2\text{Et})_2$, analogous products being formed (C. A. 4, 2106). These are sepd. in the same way as the $(\text{CO}_2\text{Et})_2$ derivs. and are capable of the same transformations. *2,2'-Dichloro-4,4'-dibromomalonanilide*, $\text{CH}_2(\text{CONHC}_6\text{H}_3\text{ClBr})_2$, needles with straight extinction, m. 214° ; *ethyl 2-chloro-4-bromomalonanilate*, plates with straight extinction, m. 81.5° ; *acid*, prisms, m. 165° when quickly heated, giving quant. CO_2 and $\text{ClBrC}_6\text{H}_3\text{NHAc}$; *amide*, needles, m. 149° . *4,4'-Dichloro-2,2'-dibromomalonanilide*, prisms, m. 221° , straight extinction; *ethyl 4-chloro-2-bromomalonanilate*, plates, m. 83.5° ; *acid*, prisms, m. 161° when quickly heated, giving CO_2 and the acetanilide; *amide*, needles, m. 159° . *2,4-Dibromomalonanilamide*, $\text{Br}_2\text{C}_6\text{H}_3\text{NHCOCH}_2\text{CONH}_2$, needles, m. 164° . *Benzene-sulfon-2-chloro-4-bromoanilide*, prisms with straight extinction, m. 122° ; *2-chloro-4-bromophenylchloroamide*, $\text{ClBrC}_6\text{H}_3\text{NCISO}_2\text{Ph}$, prisms, m. $111-2^\circ$ when rapidly heated; *benzenesulfon-4-chloro-2-bromoanilide*, prisms, m. 128° ; *4-chloro-2-bromophenylchloroamide*, prisms, m. 123° . *p-Toluenesulfon-2-chloro-4-bromoanilide*, plates, m. 121° ; *2-chloro-4-bromophenylchloroamide*, prisms, m. 78° ; *p-toluenesulfon-4-chloro-2-bromoanilide*, plates, m. 126.5° ; *4-chloro-2-bromophenylchloroamide*, prisms, m. 77° ; *p-toluene-sulfon-2,4-dibromoanilide*, plates, m. 134° , straight extinctions; *2,4-dibromophenylchloroamide*, prisms, m. 78° . *p-Nitrotoluene-o-sulfon-2-chloro-4-bromoanilide*, faintly yellow prisms, m. 164.5° , extinction 25° ; *2-chloro-4-bromophenylchloroamide*, prisms, m. $123-4^\circ$; *p-nitrotoluene-o-sulfon-4-chloro-2-bromoanilide*, faintly yellow prisms with 60° and 43° terminal faces, straight extinction, m. 165° ; *4-chloro-2-bromophenylchloroamide*, prisms, m. 122° ; *p-nitrotoluene-o-sulfon-2,4-dibromoanilide*, faintly yellow prisms with straight extinction, m. 173° ; *2,4-dibromophenylchloroamide*, prisms, m. $124-5^\circ$. *2-Chloro-4-bromobenzeneazo- β -naphthol*, plates with a beetle-green color by reflected light and a red color in transmitted light, m. 210° ; *4-chloro-2-bromobenzeneazo- β -naphthol*, red plates, m. 193° , give straight extinction, and are sharply pleochroic (orange-red).

M. HEIDELBERGER.

A synthesis of flavones. BROJENDRA N. GHOSH. London. *J. Chem. Soc.* 109, 105-22(1916).—Instead of using $\text{AcCHPhCO}_2\text{Et}$ in the condensation with phenols leading to the production of substituted γ -benzopyrones or flavones (C. A. 9, 2762), the nitriles RCOCHPhCN (where $\text{R} = \text{H}, \text{Me}, \text{or Ph}$), are now used, giving rise to imides from which the flavones may be produced by boiling with dil. H_2SO_4 . The condensation takes place best when a Me or an additional OH group is present; other substituents inhibit the reaction. The yields are best when 1 *m*-position to the OH is occupied; when both are occupied, or when the substituent is *o*-, no condensation

takes place. In the case of AcCHPhCN , H_2SO_4 proved to be the best condensing agent, while with HCOCHPhCN , POCl_3 and dry HCl yielded products that were easier to handle. Using BzCHPhCN , dry HCl was the only condensing agent that could be used, while BzCH_2CN reacted in the presence of H_2SO_4 . 4 g. $m\text{-C}_6\text{H}_4(\text{OH})_2$ and 5 g. AcCHPhCN were slowly treated with 15 cc. H_2SO_4 , allowed to stand overnight, and poured onto ice, giving, almost quant., *4-imino-7-hydroxy-3-phenyl-2-methyl- γ -benzopyrane sulfate* (I),



pyrane sulfate (I), yellow needles, m. to a dark red liquid 246° , gives a yellow color, with green fluorescence, in H_2SO_4 , and a violet color with alc. FeCl_3 ; in alc. soln. aq. NaOAc gives the *base* (II), brown prisms with 0.5 H_2O , m. 221° (decompn.); the *p*-quinonoid structure is assigned because the corresponding compd. from *m*-cresol (see below), in which there is a *p*-Me, is colorless; *picrate*, orange yellow needles, m. 227° ; *perchlorate*, decomp. explosively on heating; *acetyl derivative*, faintly yellow needles with 0.5 H_2O , m. 135° ; *benzoyl derivative*, needles with 0.5 H_2O , m. $178-9^\circ$; boiled with 10% aq. H_2SO_4 (I) yields NH_3 and 7-hydroxy-3-phenyl-2-methyl- γ -benzopyrone (*loc. cit.*). Similarly, using 1,2,3- $\text{C}_6\text{H}_3(\text{OH})_3$ and treating with NaOAc an alc. soln. of the yellow salt formed, there was obtained *4-imino-7,8-dihydroxy-3-phenyl-2-methyl- γ -benzopyrane*, dark brown prisms with 0.5 H_2O , sinters 125° , m. 142° (decompn.), gives a green color with alc. FeCl_3 , a brown Na salt with NaOH , and reduces $\text{AgNO}_3\text{-NH}_3$ soln. on warming; *acetyl derivative*, pale yellow needles, m. 194° ; the keto compd. is formed on boiling with dil. H_2SO_4 . $\alpha\text{-C}_{10}\text{H}_7\text{OH}$ as the phenol gave *4-imino-3-phenyl-2-methyl-1,4- α -naphthopyrane sulfate* (III), orange needles, m. 174° (decompn.); *free base*, pale brown prisms with 0.5 H_2O , m. 162° ; gives the keto compd. with dil. H_2SO_4 . $m\text{-MeC}_6\text{H}_4\text{OH}$ yielded *4-imino-3-phenyl-2,7-dimethyl- γ -benzopyrane sulfate*, yellow prisms, m. 122° (decompn.); yield, poor; *free base* (see above), needles, m. 89° , sol. in H_2SO_4 with a yellow color; hydrolysis with 10% H_2SO_4 gave *3-phenyl-2,7-dimethyl- γ -benzopyrone*, needles, m. 155° , fluoresces blue in H_2SO_4 . 20 g. POCl_3 were added to 3 g. $m\text{-C}_6\text{H}_4(\text{OH})_2$ and 4 g. HCOCHPhCN (A) and the mixt. heated to 50° to start the vigorous reaction; cooling, treating with ice, and recrystg. from HOAc containing dil. HCl gave *4-imino-7-hydroxy-3-phenyl- γ -benzopyrane hydrochloride*, yellow needles with 1 H_2O , sinters 205° , m. 215° (decompn.) (yield, almost quant.), gives a violet color with alc. FeCl_3 and a yellow-brown soln. in NaOH , evolving NH_3 on warming, gives the keto compd. on hydrolysis with H_2SO_4 ; *free base*, yellow needles with 1 H_2O , m. 226° ; *acetyl derivative*, needles, m. 186° (decompn.); *benzoyl derivative*, needles with 1 H_2O , m. 136° ; *perchlorate*, yellow needles. 4 g. each of 1,2,3- $\text{C}_6\text{H}_3(\text{OH})_3$ and (A), and 20 g. POCl_3 at $50-60^\circ$ for 0.5 hr. followed by treatment of the alc. soln. of the yellow product with NaOAc gave *4-imino-7,8-dihydroxy-3-phenyl- γ -benzopyrane*, yellow needles with 1 H_2O , sinters 208° , m. 220° , gives a green color with alc. FeCl_3 and reduces $\text{AgNO}_3\text{-NH}_3$ soln. on warming; *acetyl derivative*, needles with 1 H_2O , m. 171° ; hydrolysis with dil. H_2SO_4 gives *7,8-dihydroxy-3-phenyl- γ -benzopyrone*, pale yellow needles with 2 H_2O , m. 215° , sol. in aq. NaOH with a brown color, in H_2SO_4 with a yellow color and green fluorescence, and reduces $\text{AgNO}_3\text{-NH}_3$ soln. on warming; *acetyl derivative*, needles with 1 H_2O , m. 184° , from the imino compd., Ac_2O , and NaOAc .

4-Imino-3-phenyl-1,4- α -naphthopyrane hydrochloride, using HCl in HOAc, yellow needles with 1 H₂O, m. 135° (decompn.); *free base*, dull yellow prisms, decomp. 115–30°, fluoresces green in alc.; *3-phenyl-1,4- α -naphthopyrone*, pale yellow needles with 0.5 H₂O, m. 169–70°, sol. in H₂SO₄ with a yellow color and dark green fluorescence. Orcinol, (A), and POCl₃ gave *4-imino-7-hydroxy-3-phenyl-5-methyl- γ -benzopyrane*, yellow needles with 1 H₂O, sinters 227°, m. 235°, decomp. 241°, gives a yellow-green color with alc. FeCl₃; *7-hydroxy-3-phenyl-5-methyl- γ -benzopyrone*, pale yellow needles with 2 H₂O, sinters 218°, m. 224°, sol. in H₂SO₄ with a yellow color and dark green fluorescence. BzCHPhCN (B) is best prepd. by slowly adding, with vigorous shaking, 75 g. EtOBz to 58 g. PhCH₂CN and 11.5 g. Na in alc., letting stand for 1 hr., and boiling for 2 hrs. This method, which gave a yield of 90% when applied to the prepn. of (A) (using EtO₂CH), yielded 45% (B) (cf. Walther and Schickler, *J. prakt. Chem.* [2] 55, 308 (1897)). On passing a slow current of HCl into a well cooled soln. of (B) and *m*-C₆H₄-(OH)₂ for 5–6 hrs. and letting stand 3 days, there sepd. *4-imino-7-hydroxy-2,3-diphenyl- γ -benzopyrane hydrochloride*, pink needles with 1 H₂O, sinters 280°, m. 286°, gives a yellow-brown color with alc. FeCl₃; *free base*, yellow needles, m. 290°; *acetyl derivative*, needles with 0.5 H₂O, m. 215°; *7-hydroxy-2,3-diphenyl- γ -benzopyrone*, needles, m. 288°, boiled 4 hrs. with 33% aq. KOH it gives PhCH₂Bz, *m*-C₆H₄(OH)₂, and 2,4-(HO)₂C₆H₃CO₂H; *acetyl derivative*, leaflets with 1 H₂O, m. 222°. 1,2,3-C₆H₃(OH)₃ yielded *4-imino-7,8-dihydroxy-2,3-diphenyl- γ -benzopyrane*, yellow needles with 0.5 H₂O, m. 179–80°, gives a green color with alc. FeCl₃; *7,8-dihydroxy-2,3-diphenyl- γ -benzopyrone*, needles, m. 185°, gives a green color with alc. FeCl₃ and reduces AgNO₃-NH₃ soln. on warming. BzCH₂CN, *m*-C₆H₄(OH)₂, and H₂SO₄, after standing in the cold overnight, pouring onto ice, and decomp. the sulfate with NaOAc, gave *4-imino-7-hydroxy-2-phenyl- γ -benzopyrane*, yellow-brown prisms with 0.5 H₂O, decomp. 185–235°, gives a violet color with alc. FeCl₃ and a green fluorescence in dil. alc. soln.; decompn. with 33% aq. KOH gave AcPh, *m*-C₆H₄(OH)₂, and 2,4-(HO)₂C₆H₃CO₂H; *picrate*, orange needles, m. 238°. *4-Imino-2-phenyl-1,4- α -naphthopyrane sulfate*, prisms, decomp. 185–215°; yield, small; *free base*, pale brown prisms, decomp. 138–48°; *picrate*, orange needles, m. 274° (decompn.). *4-Imino-7,8-dihydroxy-2-phenyl- γ -benzopyrane*, brown prisms with 1 H₂O, decomp. 145–65°, gives a red color with aq. NaOH, green with alc. FeCl₃, and reduces AgNO₃-NH₃ soln. on warming. M. H.

Mercuric acetate as oxidizer in alkaloidal chemistry. J. GADAMER. Univ. Breslau. *Arch. Pharm.* 253, 274–89 (1915).—Investigations still under way have shown that Hg(OAc)₂ may be very advantageously employed as an oxidizing agent both qual. and quant. in alkaloidal chemistry, the mercurous salt formed thereby being on account of its difficult soly. easily collected and weighed. I. Action of mercuric acetate on alkaloids of the apomorphine and hydroberberine group. J. GADAMER AND FRITZ KUNTZE.—The behavior of bulbocapnine Me ether towards alc. I soln. lead G. and K. to believe that the product of oxidation was tetrahydro-bulbocapnine Me ether. However, in view of the fact that Hg(OAc)₂ detaches but 2 H atoms, the oxidation product must be regarded as a didehydrobulbocapnine Me ether (optically inactive). The reaction is expressed by the equation $C_{20}H_{19}O_4N + 2Hg(OAc)_2 = C_{20}H_{17}O_4N + 2AcOH + Hg_2(OAc)_2$. It should be noted in this connection that the quantity of pptd. Hg₂(OAc)₂ varied according as the operation was carried out at room or H₂O bath temp., in which latter case the resulting color changes indicated a more profound oxidation. Even in the cold, further oxidation could be noted. Similar treatment of *d*-canadine lead to the formation of berberine, according to the equation: $C_{20}H_{19}O_4N + 4Hg(OAc)_2 = C_{20}H_{15}O_4N.OAc + 3AcOH + 2Hg_2(OAc)_2$. Oxidation of corydaline appears to yield first didehydrocorydaline (optically inactive?) and finally tetrahydrocorydaline. II. Action on laudanotine. J. GADA-

MER AND R. KONDO.— MnO_2 and dil. H_2SO_4 convert this alkaloid, according to Pyman (*C. A.* 3, 2966), into veratrumaldehyde, 2,4,5-MeNHCH₂CH₂(MeO)₃C₆H₃CHO, and a compd., $\text{C}_{14}\text{H}_8(\text{OMe})_4$, which latter product, according to G. and K., is tetramethoxydibenzyl, $\text{C}_{14}\text{H}_{10}(\text{OMe})_4$. The above products were obtained by the action of $\text{Hg}(\text{OAc})_2$ on *dl*-laudanosine. III. Action on papaverine. J. GADAMER AND SCHULMANN.—This alkaloid is changed almost quant. into papaverinol, $\text{C}_{20}\text{H}_{21}\text{O}_5\text{N}$.

W. O. E.

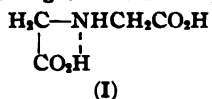
The formation of pyridine and isoquinoline bases from casein. AMÉ PICRET AND TSAN QUO CHOU. *Compt. rend.* 162, 127-9 (1916); *Ber.* 49, 376-81 (1916).—The work answers the objection that alkaloids are not formed by the decompn. of proteins because proteins do not contain nuclei such as are found in alkaloid mols. P. and C. think these nuclei are formed in the plant by condensation of HCHO with primary protein decompn. products since they were able to effect such a condensation. 25 g. methylal were slowly dropped into a mixt. of 50 g. casein and 150 g. HCl (d. 1.19). After 6 hrs. heating on the steam bath, the mixt. was evapd. dry, mixed with CaO and distd. A yellow oil (9% of casein used) was obtained which contained primary, secondary and tertiary bases. After treatment with NaNO_2 , and fractional distn., the following compds. were isolated: pyridine, 2,6-dimethylpyridine, isoquinoline, 4-methylisoquinoline; a base, $\text{C}_7\text{H}_9\text{N}$, which decolorized cold KMnO_4 and formed the picrate, m. 238°, chloroaurate, m. 225°, chloromercurate, m. 235°, and chloroplatinate, m. 285°; another base, $\text{C}_{11}\text{H}_{11}\text{N}$, whose picrate m. 240°, chloroaurate, m. 195°, chloroplatinate, m. 200°, and a third base, $\text{C}_{13}\text{H}_{13}\text{N}$, whose picrate m. 185°. Curiously P. and C. were unable to detect the slightest trace of quinoline. The above expt. carried out without the addition of methylal did not form any of the above-named compds.

L. H. CHERNOFF.

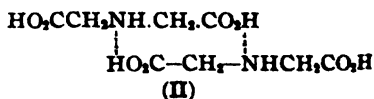
The nitration of phenylpropionic acid. M. S. REITCH. *Compt. rend.* 162, 129-30 (1916).— $\text{PhC}:\text{CCO}_2\text{H}$ can be directly nitrated with HNO_3 at -20°C . without oxidation of the side chain. Substitution takes place in the *p*- and *o*- but not in the *m*-position. This does not agree with the theory that the satn. of the side chain influences orientation, for hydrocinnamic and cinnamic acids also nitrate in the *o*- and *p*-position. Furthermore, the group $\text{—C}:\text{CO}_2\text{H}$ is about 100 times more electronegative than the group $\text{—CO}_2\text{H}$, hence the rules of substitution attributed to electronegativity do not hold.

L. H. CHERNOFF.

The structure of α -amino acids. H. J. BACKER. *Chem. Weekblad* 12, 943-6 (1915).—As it is a well-known fact that the acid and basic properties of α -NH₂ acids neutralize each other but that there exists a doubt whether this neutralization is *intra*- or *intermol.*, B. tries to solve this problem by means of the elec. cond. of an α -NH₂ acid in which there is, besides NH₂ and CO₂H groups, a group of a distinctly acid character, *i. e.*, $\text{NH}(\text{CH}_2\text{CO}_2\text{H})_2$. For the neutralization of this acid (litmus), 1 mol. NaOH was required. The aq. soln. of the acid, evapd. with an excess of NH_4OH or 2 mols. KOH, deposits crystals of the mono-NH₄ and mono-K salts, which indicates that only one of the CO₂H groups is free and the other combined with the imino group. The following formulas are possible:



and



(I) has one free CO₂H group, (II) two. The basicity of an acid can be computed from the elec. cond. of its Na salt according to Ostwald (*Z. physik. Chem.* 1, 97). B. detd. the elec. cond. of $\text{NH}(\text{CH}_2\text{CO}_2\text{Na})(\text{CH}_2\text{CO}_2\text{H})$ at different dilns. and found $\mu_{100} - \mu_{25} = 11.3$. According to Ostwald and Walden ($\mu_{100} - \mu_{25}$) varies within 10 and

13 in the case of monobasic acids and in the case of dibasic acids within 18 and 25. According to this rule, it is very probable that $\text{NH}(\text{CH}_2\text{CO}_2\text{H})_2$ is monobasic, the 2nd CO_2H group being neutralized by the NH group. Formula (I) therefore is the more acceptable. It is probable that with the free acid and also with other $\alpha\text{-NH}_2$ acids the NH_4 salt formation is intramol.

J. T. FLOHN.

Action of methyl ethyl ketone on 2,3,4,6-tetranitrophenylnitramine. P. VAN ROMBURGH. *Proc. Akad. Wetenschappen* 18, 98-100(1915).—R. has shown (*Rec. trav. chim.* 8, 275(1889)) that H_2O acts on 2,3,4,6-(O_2N)₄ $\text{C}_6\text{HNNMeNO}_2$ (a) to form HNO_2 and 2,4,6,3-(O_2N)₃(HO) $\text{C}_6\text{HNNMeNO}_2$ (b), very slowly at room temp. but fairly rapidly on boiling. Later, with Sinnige, he found that when (a) is dissolved in acetone it reacts very rapidly with H_2O at room temp. This reaction has been further investigated in the present work. R. was not able to sep. and identify the reaction products other than HCN and (b), when acetone was used. The course of the reaction was more successfully followed by using MeEtCO . 11 g. (a) dissolved in 16 cc. MeEtCO to which had been added 0.8 cc. H_2O soon sepd. crystals of (b). The ketone soln. was decanted from the crystals and distd. on the water bath. A yellow liquid passed over in which were identified HCN and Ac_2 . On evacuating the distg. flask and heating further at the same temp. crystals of $\text{MeC}(\text{:O})\text{C}(\text{:NOH})\text{Me}$ formed in the receiver together with a small amt. of an unidentified liquid acid. The same reaction takes place in MeEtCO dried over CaCl_2 , but if the (a) is dried over H_2SO_4 and the MeEtCO over P_2O_5 , no reaction takes place at room temp. even after 2 days. On long-continued heating traces of HCN are produced and a faint yellow color appears in the distillate. On heating (a) alone, however, traces of nitrous vapors are formed. The products formed in moist ketone must be due to the action on the ketone of HNO_2 produced from (a) and H_2O . The action of H_2O on (a) in other solvents is being studied.

E. H.

Improved method for preparation of allyl alcohol. AGNES HOFF. *Oversigt Kgl. Danske Vidensk. Selsk. Forh.* 1915, 199-224.—The most important methods of prepn. are reviewed. The expt. of Hübner and Müller with *sym*-dichlorohydrin was reproduced after a careful sepn. of the *sym.* from the *unsym.* Both are found to yield allyl alc., the latter upon treatment with Na . Hydrolysis of allyl iodide yielded 96.8% alc. The objection to this method is the cost of allyl iodide and the diln. of the alc. produced, making sepn. difficult. The Tollens method of reducing glycerol (a) with $(\text{CO}_2\text{H})_2$ gave a yield corresponding to 25.4% of (a). By mixing (a) and HCO_2H (b) in varying proportions H. secured a much higher yield than Tollens. A mixt. of 5 mols. (a) and 3 mols. (b) showed the conversion of 36% (a) and 58.2% (b). 6 mols. (a) and 7 mols. (b) showed 44.3% (a) and 38.7% (b) converted. By mixing 5 mols. (a) with 1 mol. (b) and after each distn. adding such quantities of both as to maintain the same ratio, a yield equiv. to 54.1% of the constituents is obtained. By detg. the amt. of (a) and (b) left, proof is obtained that about 38% of both constituents has been lost. The theory is advanced that this must have been lost in the form of monoformin, although no direct proof is offered.

P. M. GLASOR.

The resolution of asymmetric quinquivalent nitrogen compounds. J. REILLY. Emmanuel College. *Proc. Cambridge Phil. Soc.* 18, 177-9(1915).—The selective action of optically active acids in effecting the resolution of externally compensated compds. is more noticeable in the case of N than of C derivs. and suggests that the non-resolution must be due to causes other than to racemization effects or to the hydrolytic dissociation of the salts. *d*-Benzylphenylallylmethylammonium *d*- α -bromocamphor- π -sulfonate was obtained in the forms *dBdA*, *dBIA*, *IBIA* and *IBdA* by combining *d*- and *l*-benzylphenylallylmethylammonium iodide with *l*- and *d*-Ag bromocamphor- π -sulfonate in dry Me_2CO . These compds. show a very slight tendency to racemize.

Upon standing for 2 months at 20°, $[\alpha]_D$ for *dBdA* decreased 1.6°. The pure compd. crystals from dry AcOEt without racemization. When recrystd. from alc. a slight fall in rotatory power is observed with a greater fall when recrystd. from CHCl_3 . The compds. are being studied further.

R. L. SIBLEY.

Equilibrium of the reduction of carbonic acid (to formic acid). G. BREIDIG AND S. R. CARTER. Karlsruhe. *Chem. Ztg.* 39, 72-3 (1915); cf. *C. A.* 8, 1584; 9, 294.—Considerable amts. of free HCOOH are obtained by the action of H and Pd black under pressure on CO_2 in the presence of H_2O ; the HCOOH is decompd. catalytically into CO_2 and H (cf. *C. A.* 6, 2912). The detn. of the equil. between these reactions between 30° and 90° gave no indication of the formation of HCHO as an intermediate product, so that it is unlikely that the formation of the latter is a stage in the assimilation of CO_2 in nature.

L. T. FAIRHALL.

Tetrabromo-*o*-phenylenediacetamide. C. LORING JACKSON AND SYDNEY A. BEGGS. *J. Am. Chem. Soc.* 38, 685-7 (1916); cf. *Am. Chem. J.* 35, 148 (1906).—4,6,1,2- $\text{C}_6\text{H}_2\text{Br}_4(\text{NH}_2)_2$, formerly obtained in only 5% yield by steam distg. the reduction product of the 2- NO_2 compd., is obtained in 78% yield (although not quite so pure) by extg. with Et_2O ; 6.5 g. treated with a slight excess of Ac_2O give 7 g. of 2-amino-4,6-dibromoacetanilide, needles from dil. alc., m. 189°. Tetrabromo-*o*-phenylenediacetamide, from the di-Br compd. in AcOH boiled 11 hrs. in sunlight with an equal wt. of Br, prisms from dil. alc., does not m. 280°. Attempts to remove the Ac groups with H_2SO_4 , NaOH or alc. NH_3 gave 2-methyltetrabromobenzacetimidazole, $\text{C}_6\text{Br}_4\text{N}(\text{Ac})\text{CMe:N}$, m. 265-6°.

CHAS. A. ROUILLER.

The essential oil of sugi (*Cryptomeria japonica*) leaves. SO UCHIDA. *J. Am. Chem. Soc.* 38, 687-99 (1916).—Steam distn. of the green leaves gives 0.70% of mobile brownish yellow oil with fresh aromatic odor, b. 155-350°, reacts violently with Br, becoming greenish and viscous, gives an intense green color and becomes very viscous when 2 drops are dissolved in 1 cc. Ac_2O and shaken with 1 drop H_2SO_4 ; it dissolves in H_2SO_4 with yellowish brown color and sepn. of a small amt. of thick reddish brown oil; it gives no characteristic color with dil. FeCl_3 , does not reduce $\text{NH}_4\text{-AgNO}_3$, contains neither N nor S, and shows $d_{15.5}^{15.5}$ 0.9217, $[\alpha]_D^{15}$ 19.29° (10% CHCl_3 soln.), n_D^{20} 1.4895, acid no. 1.0, ester value 6.56 and, after acetylation, 14.35. The following substances were isolated from the oil: *d*- α -Pinene (a); dipentene (b); an alcohol (c), $\text{C}_{10}\text{H}_{18}\text{O}$, b. 212-4°, d_{18} 0.9414, $n_D^{22.8}$ 1.4832, $[\alpha]_D$ 56.07° (8.98% CHCl_3 soln.), mol. wt. in freezing C_6H_6 162.7; cadinene (d); a sesquiterpene with 2 double bonds (e), $\text{C}_{15}\text{H}_{24}$, b. 266-8°, d_{18} 0.9335, $n_D^{22.8}$ 1.5041, $[\alpha]_D$ 15.19° (6.08% CHCl_3 soln.), mol. wt. in freezing C_6H_6 209.0; a sesquiterpene alcohol (f), $\text{C}_{15}\text{H}_{26}\text{O}$, b. 284-6°, $d_{18.5}$ 0.9623, $n_D^{22.8}$ 1.5048, $[\alpha]_D^{15}$ 16.76° (5% CHCl_3 soln.), mol. wt. in freezing C_6H_6 218.0; a new diterpene, α -cryptomerene (g), $\text{C}_{20}\text{H}_{32}$, needles from AcOEt , m. 61°, b. 345°, b_{18} 198°, $[\alpha]_D$ -34.22° (4.67% CHCl_3 soln.); a lactone $\text{C}_{10}\text{H}_{16}\text{O}_2$; caprylic acid in combination with (c); higher fatty acids free; and a blue oil, azulene. The terpenes, chiefly (a) with a little (b), form about 34% of the oil; (d) and (e), chiefly (e), 30%; (f), 4.5%; (g), 18%; (f), 12%. (c) has a powerful odor like that of camphor and peppermint and is the chief odoriferous constituent of the oil. (e) is a viscous oil with a weak hay-like odor, forms with $\text{Ac}_2\text{O-H}_2\text{SO}_4$ a yellowish green color changing to indigo and gives with HCl gas in Et_2O a dihydrochloride, brownish black oil. (g) treated in cold Et_2O with HCl gas deposits an isomer, β -cryptomerene, needles from AcOEt , m. 211-2°, mol. wt. in freezing PhOH 275-6°.

CHAS. A. ROUILLER.

Essential oil of Formosan hinoki (*Chamaecyparis obtusa*, S. et Z.) wood. SO UCHIDA. *J. Am. Chem. Soc.* 38, 699-702 (1916).—The crude oil (2.4% of the wood) on rectification with steam yielded 89.9% of mobile, lemon-yellow oil with the hinoki

wood odor; after washing with dil. soda it shows $d_{11.1} 0.8821$, $n_D^{18.5} 1.4990$, $[\alpha]_D 50.37^\circ$ (10% CHCl_3 soln.) and consists chiefly of *d*- α -pinene and cadinene, with a small amt. of oxygenated compds.; the terpenes form about 70% and the sesquiterpenes 24% of the oil. Pinene-HCl may advantageously be purified by sublimation and m. $132.5-3.5^\circ$ (cor.).

CHAS. A. ROUILLER.

Organic molecular compounds. JAMES F. NORRIS. *J. Am. Chem. Soc.* 38, 702-11 (1916); cf. *C. A.* 5, 496.—This work has been undertaken to det., if possible, the causes affecting the mutual affinity between atoms in org. mols. and the relationship between these affinities and the formation of mol. compds. The following working hypothesis has been formulated and is being tested: Every element contains a definite amt. of chem. energy which partly undergoes transformation when it combines with another element, the amt. of chem. energy in the resulting compd. being detd. by the amt. of energy transformed in its formation. The residual energy still present in the atoms makes it possible for the mol. to unite either with additional atoms or with mols. to form mol. compds. If, in the formation of the original mol., a large share of the chem. energy is transformed the resulting compd. would have little power to combine with other things; if, on the other hand, only a small amt. of the chem. energy has been lost, the compd. will still have a marked power to combine with other substances. If this residual affinity is sufficient, a compd. with another element is possible, whereas if the amt. is small a mol. compd. may be formed. In general, the change in energy taking place in the formation of mol. compds. is less than that transformed in the formation of simple compds. Thus, PCl_3 can still combine with Cl to form PCl_4 and the latter still contains available chem. energy which is no longer sufficient to react with more Cl but is sufficient to react with certain mols., many mol. compds. containing PCl_4 being known. $\text{Ph}_3\text{C}:\text{CPh}_2$ does not show the characteristics of an unsatd. compd.; it does not give a dibromide with Br, the chem. affinity of the 4 Ph groups almost completely "neutralizing" that of the 2 C atoms. They can combine with Cl, however, but in the resulting $(\text{Ph}_2\text{CCl})_2$ the Cl atoms are very labile, being easily removed by metals and reacting with H_2O at room temp. The 2 C atoms to which the Cl atoms are united do not hold the latter firmly, since they possessed but little available chem. energy, which was transformed in the formation of the $(\text{Ph}_2\text{CCl})_2$. Accordingly, but little of the chem. energy of the Cl was expended in the union and a large amt. is left available for the formation of mol. compds. and as a matter of fact a number of such mol. compds. have been prepd. According to the hypothesis compds. with an active Cl atom should be able to form mol. compds.; this has been verified with Ph_2CCl . Of compds. not containing halogens, 2 classes might be expected to form mol. compds.: (1) those containing an active element or group (verified in the case of Ph_2COH); (2) so-called unsatd. C compds. which have largely lost the power to add other atoms as the result of the accumulation of negative groups around the unsatd. C atoms (verified with $(\text{BrC}_6\text{H}_4)_2\text{C}:\text{C}(\text{C}_6\text{H}_4\text{Br})_2$). The $(\text{Ph}_2\text{CCl})_2$, m. $160-2^\circ$ (decompn.), is obtained in 90% yield from $\text{Ph}_3\text{C}:\text{CPh}_2$ in the smallest possible amt. of CHCl_3 satd. with Cl. A satd. soln. in hot CHBr_3 allowed to cool deposits crystals of the *bromoform double compound* $(\text{Ph}_2\text{CCl})_2 \cdot 2\text{CHBr}_3$. The *carbon tetrabromide compound*, from the components in CS_2 allowed to evaporate spontaneously, m. $144-7^\circ$. *Dichlorobromomethane compound*, from $(\text{Ph}_2\text{CCl})_2$ recrystd. from hot CHBrCl_2 . *Sulfuryl chloride compound*, transparent crystals rapidly efflorescing and readily decompd. by moisture. *p*- $\text{ClC}_6\text{H}_4\text{-CPhClCClPh}_2$ forms a *chloroform compound*, cubes with 1 mol. CHCl_3 , m. $58-9^\circ$, rapidly loses its CHCl_3 in the air, and a *carbon tetrachloride compound*, crystals with 2 mols. CCl_4 , m. $91-3^\circ$, quickly loses CCl_4 . [*p*- BrC_6H_4] $_2\text{C}:$, m. $251-2^\circ$, is obtained in 65% yield from 5 g. powdered $\text{Ph}_3\text{C}:\text{CPh}_2$ spread out in a thin layer, treated with 7.5 cc. Br in small portions and, after the excess of Br has evaporated, crystd. from Me_2CO , from

which it seps. as the *acetone compound*, needles with 2 mols. Me_2CO ; *methyl ethyl ketone compound*, with 1 mol. AcEt ; *diethyl ketone compound*, needles; *carbon tetrachloride compound*; *ethyl acetate compound*, loses AcOEt at the rate of 1 mg. per g. in the air at room temp.; *benzene compound*, needles. The dichloride, m. $190-2^\circ$, does not form addition products with CHCl_3 and CCl_4 . Ph_3COH seps. from hot CCl_4 on cooling in flat square crystals of the compn. $4\text{Ph}_3\text{COH} \cdot 3\text{CCl}_4$. *Acetone compound*, $2\text{Ph}_3\text{COH} \cdot \text{Me}_2\text{CO}$, prisms. Ph_3CCl gives the *carbon tetrachloride compound* $\text{Ph}_3\text{CCl} \cdot \text{CCl}_4$ and the *acetone compound* $2\text{Ph}_3\text{CCl} \cdot \text{Me}_2\text{CO}$. CHAS. A. ROUILLER.

Electrochemical experiments with organic arsenic compounds. FR. FICHTER AND EPHRAIM ELKIND. Basel. *Ber.* 49, 239-50(1916); cf. *C. A.* 9, 2543, and earlier papers.— $p\text{-H}_2\text{NC}_6\text{H}_4\text{AsO}_3\text{H}_2$ (a) is obtained in 40 g. yield by heating a mixt. of 300 g. PhNH_2 and 142 g. H_3AsO_4 in a series of small flasks, 12 hrs. at 150° instead of $170-200^\circ$ as usually recommended. Like all other aliphatic and aromatic arsonic acids studied, the pentavalent As in (a) can be reduced electrolytically only in acid soln. In 2 N HCl in a cathode chamber carefully protected from the air it is smoothly reduced to $p\text{-H}_2\text{NC}_6\text{H}_4\text{AsH}_2$ (b). With current densities of 0.08 amp./sq. cm. and cathodes of different materials the following % current yields were obtained: Cu 32.9, Pb 37, amalgamated Pb 72.0, Hg 73.1 (current density 0.18), amalgamated Zn 81.5. With Pb cathodes and current densities of 0.019, 0.038, 0.076 and 0.114 amp./sq. cm. the current yields were 24, 22.7, 35 and 54.4, resp. In aq. HCl, as the result of the decrease of HCl around the cathode, oily deposits of (b) are often formed on the more slowly working cathodes; this can be avoided by using alc. HCl. Thus, with 2.17 g. (a) in 4 cc. concd. HCl, 18 cc. alc. and 3 cc. H_2O , the current yields with different cathodes are, in the order given above, 36.2, 43.5, 78.8, 71.4, 71.9%, resp. A greater initial concn. of HCl than 2 N is not advisable on account of the lesser soly. of (b)-HCl, which seps. on the cathode as a white, powdery, cryst. layer. Addition of NaCl has the same effect; in fact, the (b)-HCl can be quant. pptd. with 5 N NaCl from the clear reduction liquid obtained at a Zn cathode. 2 N H_2SO_4 has the same disadvantage as more concd. HCl. The temp. must be carefully kept down, otherwise PhNH_2 and H_3AsO_3 are formed, the latter being further reduced to AsH_3 . $p\text{-H}_2\text{NC}_6\text{H}_4\text{AsO}$ (c) is smoothly reduced in HCl and still more easily in 2 N NaOH but even when the air is carefully excluded the reduction generally proceeds only as far as $(\text{H}_2\text{NC}_6\text{H}_4\text{As})_2$ (d), although the amt. of H utilized indicates that somewhat more than that calcd. for the above reduction is used, and at a Hg cathode in HCl is obtained a clear soln. which turns yellow only in the air, depositing (d)-HCl. F. and E. conclude that (b) is first formed and reacts with unchanged (c), giving (d). This last condensation is very rapid in alk. soln. and at Pb cathodes (d) is obtained quant. with very little more than the calcd. amt. of H. The current yields (calcd. on the basis of reduction to (d)) with various cathodes in the order given above are 29.4, 156.2, 129.8, 200, 129.0%, resp. The reason that in the reduction of (a), (c), which must be an intermediate product, cannot be isolated is that in order that (a) may be attacked a cathode potential must be set up which more than suffices to reduce (c) so that the latter cannot accumulate. PhAsO_3H_2 in aq. alc. HCl is quite smoothly reduced at all cathodes to PhAsH_2 . From 2.47 g. $o\text{-O}_2\text{NC}_6\text{H}_4\text{AsO}_3\text{H}_2$ in 2 N NaOAc electrolyzed at a cooled U-tube Pt cathode until no more H is used up is obtained 1.2 g. $(\text{H}_2\text{O}_2\text{AsC}_6\text{H}_4\text{NH})_2$, together with a little $\text{H}_2\text{NC}_6\text{H}_4\text{AsO}_3\text{H}_2$, while in HCl at a cooled Pb tube cathode is obtained a clear yellow soln. which with air gives an 82.5% yield of $(o\text{-ClH}_2\text{H}_2\text{NC}_6\text{H}_4\text{As})_2$. Partial reduction of the $p\text{-NO}_2$ acid in $(\text{NH}_4)_2\text{CO}_3\text{-NH}_4\text{OH}$ gives the hydrazo compd., oxidized by the air to the azo acid. $\text{Me}_2\text{AsO}_3\text{H}$ (e) in 2 N H_2SO_4 quickly absorbs H at a Pb cathode and at an amalgamated Zn cathode forms chiefly $(\text{Me}_2\text{As})_2$ and some Me_2AsH . In alk. solns. (e) is oxidized at the anode to H_2AsO_4 ; in such an

expt. it was found that 8.6 mols. CO_2 were formed per mol. H_2AsO_4 , instead of 2, as required by the equation $(e) + 8\text{O} = 2\text{CO}_2 + \text{H}_2\text{AsO}_4 + 2\text{H}_2\text{O}$, so some other oxidation product, also yielding CO_2 in its production, must have been formed; such a product can be none other than MeAsO_2H_2 (f) : $(e) + 4\text{O} = \text{CO}_2 + (f) + \text{H}_2\text{O}$. The current yield in the formation of (f) was 10.8% and in the total oxidation to H_2AsO_4 3.06%. (f) can also be oxidized to H_2AsO_4 ; current yield 5.15%. Below are the conductivities at 25° for V 64, 128, 256, 512 and 1024; PhAsO_2H_2 84.7, 114, 153, 200, 256; (a) 38.7, 57.9, 83.7, 116, 179; $o\text{-O}_2\text{NC}_6\text{H}_4\text{AsO}_2\text{H}_2$ 95.3, 129, 172, 225, 285.

CHAS. A. ROUILLER.

Remarks on the communication of K. Hess and Cl. Ubrig. Action of aldehydes on primary hydroxyamines. MORITZ KOHN. Vienna. *Ber.* 49, 250-1 (1916).—C. and U.'s methylene- and benzylidenediacetonealcamines (C. A. 10, 470) are probably identical with the bases obtained by K. in the same way and to which, owing to the ease with which they are converted into nitrosamines, the assigned cyclic structures (*Monatsh.* 1904, 820). C. and U.'s methylidiacetonealcamine was also previously prep'd. by K. (*Monatsh.* 1904, 137). K. believes that their comp'd. $\text{C}_{11}\text{H}_{13}\text{O}_2\text{N}_2$ is identical with his $\text{Me}_2\text{C.NH.CO.O.CHMe.CH}_3$, obtained from diacetonealcamineurethan

by loss of alc. (*Monatsh.* 1905, 942.)

CHAS. A. ROUILLER.

Obtaining liquid hydrocarbons by the action of aluminium chloride on naphthalene under pressure. FRANZ FISCHER. Kaiser Wilhelm Inst. Kohlenforschung, Mülheim-Ruhr. *Ber.* 49, 252-9 (1916).—By working under pressure with 4% of AlCl_3 , 40% of com. pure C_{10}H_8 can be converted into a mixt. of liquid hydrocarbons, the remainder forming chiefly a mixt. of tar and carbon; apparently a part of the C_{10}H_8 is hydrogenated at the expense of the rest. In evacuated sealed tubes there is no liquefaction after 3 hrs. at 280° but after 15 hrs. about 40% of the C_{10}H_8 is converted into an oil depositing no solid after 6 hrs. at 0° ; gaseous products are also formed. Similar results (except that more gas is formed) are obtained after 3 hrs. at 330° . On the other hand, 100 g. C_{10}H_8 and 4 g. AlCl_3 boiled under a reflux 3 hrs. and distd. gave 2 g. liquid up to 215° , 47 g. C_{10}H_8 satd. with oil between $215\text{--}40^\circ$, and 47 g. of a brittle tarry residue, 7 g. of which, heated to redness, gave 0.5 g. of viscous residue and 6 g. coke. From 250 g. C_{10}H_8 and 10 g. AlCl_3 heated in a 2-l. autoclave under varying conditions were obtained the following yields of oil after freezing out the solids: Heated 25 min. to a final pressure of 15 atm., 83 g.; 20 min. to 10 atm. and 330° , 92 g.; 10 min. to 5 atm., 84 g.; 8 min. to 2.5 atm., 75.8 g. With crude C_{10}H_8 , more AlCl_3 is required; with 10% AlCl_3 35% of the C_{10}H_8 can with certainty be converted into a liquid. A large quantity of such an oil obtained from a technical C_{10}H_8 ("warm presscake") was stirred some hrs. on the H_2O bath with powdered CaO and 520 g. of the filtered, brownish oil of pleasant sweetish odor gave on distn. 19.5 g. up to 150° (a) , 410 g. between 150° and 300° and 87 g. residue (b) ; the main fraction in the ice chest deposited 27% C_{10}H_8 ; the portion remaining liquid contained 91.5% C and 8.4% H, had a heat of combustion of 9932 cal., a viscosity of 1.16 at 20° , a flash point of 70° in the Pensky-Martens app. and 75° in the open cup, but could not be burned in ordinary lamps without deposition of soot. The compn. of (a) and (b) was 91.4 and 94.0% C and 8.4 and 6.2% H, resp. C. A. ROUILLER.

Conversion of α -methylnaphthalene into 1,2-di- α -naphthylethane and picene. WALTER FRIEDMANN. *Ber.* 49, 277-84 (1916).—The synthesis of picene (a) from α,α' -dinaphthostilbene (b) (Hirn, *Ber.* 32, 3341 (1899)) cannot explain its formation in lignite tar nor its occurrence in the products of the dry distn. of California petroleum residues. Lignites always contain S, which must play a considerable role in their distn.; it can be removed only with difficulty and incompletely and a part is eliminated

as H_2S in the distn. gas, indicating a reaction between it and the hydrocarbons. When 24 g. $\alpha\text{-C}_{10}\text{H}_7\text{Me}$ (c) and 3 g. S are heated in sealed tubes 24 hrs. at $300\text{--}10^\circ$ and the viscous tarry product, which contains considerable H_2S , is freed from most of the un-attacked (c) under 8 mm., the residue after several days deposits solid particles sepg. from C_6H_6 in silvery leaflets, m. $298\text{--}300^\circ$, having a compn. corresponding to $\text{C}_{10}\text{H}_8\cdot\text{CH}_2\cdot\text{S}\cdot\text{S}\cdot\text{CH}_2\cdot\text{C}_{10}\text{H}_8\cdot\text{S}$, and yielding a *picrate*, $\text{C}_{22}\text{H}_{18}\text{S}_{1.2}\text{C}_6\text{H}_5(\text{NO}_2)_2\text{OH}$, red

needles from CHCl_3 , m. 240° . Not enough was obtained to det. whether it can be converted into (b) and is therefore really an intermediate product in the formation of (b) (see below). If the (c) and S are heated 72 hrs. at 300° and the product is at once distd. *in vacuo*, after the unchanged (c) has distd. off the temp. rises rapidly to 300° , when decompn. begins, but a very viscous red-brown oil (d) passes over and at a higher temp. another distillate (e) is obtained. After some hrs. (d) becomes semi-solid and on mixing with alc. more solid is deposited while addition of light petr. ether produces a further deposit; after washing with petr. ether the solid is crystd. from C_6H_6 and alc., yielding $(\alpha\text{-C}_{10}\text{H}_7\text{CH}_2)_2$, greenish yellow tables, m. $159\text{--}60^\circ$ (Bamberger and Lotter, *Ber.* 21, 54 (1888)); *picrate*, $\text{C}_{22}\text{H}_{18.2}\text{C}_6\text{H}_5(\text{NO}_2)_2\text{OH}$, orange-yellow, m. 205° . (e) similarly treated yields a solid only partially sol. in C_6H_6 ; the sol. portion on recrystn. from alc. gives (b), m. 160° ; *picrate*, $\text{C}_{22}\text{H}_{18.3}\text{C}_6\text{H}_5(\text{NO}_2)_2\text{OH}$, orange-red to red needles, m. 210° (Elbs, *J. prakt. Chem.* 47, 56 (1893)). The part insol. in C_6H_6 gives from cumene crystals of (a), m. about 345° (Bamberger and Chattaway, *Ann.* 284, 52).

CHAS. A. ROUVILLER.

Formation of isoxazolones from aldehydes and isonitrosolevulinic acid. OTTO DIELS AND KARL SCHLEICH. Univ. Berlin. *Ber.* 49, 284-9 (1916).— $\text{AcC}(\text{:NOH})\text{-CH}_2\text{CO}_2\text{H}$ (a), m. 119° , is obtained in 27 g. yield from 100 g. $\text{AcCH}(\text{CO}_2\text{Et})\text{CH}_2\text{CO}_2\text{Et}$ and 100 g. KOH in 2 l. H_2O allowed to stand 12 hrs. with frequent shaking, treated with 40 g. KNO_3 in 1 l. H_2O , cautiously acidified with cooling and stirring with dil. H_2SO_4 , treated with 150 g. anhydrous Na_2SO_4 , extd. with AcOEt , evapd. and crystd. from Et_2O ; 13 g. in 300 cc. of 37% HCl treated with 10 g. BzH , cooled and shaken vigorously gives in 12 hrs. 10 g. (and on concn. and salting out 8 g. more) of 5-keto-4-benzylidene-3-acetyl-4,5-dihydroisoxazole, S-yellow prismatic leaflets from MeOH, m. 124° , decompd. into BzH by heating with alkalis, dil. H_2SO_4 , $(\text{CO}_2\text{H})_2$ or phthalic acid, gives with $\text{HBr}\cdot\text{AcOH}$ an intensely red soln. depositing on addition of H_2O a green ppt.; 1 g. with 0.4 g. $\text{H}_2\text{NNHCO}_2\text{Me}$ in 4 cc. warm PrOH gives 0.8 g. of the compound $\text{C}_{14}\text{H}_{14}\text{O}_4\text{N}_2$, yellow needles from HCO_2H , m. 200° (decompn.), while from 1 g. in 35 cc. MeOH with 0.5 $\text{H}_2\text{NCONHNH}_2\cdot\text{HCl}$ in $\text{AcOH}\cdot\text{MeOH}$ is obtained 0.7 g. of the semicarbazone, yellow needles from HCO_2H , m. 212° (decompn.). In the same way, from 2 g. (a) and 2 cc. furfural is obtained 1.7 g. 5-keto-4-furylidene-3-acetyl-4,5-dihydroisoxazole, deep yellow needles from AcOH or HCO_2H , m. 126° ; semicarbazone, light brown leaflets m. above 300° . 4-Anisylidene compound, in 1.5 g. yield from 2 g. (a) and 1.9 g. anisaldehyde, yellow needles from alc., m. 162° .

CHAS. A. ROUVILLER.

Partial acylation of the polyvalent alcohols and sugars. III. EMIL FISCHER AND MAX BERGMANN. Univ. Berlin. *Ber.* 49, 289-303 (1916); cf. *C. A.* 10, 900. — α -Dibenzoyldiacetonedulcitol (a), m. $185\text{--}6^\circ$, formerly obtained from α -diacetone-dulcitol (b) with BzCl and quinoline (*C. A.* 9, 1183), is also obtained in 93% yield from 1.3 g. β -diacetonedulcitol (c), 1.4 g. BzCl and 1.4 g. quinoline heated 4 hrs. at 100° and in 70% yield from the same substances kept 2 hrs. at 18° in CHCl_3 (under the latter conditions (b) gives chiefly the mono-Bz deriv.). Finally, (a) is also obtained in 95% yield from 1.3 g. (c), 1.6 g. BzCl and 1.2 g. $\text{C}_6\text{H}_5\text{N}$ after 3 hrs. at 100° and almost quant. after 5 hrs. at 18° in CHCl_3 . On the other hand, 5.2 g. (b), 6.2 g. BzCl and 4.4 g. $\text{C}_6\text{H}_5\text{N}$ heated 3 hrs. at 100° give 88% of β -dibenzoyldiacetonedulcitol (d),

sepg. from alc. in 2 forms: hair-like needles, m. $82-3^{\circ}$, and many-surfaced, hard crystals, m. $65-70^{\circ}$ and therefore apparently not homogeneous; either form can be obtained at will by seeding and both forms often sep. simultaneously; 1 g. in 5 cc. cold AcOEt treated with 5 cc. HCl (d. 1.19), dild. with 10 cc. H_2O after 3 min., heated 5 min. on the H_2O bath, treated with 10 cc. more H_2O , again heated 5 min. and allowed to stand 12 hrs. in the cold, gives 63% of α -dibenzoyldulcitol (*e*), m. 210° , whereas 5 g. (*d*) in 25 cc. cold AcOH and 25 cc. HCl (d. 1.19) kept 5 min. at 18° , dild. with 30 cc. H_2O , filtered, cooled with ice after 15 min., slowly treated with 200 cc. H_2O and kept in the ice chest 12 hrs., gives 3 g. crystals of the same compn. as (*e*) but beginning to sinter at 80° and m. $145-55^{\circ}$ and, after repeated crystn. from AcOEt-petr. ether or Me_2CO -petr. ether, m. $174-5^{\circ}$; short heating at 50° in AcOH-fuming HCl converts them into (*e*) but not quant.; the same change is effected by boiling H_2O . It is not yet certain whether the above are cases of isomerism in the narrower sense or also partially of polymorphism. α -Dianisoyldiacetonedulcitol, in 37% yield from 5.2 g. (*b*) or (*c*), 9.4 g. $MeOC_6H_4COCl$ and 8 g. quinoline heated 8 hrs. at 100° , pointed needles from CCl_4 , m. $146-7^{\circ}$. β -Compound, in 92% yield from (*b*) and 2.2 mols. each of $MeOC_6H_4COCl$ and C_6H_5N 3 hrs. at 100° , microscopic spears from alc., m. 116° . Dianisoyldulcitol, in 90% yield from the α -acetone compd. shaken 2 hrs. with AcOH containing 5% of HCl, 4-sided rectangular platelets from AcOH, sinters 192° , m. $204-5^{\circ}$. Monoanisoyldulcitol, long, felted needles, from AmOH, m. $166-7^{\circ}$, is obtained in 80% yield from 10 g. (*b*), 13.1 g. $MeOC_6H_4COCl$, 11.0 g. quinoline and 40 cc. $CHCl_3$ shaken 8-10 hrs., allowed to stand 12 hrs. in the ice chest, shaken with 120 cc. of 0.25 *N* HCl 2 hrs., extd. with 300 cc. Et_2O , washed with 200 cc. of 12% $KHCO_3$, then with H_2O , evapd., shaken in 60 cc. $CHCl_3$ with an equal vol. of 5 *N* HCl 5 hrs. and allowed to stand some hrs. in ice. Dicarboethoxysalicyldiacetonedulcitol, in 42 g. yield from 30 g. (*c*), 51 g. $MeOCOC_6H_4COCl$, 35 g. quinoline and 125 cc. $CHCl_3$ allowed to stand 2 hrs., microscopic plates or many-surfaced prisms from alc., m. $138-40^{\circ}$; 15 g. in 300 cc. alc. satd. with NH_3 at 0° and shaken 3 hrs. gives 6.5 g. crude disalicyldiacetonedulcitol (C found in samples recrystd. from ligroin, 0.4-0.5% too high), 12 g. of which, shaken 2.5 hrs. with 300 cc. AcOH containing 5% of HCl, gives 85% of disalicyldulcitol, needles, sinters about 200° , m. 219° , sol. in cold dil. NaOH, almost tasteless. Dianisoylmannitol, in 58% yield from 35 g. mannitol in 50 cc. C_6H_5N at 60° treated in the course of 45 min. with 65 g. $MeOC_6H_4COCl$ in 200 cc. $CHCl_3$, allowed to stand 12 hrs., freed from the $CHCl_3$ and about 0.5 of the C_6H_5N *in vacuo* and poured into an excess of cold dil. H_2SO_4 , thin 4-sided plates from alc., m. $175-6^{\circ}$, changed by warming with AcOEt or EtOH into felted needles or prisms, sol. in dil. alkalies with hydrolysis. Diacetylsalicylmannitol, in 53% yield from 9 g. mannitol in 100 cc. C_6H_5N treated in the course of 20 min. with 20 g. $AcOC_6H_4COCl$ and allowed to stand 2 hrs., needles from C_6H_6 , m. $135-6^{\circ}$, melts in boiling H_2O , sol. with hydrolysis in dil. alkalies and hot dil. soda, gives no marked color with alc. $FeCl_3$, has a strongly bitter taste; 30 g. allowed to stand 1 hr. at 0° in 200 cc. alc. satd. with NH_3 , then freed from NH_3 and alc. *in vacuo*, gives chiefly disalicylmannitol, microscopic, elongated, quadrangular plates from AcOEt, m. $182-4^{\circ}$, sol. with quite rapid hydrolysis in dil. alkalies, gives a strong violet-red color with alc. $FeCl_3$, has no pronounced taste; there is also formed some monosalicylmannitol, thin quadrangular platelets from H_2O , sinters 140° , m. $148-9^{\circ}$, gives with aq. $FeCl_3$ a color similar to that produced by o - $HOC_6H_4CO_2H$. Tetraacetylacetone-mannitol, in 90% yield from 4.4 g. monoacetone-mannitol allowed to stand 24 hrs. with 18 g. Ac_2O and 18 g. C_6H_5N , viscous oil, b.p. $190-200^{\circ}$ (bath temp.); with AcOH-HCl it yields a hard viscous product. (*b*) forms monoclinic prismatic crystals, $a:b:c = 0.7661:1:1.0410$, β $93^{\circ} 59'$, c (001), b (010), h (021), o (111).

CHAS. A. ROULLER.

Formation of formaldehyde and other organic substances from formic acid. I. Autoreduction of formates. K. A. HOFMANN AND K. SCHUMPELT. Berlin. *Ber.* 49, 303-17 (1916).—Having noticed that the formates of most rare earths evolve the odor of HCHO when subjected to dry distn., H. and S. heated various formates, mixed with excess of white ignited quartz sand, in a rapid current of moist CO₂, raising the temp. as quickly as possible to 450–500°. The amt. of C "assimilated," i. e., passing into org. combination, in the case of the different formates was found to increase in the following order: Ni, Fe, Mn, rare earths, Cu, Th (Na, K, uncertain), UO₃, Zn, Mg, Ca, Ba, Li. The HCHO formation is cleanest with the Pb, UO₃, Cu, Fe, Er and Th salts while with those of the other rare earths, Zn, Mn, Mg and Ca it is increasingly masked by empyreumatic substances, furfural and Me₂CO, these becoming so marked with the alkali and Ba formates that the HCHO formation becomes uncertain. The approx. amt. of formate converted into HCHO and other products using up I was detd. by titrating the distillates with I in alk. soln.; qual. tests for HCHO were made by the morphine-H₂SO₄ method; the MeOH, Me₂CO and C, which sometimes was deposited in large amts., were also detd. in the more important cases, as were the CO (in acid Cu₂Cl₂) and the H and CH₄ (C. A. 10, 303). Thus, 10 g. (HCO₂)₂Ni, dried at 90°, decomps. above 210° into Ni and almost entirely gaseous products (310 cc. CO, 804 cc. H₂ and about 50 cc. CH₄); 0.1 N I used up, 0.76 cc.; morphine test, negative. The yellow aq. soln. of the UO₃(O₂CH)₂ in direct sunlight turns dark green and evolves gas and later deposits a dark, finally black powder and on distn. yields some HCHO, a reaction to be further studied on account of its analogy with the phenomenon of assimilation by plants. HCO₂Li.H₂O decomps. above 300° with formation of thick, white vapors of empyreumatic odor; in the receiver are deposited tarry drops giving with isatin or phenanthrenequinone and H₂SO₄ a dark violet color, reducing NH₃-AgNO₃ and coloring a fir splinter moistened with HCl olive-green; indicating furfural compds. and pyruvic acid; MeOH and Me₂CO are also formed and much org. C is deposited on the walls of the distg. flask. Li glyoxalate behaves qual. so similarly that H. and S. believe that its formation precedes that of the above decompn. products and not that they are produced by HCHO, first formed, undergoing aldol-like condensation in contact with the Li₂CO₃, etc., for HCHO vapors passed over the heated residue of HCO₂Li distn. are not markedly changed. Among the gaseous products from 10 g. HCO₂Li are 1103 cc. CO, 113 cc. H₂ and 15 cc. CH₄; 0.1 N I used up, 145.5 cc., the org. C remaining in the residue (0.254 g.), calcd. as HCHO, being equiv. to 424 cc. more of I; morphine test, red-brown. This thermo-assimilation of HCO₂H (and hence of CO₂, since HCO₂H is prepd. from CO₂) through the Li salt is influenced to an extraordinary degree by the presence of other formates; thus, mixts. of 10 g. each of the Li and Ca formates yield a distillate using up 270–300 cc. I, while when distd. singly they require only 145.5 + 70.5 = 216 cc.; on the other hand, the distillate from 10 g. each of Li and Ni formates requires only 1.7 cc. I and 646 cc. CO and 3252 cc. H₂ are formed; this difference is due to the catalytic action of the metallic Ni resulting from the Ni salt, which decomps. before the Li salt. The Cu and Fe salts have a similar but less marked effect. For details as to the decompn. of the other salts, cf. the original. The apparently complicated processes can be simply referred back to the peculiar nature of the metal in the particular formate if the assumption be made that the inner displacements start from the H atoms. Under the influence of heat these atoms may work in 4 ways: (1) 2 H atoms combine to a H mol., leaving the oxalate which further decomps. into CO₂ and metal or carbonate and CO; this process, which consists first in the driving out of the H atoms, will be favored by atoms occupying a large space and by those having a strong affinity for O, for in the latter case the C atoms will have more residual affinity available for mutual combination. Na and K formates therefore yield almost only H and oxalate. The removal

of H atoms as H mols. will also be favored by such typical H catalysts as finely divided metallic Ni, such catalysts accelerating the reaction $H + H \rightleftharpoons H_2$ in both directions. The splitting off of H atoms can also be accompanied or followed by a further decompn. into CO_2 and metal when the metallic oxide is too easily reduced to form a stable oxalate. While (1) involves no "assimilation" of the HCO_2H , if the $(CO_2H)_2$ is disregarded, such an assimilation occurs (2) when a H splits off from a C atom and migrates to the next C, producing a shifting of an OM union ($M = \text{metal}$), with the formation of carbonate and HCHO (or equal vols. of H_2 and CO); this will occur most easily when the shifting of the OM union is effected by the metal itself; with the salts of polyvalent metals, the metal itself need not migrate, a shifting of one O bond being

sufficient to give a carbonate and HCHO (or $CO + H_2$), thus: $OC(H) - \overbrace{OMO} - CHO$.

Besides CO and H_2 , HCHO and some MeOH were obtained with the following salts (arranged in order of decreasing yields): Zn, UO_2 , Th, Er, Y, didymium, Ce, Mn, Fe. With the strongly basic metals, there is formed, besides HCHO, in increasing amt. as the basicity increases, Me_2CO , MeOH, furfural, empyreumatic substances and org. C, resulting from basic glyoxylates formed as intermediate products. (3) The process resulting in glyoxylates presupposes the migration of a H atom from C to an O atom doubly bound to another C and subsequent union of two C atoms:

$MOC(O)H - \overbrace{OCHOM}$. Polyvalence of the metal will also favor this process, as the

formate residues combining are thereby brought together spatially, but it will also be necessary that the metal form a strong base as basic glyoxylates only of strong bases are known. Correspondingly, it was found that Li, Ba, Ca, and Mg formates yield the products of glyoxylate distn. in increasing amts. in the order given, while Na, K and all other formates give much smaller amts.; Li, though monovalent, in all the properties of its salts greatly resembles the bivalent alk. earths. Processes (1)-(3), however, can give CO and H_2 in the ratio of 1:1 at most, whereas with Li, Mg, Ba and Th formates the ratio was found to be 4-10 times as great. This can be explained (4) by a decompn. initiated by a shifting of the H to the O of the metal and completed by the formation of H_2O and oxide or carbonate. As in the present work the distns. were carried out in CO_2 , the carbonate formation with the more strongly basic oxides favored this decompn. Arranged in order of decreasing $CO:H_2$ ratios, the metals form the series Li, Mg, Ba, rare earths, Na, K, UO_2 , Ca, Mn, Fe, Ni, Pb, Zn, Cu. In connection with the unusually high position occupied by the rare earths must be considered their marked tendency to form highly condensed oxides. (3) and (4) in the first stage are very similar in that they consist in the shifting of H from the C to O, and the formates with the highest $CO:H_2$ ratios also yield the most Me_2CO , furfural, empyreumatic substances and org. C. From the ratio $CO:H_2$ it can be approx. detd. to what extent process (4) takes place as compared with (1) and (2); in this way H. and S. calc. that in the case of the Li salt, (4) is 4.5 times as great as (1) and (2), the corresponding values for the other salts being: Mg, 2.5; Ba, 1; Th, 2; Y, Er, didymium, Ce, 1-0.5; Na, K, 1; UO_2 , Ca, 0.5; Fe, entirely according to (1) and (2). With the Zn salt, the extremely low ratio $CO:H_2 = 0.18:1$ is probably to be explained by the assumption that H_2O of crystn. or from the moist CO_2 reacts with the CO in contact with the ZnO, forming CO_2 and H. The Ni, Pb and Cu salts leave the free metals and decomp. further chiefly according to (1) and to a lesser extent according to (2).

CHAS. A. ROUILLER.

Theoretical considerations on hydrogenation (KORREVAAR) 2. The kinetics of the

accelerated oxidation of phenylthiourea by charcoal (FREUNDLICH) 2. The dynamics of the splitting off of carbon dioxide from organic compounds (BAUR) 2. Apparatus for preparing alkyl iodides (NAGAI) 1.

LINDNER, J.: Die Konstitution des Benzols. Berlin: R. Friedlander & Sohn. 1 M.

II. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

FRANK P. UNDERHILL.

The influence of blood charcoal on peptic digestion. H. STRAUSS. *Deut. med. Wochschr.* 42, 36-8(1916).—Expts. were made with stomach juice *in vitro* and with stomach contents after giving "carbo sanguinis depuratus (Merck)" to test the adsorption of HCl and pepsin by blood charcoal. In each case it was evident that there was an adsorption of HCl, total as well as free. When the charcoal had been given to the patient the adsorption of the HCl was not so marked; the adsorption of pepsin was also less although the pepsin content of the stomach juice to which charcoal was added *in vitro* was not influenced as much as that of the HCl. It is pointed out that the stomach may secrete HCl and pepsin according to demand. Furthermore, the HCl is only loosely bound to the charcoal. S. AMBERG.

Further studies on the colloidal and physical chemistry of the cell. W. RUHLAND. *Jahrb. wiss. Botan.* 54, 391-447(1914); *Expt. Sta. Record* 33, 28.—R. has continued work previously noted (*C. A.* 7, 2951; 8, 3558), detailing results and inferences from a study of carbohydrates, alkaloids, glucosides and acids, also those from a study of the physico-chem. properties of the cell in general and of the cell as an ultra-filter in particular. The function of an ultra-filter is exercised by the plasma membrane and not by the cell wall. E. J. C.

Alterations in the forms of antagonism curves. W. J. V. OSTERHOUT. *Jahrb. wiss. Botan.* 54, 645-50(1914); *Expt. Sta. Record* 33, 31.—Previous work (*cf. C. A.* 6, 2438; 7, 394, 616) has been continued. It is shown by tables and curves how the antagonism between given percentages of NaCl and CaCl₂ may vary from time to time in the course of an expt. This is held to be due to progressive alterations in the permeability, toward each salt, of the living material employed, which in this case consisted of portions of *Laminaria saccharina*. It is thought that these 2 salts act in different ways to influence permeability. E. J. C.

Fatal temperatures for some diastases of animal or vegetable origin. E. C. TEODORESCO. *Rev. gen. botan.* 25, 599-627(1914); *Expt. Sta. Record* 33, 30.—Giving further details (*cf. C. A.* 7, 2758) of tests made with diastases heated to varying temps., T. states that when dried these support for a short period (1½ hr.) temps. above 100°, and in some cases much higher. Some suggestions as to the nature of these substances are also offered. E. J. C.

Does blood serum possess antitryptic power? SABATO VISCO. Univ. Rome. *Arch. farm. sper.* 20, 314-39(1915).—The presence of an antitryptic enzyme in the blood serum of normal individuals could not be demonstrated. Individuals affected with malignant tumors or other diseases showed no difference in this respect, either among themselves or compared with normal individuals. *Cf. C. A.* 9, 212.

A. W. DOX.

Rise in temperature produced by action of pancreatic amylase. CESARE SERONO. *Rass. clin. terap. sci. affini.* 14, 325-8(1915).—S. regards enzyme action not as a catalytic phenomenon, but as a liberation of energy through dissociation of very labile chemical groupings. 'He attempts to prove this by delicate measurements of the heat liberated in the process of enzyme action. A solution of potato starch and glycerol ext. of pancreatic amylase was used. The heat liberated is not explainable by the hydrolysis of the starch paste, but is partly due to energy set free by the enzyme. Cf. *C. A.* 9, 636.

D. I. MACHT.

Enzyme action, digestion and electrons; digestive and glucolytic enzymes and the theory of electrons. G. GALLERANI. Camerino. *Boll. soc. eustach.* 1914, No. 1/2; *Zentr. Biochem. Biophys.* 18, 192(1915).—G.'s expts. on digestion and glucolytic enzymes indicate that organic matter acts in the same manner as radioactive substances, although the action is less intense; the resemblance increases with the size, complexity and instability of the mol. The enzyme modifies the velocity of the atom electrons, *i. e.*, it increases this velocity with fixation of electrons (cleavage, but not decompn. in the case of pancreatic, gastric and salivary digestion) or diminishes it with loss of electrons (decompn. and liberation of energy as in the case of radioactive bodies and glucolysis and in general in organic decompn.) or increases and diminishes it simultaneously (aggregation and synthesis). Enzyme action is intra-atomic and its velocity may be detd. quantitatively according to the degree of fixation or loss of electrons and according to the decrease or increase of the coeff. of elec. dispersion. The specificity of a definite enzyme action is connected with the peculiar syntony and synchronism which exists between the electronic, intra-atomic motion of the agent and that of the element which is undergoing this action.

H. S. PAINÉ.

On the use of antiseptics in autolysis of animal and vegetable matter; enzymic peptolysis in germinating seeds. DOROTHY COURT. *Proc. Edinburgh Soc.* 32, 252; 34, 113-27; *Zentr. Biochem. Biophys.* 18, 190-1(1915).—In the 1st paper C. describes preliminary work with particular reference to the technic of sterilization in autolysis expts. The most appropriate antiseptic should be carefully chosen for each expt.; general directions which will cover all cases cannot be given. In the 2nd paper C. describes peptolysis expts., peptolysis in germinating barley being first studied. Witte and Roche peptones were employed and 2 distinct peptolytic enzymes were detected; 1 of these enzymes is readily extd. by H₂O, while the other is apparently an endo-enzyme which is liberated after the destruction of the cells. The 2 enzymes exhibit distinct temp. curves; the optimum temp. for each enzyme is 25-37°. Action on Roche peptone is inhibited at 50°, while the hydrolysis of Witte peptone is undisturbed at that temp. The digestion expts. were always performed with a sterile substrate. C. also performed peptolysis expts. with the fruit of *Ananas sativa*. Proteolysis and peptolysis were observed; an enzyme capable of producing cleavage of tyrosine was not observed (Roche peptone was not digested). A similar result was obtained in expts. with various fungi (*Lycoperdon*, *Hyphaloma*, *Russula*, *Boletus*, *Laccaria*, *Hydnum*, *Amanita*, and *Amentopsis*); Witte peptone was invariably attacked, while Roche peptone remained intact. The Buchner press juice of these fungi was also inactive toward Roche peptone. Both peptases were found, however, in *Agaricus campestris* and *Saccharomyces cerevisiae*. *Aspergillus* also contained both peptases; this was not true, however, of *Penicillium glaucum*, in spite of the close relationship of the 2 fungi. C. concludes from these expts. that the 2 peptases are not identical; the peptolysis is likewise quite distinct from the proteolysis observed simultaneously therewith.

H. S. PAINÉ.

Nature of opsonic substances of normal sera. HANS ZINNSEN AND EDWARD G. CARY. Stanford and Columbia Univs. *J. Exp. Med.* 19, 345-61(1914).—The albumin

fraction, or end piece, obtained by the dialysis of normal guinea-pig serum possesses definite opsonic action, which is often equal to that residing in the unfractionated alexin. It is evident, however, only if the reaction maintained throughout the expt. approximates that of the original serum. Addition of NaOH to dialyzed serum will bring back opsonic action which was not evident in the same end piece if simply rendered isotonic. The work suggests that the opsonic action of the albumin fraction is enhanced by preliminary sensitization of the bacteria with heated normal serum and by persensitization of such bacteria with the globulin fraction. While the expts. do not point to a differentiation of normal opsonin from alexin, they indicate that the so-called end piece can enter to a slight extent into nonspecific relationship with unsensitized bacteria and it is therefore active, whereas it cannot enter into a similar relation to unsensitized cells.

C. J. WEST.

Progress in physiological chemistry. F. G. HOPKINS. *Ann. Repts. Progress Chem. London* 11, 188-212(1914); *Expt. Sta. Record* 34, 167.—This report contains a summary and digest of the more important exptl. data contributed to the science of physiological chemistry during 1914. Among the subjects in which progress has been reported are catalysis, the specificity of tissue enzymes, defensive enzymes, the metabolism of carbohydrates and fats, the creatine problem and vitamins. E. J. C.

BAYLISS, W. M.: *Principles of General Physiology*. New York: Longmans, Green & Co. 850 pp. \$6.00.

COLWELL, H. A. AND RUSS, S.: *Radium, X-Rays and the Living Cell*. London: Bell. 324 pp. 12s. 6d.

UNDERHILL, F. P.: *The Physiology of the Amino Acids*. New Haven: Yale University Press. 169 pp. \$1.35.

B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

Chemo-serodiagnosis of cerebral hemorrhage. P. MARIE AND A. LERI. *Union pharm.*, Aug. 15, 1914; *Reperl. pharm.* 28, 18-9(1916).—The authors have made the observation that the blood serum in cases of cerebral hemorrhage is green and somewhat fluorescent, due probably to the passage into the blood of hemoglobin decompn. products of the extravasated blood. They think this diagnosis might be applicable to every case of hemorrhagic lesion from other organs.

L. H. CHERNOFF.

Analytical work. (Determination of iron in plant substances.) P. L. GILE AND J. O. CARRERO. *Porto Rico Sta. Report* 1914, 13; *Expt. Sta. Record* 33, 502.—A comparison of the KCNS colorimetric method for Fe with the permanganate method indicated that the former is preferable for the detn. of small amts. of Fe contained in most plant substances.

E. J. C.

A new procedure for removing the humus substances produced in the hydrolysis of organic substances by mineral acids. A. CLEMENTI. *Univ. Rome. Arch. farm. sper.* 20, 561-6(1915).—Colloidal Fe in aq. soln. added to the soln. resulting from the hydrolysis of org. substances by strong mineral acids, in the presence of electrolytes (e. g., Na_2SO_4) passes from the sol to the gel state and absorbs the humus substances so that they are retained by the filter. A clear, transparent liquid with a light straw-yellow color is thus obtained. This method does not entail any appreciable loss of N, and compared to the Kossel-Kutscher or the Sørensen-Jessen-Hansen method, is much quicker and easier to operate. Titration with formol after decolorizing by means of colloidal Fe gives results entirely comparable with those obtained after decolorization by either of the above-mentioned methods.

A. W. DOX.

Drugs in their relation to (chemical) properties of urine. ANON. *Gaceta farm. espan.*; *Revista sanitaria* 9, 2; through *Pharm. Post* 48, 241-3(1915).—Administration

of the following drugs causes changes in the character of urine which may lead to errors of analysis and diagnosis: (A) Drugs which change the color of urine: (1) analgen—blood-red, changed to yellow by alkali; (2) pyramidon—salmon to cherry-red; (3) sulphonal—dark red; (4) PhOH—dark green, changing to black; (5) naphthalene—dark to dark gray; (6) salol—dark green—black after long usage; (7) phenecol and its salts—reddish dark gray; (8) CHBr_3 —dark green; (9) infusions of *Folia Uvae Ursae* and *Folia Myrtilli*—dark azure; (10) thallein—yellow, changing through dark green to dark gray; (11) naphthol—olive-green (reddish yellow if very large doses are taken); (12) santonin—yellow, changed to red by alkali; (13) cascara sagrada and (14) rhubarb and senna—yellow or dark reddish yellow, changed to red by alkali. (B) Drugs which interfere with the detection of glucose: (1) Infusions of *Folia Uvae Ursae* and *Folia Myrtilli*—interfere with polarization and fermentation detns.; (2) methylene blue—interferes with the Causse-Benos test; (3) Me_2CO —ppt. with Fehling soln.; (4) anti-febrin and (5) salicylic acid in large doses—urine becomes levorotatory; (6) antipyrine in large doses—Nylander's test positive; (7) copaiba balsam and (8) chloral hydrate—urine becomes levorotatory; (9) benzoates in large doses, (10) CHBr_3 , and (11) camphor—urine becomes dextrorotatory; (12) CHCl_3 —urine reduces Fehling soln.; (13) cubebs and (14) oil of turpentine—Nylander's test positive; (15) glycerol(?); (16) *Hydrastis canadensis*, (17) morphine, and (18) quinine—positive test for alkaloids; (19) phenacetin—wine-red color with FeCl_3 ; (20) rhubarb in large doses, and (21) senna in large doses—urine reduces alk. Bi soln.; (22) salol in large doses—urine becomes levorotatory and gives tests for salicylic acid; (23) sulfonal—urine becomes levorotatory; (24) tannin in large doses—urine gives a dark blue color with FeCl_3 ; (25) urethan—forms a compd. with glucuronic acid. (C) Drugs other than alkaloids, which interfere with the detection of albumin: (1) copaiba balsam—urine will not respond to HNO_3 test; (2) methylene blue—ppt. with Esbach's reagent; (3) tincture of myrrh (after long usage)—urine becomes turbid upon heating; (4) terpin—urine gives albumin-like ppts.; (5) wrotopin—ppt. with Br water. (D) The detection of indoxyl is difficult in the urine of patients taking large doses of iodides. (E) A positive test for acetoacetic acid is given by urine of patients to whom antipyrine or compds. of salicylic acid have been given. (F) Antipyrine, CHCl_3 , and turpentine and its derivs. interfere with some tests for bile pigments. (G) Caffeine, theobromine, rhubarb, benzonaphthol and naphthyl salicylate interfere with Denigès test for xanthouric compds. (H) Certain drugs added as preservatives can mask reactions: HCHO interferes with tests for indican, pentose and acetoacetic acid; CHCl_3 interferes with tests for Me_2CO ; EtOH gives Gmelin's and Hay's reactions; Et_2O gives Gmelin's reaction.

C. O. EWING.

The Lewis and Benedict method for the estimation of blood sugar, with some observations obtained in disease. VICTOR C. MYERS AND CAMERON V. BAILEY. New York. Post Grad. Hosp. and Med. School. *J. Biol. Chem.* 24, 147-61 (1916).—To save time and manipulation the method of Lewis and Benedict (*C. A.* 9, 638) is modified as follows: 2 cc. of blood are measured, with an Ostwald pipet, into a centrifuge tube graduated to 10 cc. and the pipet is washed out with 8 cc. of H_2O . 0.2 g. of dry picric acid is now added and the mixt. thoroughly stirred with a glass rod several times during the next few minutes. The tube is then centrifugated and the supernatant liquid filtered through a 4 cm. paper. Three cc. of the filtrate are measured into a tall, narrow test-tube graduated to 3, 4, 10, 15 and 20 cc., 1 cc. of 20% Na_2CO_3 soln. is added and the tube is kept in a beaker of boiling H_2O for 15 min. The soln. is then cooled and dild. to 10, 15 or 20 cc., depending upon the depth of color. It is then compared in a Hellige colorimeter with a standard picramate soln. (0.100 g. picramic acid, 0.2 g. Na_2CO_3 in 30 cc. warm H_2O , dild. to 1000 cc.). The readings are best taken between

40 and 65, and the % of sugar is calcd. by subtracting the reading from 100 and multiplying by 0.002, 0.003, etc., according as the dilm. was to 10 cc., 15 cc., etc. If desired, a Duboscq colorimeter may be used. The standard picramate soln. should then be of such strength as to correspond in color with that developed by 0.6 mg. glucose treated as above and dild. to 10 cc. If desired, a soln. of glucose in picric acid may be used as the standard. Hyperglucemia was found in parenchymatous and in interstitial nephritis, but not in "renal" diabetes. In presence of hyperglucemia in parenchymatous nephritis there is mild glucosuria, which latter is apt to be absent in interstitial nephritis. The significance of these facts, explaining some of the phenomena of diabetes, is discussed.

I. GREENWALD.

A quantitative determination of urea. C. P. MOM. *Chem. Weekblad* 13, 72-5 (1916).—M. has found that *Urobacillus Pasteurii*, which is usually present in garden soil, can be used to great advantage for the detn. of urea. A pure culture is prepared as follows: to 50 g. of meat bouillon 10% urea is added and this inoculated with 2 to 5 g. garden soil or liquid manure and kept at 30°, care being taken that there is ready access of air to the culture as the bacterium is aerobic. Within a day 2 to 2.5% of the urea has been changed into $(\text{NH}_4)_2\text{CO}_3$, which destroys the other soil bacteria. After 2 days 5 to 6.5% has been decompd. and the weaker urea bacteria (*U. Miguelii*, *Leubii* *s. v.*) are eliminated by the action of $(\text{NH}_4)_2\text{CO}_3$; only *U. Pasteurii* survives. Within 2 days the whole process is finished and a quantity of $(\text{NH}_4)_2\text{CO}_3$ is found corresponding to 8% urea; the other 2% has volatilized during the cultivation. Fifty cc. of a 2% urea-bouillon is placed in an Erlenmeyer flask of 300 cc. capacity, inoculated with a few drops of the above culture and kept at 30° for a day. The resulting liquid contains very much urease and about 2% $(\text{NH}_4)_2\text{CO}_3$ and may be kept indefinitely for an eventual regeneration of *U. Pasteurii*. *Method of procedure:* The detn. of urea in a liquid, *e. g.*, urine, is made as follows: equal vols. urine and *U. Pasteurii* culture are mixed and the amt. of $(\text{NH}_4)_2\text{CO}_3$ present titrated (by adding excess acid, heating and titrating with alkali). The liquid is then placed in a flask, which is afterwards closed and heated in a water bath of 50°. *U. Pasteurii* is now destroyed; the enzyme, however, retains its max. activity. Within 1 to 2 hrs. a second titration is made and the amt. of urea computed through subtraction. A duplicate detn. should be made with the urine diluted to twice its vol. to make sure that all the urea has been decompd. A pure culture as old as 2 weeks is unreliable as the activity of the urease gradually decreases, so that a regeneration of the old culture in 2% urea bouillon should be made, when needed.

J. T. FLORELL.

The applicability of dry yeast to the investigation of sugar in urine. A. BOLLAND AND A. KRAUSZ. *Trencsén. Chem. Ztg.* 39, 947-8 (1915).—The authors recommend "a concd. press yeast" recently put on the market by Rudolf Adler, Vienna, because they have found it unnecessary to run check fermentations with it, and because it retains its activity for 6 months.

J. H. MOORE.

Simulation of albuminuria by intravesical injection of ovalbumin. A. CH. HOLLANDER, M. LEPEYRE AND J. GATÉ. *J. pharm. chim.* 12, 345-50 (1915).—Injection of ovalbumin into the bladder, sometimes practiced to escape military service, may be detected by adding to urine a mixt. of equal parts of HCHO and glacial AcOH which ppts. ovalbumin but does not coagulate pathological albumin. Maurel's reagent, a freshly prepd. mixt. of 33% aq. NaOH soln. 25 cc., 3% aq. CuSO_4 soln. 5 cc., glacial AcOH 70 cc., coagulates ovalbumin but does not ppt. serum albumin or serum globulin. Five cc. of the reagent placed beneath urine containing pathological albumin free from ovalbumin causes no pptn. whatever even after 1 hr.; the mixt. remains clear upon agitation. If only 0.1 g. ovalbumin per l. is present, a white ring is formed, pptg. within 1 hr. These tests are checked by means of a pptg. serum prepd. by making

4 subcutaneous injections of ovalbumin into a rabbit at intervals of 8 days. 0.5 g. ovalbumin in 5 cc. physiological NaCl soln., then 1 g. in 10 cc., and the 3rd and 4th times 1.5 g. in 15 cc. are injected. The serum, obtained 1 week afterward, whether inactivated at 56° for 0.5 hr. or not, ppts. at the rate of 1 drop per cc., a urine containing 0.1 g. ovalbumin per l. When much ovalbumin is present in urine, it tends to sep., forming a lower zone coagulable by heat. Added ovalbumin disappears completely after 48 hrs.

S. WALDBOTT.

Detection by the analysis of urine and blood of the simulation of icterus caused by the absorption of picric acid. POGNAN AND B. SAUTON. *J. pharm. chim.* 12, 350-2 (1915); cf. *C. A.* 10, 68.—Defecate urine with 0.02 part of Pb(OAc)₂, add 0.1 part of HCl and extract with Et₂O. From this soln. remove traces of Pb with H₂SO₄ and purify the crude picric acid with amyl alc. In another method of extn., add 1 cc. H₂SO₄ and 2 g. of animal black to 300 cc. of urine. After at least 1 hr., with constant stirring, filter, wash the black with H₂O, then leave filter and contents for 1 hr. in contact with 100 cc. of a warm mixt. of equal parts of EtOH and NH₄OH, filter and extract the black with the same mixt. as long as the soln. is colored. Evap. till dry, take up the residue with benzene and evap. again. A yellow soln. in H₂O indicates picric acid, which is then identified by the picramic acid test; or by a pink pptn. with SnCl₂ in HCl followed by NH₄OH, sensitive to 3.5 mg. per l.; or with methylene blue, the ppt. forming a green soln. with CHCl₃; and by fixation upon wool. Examns. of 69 icteric and 18 normal urines has shown that no resemblance exists between the reactions of picric acid and those of normal or pathologic urines. To detect picric acid in blood, render 20 cc. of blood acid with 2.5 cc. H₂SO₄ (1:2), evap. to dryness on water bath, mix the residue with an equal vol. of sand and extract with Et₂O. Evap. and apply the above tests for picric acid to the residue. The results with urine and blood show perfect agreement.

S. WALDBOTT.

A mercury ureometer of simple construction. HENRI MARTIN. *J. pharm. chim.* 12, 352-4 (1915).—The app. has no stopcocks. It consists of a narrow glass tube closed at one end, holding about 30-40 cc. and being graduated into 0.1 cc. Near the open end it is widened into a bulb. Mix 10 cc. of serum or blood with 10 cc. of 20% CCl₄CO₂H, filter and collect about 10 to 12 cc. of the nearly albumin-free clear filtrate. Put 10 cc. thereof into the app., add 1 drop of soln. of phenolphthalein and NaOH until just alk. Add Hg until the tube is almost filled, lacking 1-2 cc., fill up carefully with H₂O without mixing, and invert into a basin with Hg. By means of a doubly bent pipet introduce 5-6 cc. of NaBrO soln. and agitate, inverting the tube repeatedly, the opening being firmly closed with the finger. Finally transfer the app. into H₂O, bring the inner and outer surfaces to a level and read the vol., *n* cc. Repeat the process with 5 cc. of soln. of urea, 1 g. in 500 cc., or with 1 cc. of soln. of 1 g. in 100 cc. Observe number of cc. of N from 0.01 g. urea, *u*. The content of urea in blood is then $2n/u$ g. per l.

S. WALDBOTT.

C. BACTERIOLOGY.

ERNEST D. CLARK.

The physiological role performed by *B. bifidus* in the intestinal canal. C. A. KLING. Stockholm. *Ann. inst. Pasteur* 28, 797-806 (1914).—*B. bifidus* exerts an energetic bactericidal action upon a certain number of microorganisms such as *B. coli* com., *B. lactis aerogenes*, *B. proteus vulgaris* and *Staphylococcus aureus*. It is most probably the acid product formed by the action of the organism on sugar which causes the disappearance of the other bacteria. K. did not find thermo-labile bactericidal substances of colloidal nature analogous to those found by Eijkman and others in cultures of the bacillus and in the feces. The feces of a healthy infant have usually an acid reaction. In children fed with cow milk, on the contrary, an alk. reaction

is often observed. The sugar introduced with the food is not completely absorbed in the stomach and small intestine; that which remains is attacked in the large intestine and decomposed by *B. bifidus*. The acid reaction of the feces in health is presumably the result of this chem. process. GEO. T. CALDWELL.

A ferment contained in water producing the dehydration of glycerol. E. VOISENET. *Ann. inst. Pasteur* 28, 807-18(1914).—In waters of very diverse origins V. finds a bacillus presenting all the morphological characteristics and chem. properties of *B. amaracrylus*, which he had previously isolated from bitter wines. When it is grown in a mineral-glycerol medium glycerol is dehydrated. Hydracrylic aldehyde is first formed; in part, it is changed into acrolein. The H liberated transforms a part of the hydracrylic aldehyde into the corresponding alc. GEO. T. CALDWELL.

The tubercle bacillus and arsenic. CHARPENTIER. Paris. *Ann. inst. Pasteur* 29, 443-58(1915).—The tubercle bacillus grows well in a bouillon containing 1% of its wt. of As in the form of Na arsenate. To retard the growth of the organism double this concn. was necessary. The organism likewise grows well in the presence of atoxyl, a little less actively in the presence of Na methylarsonate and with difficulty in the presence of Na cacodylate. The organisms themselves were found to take up As from these media containing arsenical compds. Such organisms were just as virulent for guinea pigs as those grown on the usual media. In studying the action of the same compds. upon other organisms, yeast and aspergillus were found to be unaffected in the same degree as the tubercle bacillus. Injections of Na cacodylate do not modify at all the course of tuberculous infection in guinea pigs inoculated with very virulent strains although the treatment is begun at once. GEO. T. CALDWELL.

The antiputrefactive role of the bile. H. ROGER. *Ann. inst. Pasteur* 29, 545-50 (1915).—Bile modifies the intestinal flora by favoring the development of certain bacteria such as *B. coli* at the expense of certain others, notably anaerobic organisms, the most important factors in putrefaction and in toxicity. Of more importance is the fact that it diminishes the production and the action of bacterial enzymes and neutralizes the intestinal toxins. GEO. T. CALDWELL.

PITFIELD, R. L.: *Compend of Bacteriology, Including Animal Parasites*. 2nd ed. Philadelphia: Blakiston. \$1.25.

STITT, E. R.: *Practical Bacteriology, Blood-Work and Animal Parasitology*. 3rd ed. Philadelphia: Blakiston. \$1.50.

D. BOTANY.

CARL L. ALSBERG.

Ricin (toxin and agglutinin) in the different species and varieties of *Ricinus*. H. AGULHON. *Ann. inst. Pasteur* 28, 819-22(1914).—Of the 21 different varieties of ricin seeds examd. all yielded the specific agglutinin. In every instance 0.001 cc. of a 50% aq. ext. agglutinated 1 cc. of rabbit corpuscles under exptl. conditions. A. concludes that the toxin and agglutinin are present in practically const. amts. for a given wt. of vegetable substance and that this ought to be considered a fixed property of the genus *Ricinus*. GEO. T. CALDWELL.

Some recent work on plant oxidases. W. R. G. ATKINS. *Sci. Progress Twentieth Cent.* 9, 112-26(1914).—A critical review is given of recent publications relating to the nature of plant oxidases, their physiological function, distribution in relation to pigmentation and role in plant pathology, and the bearing of oxidase investigations on technology. E. J. C.

The occurrence of *p*-hydroxyphenylethylamine in various mistletoes. ALBERT C. CRAWFORD AND WALTER K. WATANABE. Stanford Univ. Med. School. *J. Biol. Chem.* 24, 169-72(1916); cf. *C. A.* 8, 3704.—Indications were obtained of the presence of *p*-HOC₆H₄NH₂ in the following plants: *Phoradendron villosum* (2 specimens

parasitic on California oaks), *P. flavescens* (var. *macrophylla*) and *P. californicum*. No indication of its presence could be found in *Viscum album*, *Arceuthobium occidentale* (Jepson), *Razoumofsky cryptopoda* (Coville), *Phoradendron bolleanum*, *P. juniperinum* and one sample of *P. villosum* from Arizona, which, however, did not contain leaves.

I. GREENWALD.

The relative transpiration of white pine seedlings. G. P. BURNS. *Plant World* 18, 1-6(1915); *Expt. Sta. Record* 33, 224.—Differences in size and compn. of 3 groups of white pine seedlings under no shade, half shade, and full shade, are to be sought along the lines of photosynthesis and assimilation rather than along the line of absorption and transpiration.

E. H.

New studies on the representation of places of reduction and oxidation of the plant cell. H. SCHNEIDER. *Z. wiss. Mikr.* 31, 478-91(1914); *Zentr. Biochem. Biophys.* 18, 191(1915).—After testing the hypothesis of Unna, S. concludes that the rongalite white method is not dependable even on the assumption that especial O locales exist in the tissue. When applied to plant cells the reduction colorations prove the invalidity of the O theory and show that the blue coloration of the nucleus by rongalite white cannot depend on the oxidation of the reagent by the nucleus itself. Expts. with objects which contained no oxidizing enzymes nor free O indicated that the blue color is caused by O of external origin. Expts. with fresh material to which access of air was rigorously excluded showed that re-oxidation of the reagent is only accomplished by O of external origin and that O locales in the sense conceived by Unna do not exist (at least not in plant cells). Cf. *C. A.* 9, 1188.

H. S. PAINE.

Properties of a chromogen universally distributed among plants. J. WOLFF AND NADIA ROUCHELMANN. *Compt. rend.* 161, 399-401(1915); cf. *C. A.* 9, 3084.—In addition to their remarkable sensibility to the combined actions of laccase and HI, the chromogens have many characteristics in common. They turn dark brown under the action of laccase or of the alkali or alk. earth carbonates, and give substances of marked fluorescence when the product obtained by heating the chromogen with H_2SO_4 and resorcinol is made alk. Small amts. of quercitannin prevent the reaction of the chromogen with laccase and HI, also the presence of a chromogen prevents the oxidation of guaiacol by the laccase. W. and R. think that the brown color formed in various plants, cut fruit, dead leaves, and in macerations of green plants when acted upon by laccase indicates that one and the same substance acts as a chromogen. The work of Palladin (cf. *C. A.* 5, 300-1) is discussed.

L. W. RIGGS.

The exchange of ions between the roots of *Lupinus albus* and culture solutions containing three nutrient salts. R. H. TRUE AND H. H. BARTLETT. *Amer. J. Botany* 3, 47-57(1916).—Seedlings of *Lupinus albus* absorb more salts from mixts. of KNO_3 , $Ca(NO_3)_2$ and $Mg(NO_3)_2$ than from equally concd. solns. containing only 1 or 2 of these nitrates. The solns. of the 3 nitrates which were most favorable to absorption were much inferior to corresponding solns. in which 3 anions, $H_2PO_4^-$, NO_3^- , and SO_4^{--} were present. Under fairly comparable conditions the roots were able to absorb about half of the salts from the best solns. of the 3 nitrates and 85% from corresponding solns. with mixed anions. In solns. of KNO_3 , $Ca(NO_3)_2$ and $Mg(NO_3)_2$, as well as in solns. of KH_2PO_4 , $Ca(NO_3)_2$ and $MgSO_4$, the best absorption occurs where no single ion greatly predominates over the rest.

J. J. SKINNER.

Equilibrium of the reduction of carbonic acid (BREDIG) 10.

F. PHYSIOLOGY.

ANDREW HUNTER.

Studies on the physiology of reproduction in the domestic fowl. XIV. The effect of feeding pituitary substance and corpus luteum substance on egg production and

growth. RAYMOND PEARL. *J. Biol. Chem.* 24, 123-35(1916); *Proc. Nat. Acad. Sci.* 2, 50-3; cf. *C. A.* 8, 3815; 9, 1932.—Feeding desiccated anterior lobe of the pituitary gland to hens during a period of declining fecundity was not followed by increased egg production. Feeding either the anterior portion of the pituitary or dried corpus luteum to growing pullets retarded their growth (corpus luteum was about twice as active as pituitary) but neither retarded nor hastened the attainment of sexual maturity as indicated by the laying of eggs. The chickens began to lay at the same age, but at a lower body wt. than the normal controls. The expts. of Clark (*C. A.* 9, 3281) are criticized on the score of insufficient study of the normal variation in egg laying in the fowls used and also because of the lack of properly selected controls.

I. GREENWALD.

Further studies in the chemical dynamics of the central nervous system. III. The nature of the process of forgetting. T. B. ROBERTSON. Univ. California. *Fol. neurobiol.* 8, 486-506(1914); *Zentr. Biochem. Biophys.* 18, 171(1915).—In analogy to the physiol.-chem. significance of sleep according to which certain products of fatigue are removed from certain regions of the brain during sleep R. explains the phenomenon of forgetting as due to the removal of certain products of the functional activity of portions of the brain. In pursuance of the development of this conception R. applies the results of the psycho-physical investigations of Ebbinghaus and others to the explanation of this phenomenon. The fading of a recollected image is held to be due to the gradual passage of a substance from the colloidal medium in which it has been deposited into the blood channel which bathes the nerve element; the recollected image is, therefore, washed away, so to speak. The formula for autocatalysis ($\log n/n_1 - n = K(t - \tau)$) may be applied to the memorizing of syllables; n is the number of syllables and t is the time consumed in learning. The process of forgetting is continuous.

H. S. PAINE.

Prothrombin and antithrombin factors in the coagulation of blood. GEORGE R. MINOT AND GEORGE P. DENNY. Johns Hopkins Univ. *Arch. Intern. Med.* 17, 101-39(1916).—The methods of Howell (*C. A.* 8, 355, 1150, 3588) were used to study the blood of 93 individuals. Considerable variations in prothrombin and antithrombin action were found in normal individuals. The variation in fibrinogen content in the blood is apparently so slight as not to be of significance in estns. of prothrombin and antithrombin. Apparent diminution in prothrombin was observed in cases of bleeding, jaundice and hemophilia and an increase in leucemia and thrombosis. Increase in antithrombin content was observed in only 3 cases, 1 each of acute splenomyelogenous leucemia, aleucemic leucemia and congenital hemophilia, all of whom bled. A diminished antithrombin content was found in cases of severe typhoid fever, certain leucemias and anemias and thrombosis. Cases of spontaneous bleeding may have normal coagulation factors.

I. GREENWALD.

G. PATHOLOGY.

H. GIDEON WELLS.

Further results with the coagulation reaction in lues. M. BRANDT. *Deut. med. Wochschr.* 41, 915-7(1915).—There exists a far-reaching agreement between the results of the Wassermann reaction and the coagulation reaction of Hirschfeld and Klinger. Over 500 cases were examd. In some instances the coagulation reaction seemed more valuable than the Wassermann. Relatively frequently the sera proved coagulating by themselves, but this was most probably due to faulty methods of taking the blood or sending it in.

S. AMBERG.

The action of hypophysis extract in cases of hyperthyroidism. J. PAL. *Deut. med. Wochschr.* 41, 1537-9(1915).—Pituitrin, pituglandol, etc., administered subcutaneously, have no influence on normal thyroid glands nor on certain forms of goiter.

They do act on hypersecreting glands. The thyreotoxic symptoms decrease, while frequently at the same time the size of the goiter increases. It seems that the secretion into the follicles is independent of the formation of the toxin. S. AMBERG.

The permanganate (or urochromogen) reaction and the diazo reaction. S. E. C. BOSCH. *Deut. med. Wochschr.* 42, 17-8(1916).—The examn. of about 1000 urines showed that the diazo reaction was never obtained without the permanganate reaction, but that among severely tuberculous patients the latter was found more than twice as frequently as the diazo reaction. In these cases both reactions are bad prognostically. S. AMBERG.

The fat content of the human spleen. A. SCHMINCKE. *Münch. med. Wochschr.* 62, 941-4(1915).—Spleen and blood of patients having died of various diseases were examd. 6 to 14 hrs. after death. 25-100 g. spleen were treated with CaSO_4 , according to Windaus, and extd. 5-6 days with ether, yielding the total fat. This was divided in 2 parts, in one of which the phosphatides were detd.; in the other the cholesterol was detd. as cholesterol digitonin. The rest was the "Begleitsubstanz" of Wacker. In the analysis of the blood the method of Wacker and Hueck was employed. The various fat constituents were identified as above. In one case of pneumonia blood was obtained 2 hrs. before and 6 hrs. after death. The values obtained for total fat as well as for its constituents were identical. The morphological examn. of the spleens with various fat stains did not permit any conclusion as to the amt. of fat detd. by chem. analysis. The total fat content of 27 spleens varied between 0.71 and 1.51%. It was not possible to establish any relationship between the fat content and age, body weight and disease. The analysis of the total fat for cholesterol, "Begleitsubstanz," lecithin and neutral fat showed considerable variations in these substances. The total fat content of the blood expressed in % is lower than that of the spleen. There is no parallelism between the total fat content of blood and spleen, nor between their partial lipoids. S. AMBERG.

Investigations concerning the antitoxin content in the serum of tetanus patients. H. WINTZ. *Münch. med. Wochschr.* 62, 1564-6(1915).—Tested on mice the serum of tetanus patients contains tetanus antitoxin. The antitoxin content is highest about the time of beginning re-convalescence. Injection of serum in mice before administration of toxin can protect; injection after the administration of toxin did not cure. The amt. of antitoxin in the serum of the patients is too small to permit of its therapeutic use. S. AMBERG.

Relations of diabetes insipidus to the hypophysis and its treatment with hypophysis extract. J. HOPPE-SEYLER. *Münch. med. Wochschr.* 62, 1633-5(1915).—When a case of diabetes insipidus was treated with subcutaneous injections of pituitrin the urine secretion diminished while its concn. rose. Treatment with atropine was followed by a diminished urine secretion but without change in its concn. Feeding of fresh glands had no effect. S. AMBERG.

The technic and clinical applicability of the Abderhalden reaction. E. BUNZER AND F. BLOCH. *Münch. med. Wochschr.* 63, 6-10(1916).—Special attention is called to some of the 16 cases examd. In one case with tuberculosis of the lungs the patient's serum reacted with lung, liver and testicle. It was found then that there had been a tuberculous affection of the testicles. The serum of a case of cirrhosis of the liver reacted only with spleen. Another with cirrhosis of the palpable spleen reacted strongly with spleen and liver, less with kidney and lung. The urine did not contain albumin but on autopsy some changes were found in the kidney. A case of chronic lymphatic leucocythemia reacted with spleen and kidney. The value and significance of the Abderhalden reaction are not decided as yet. S. AMBERG.

The typhoidin quotient. Quantitative studies of the cutaneous test of typhoid immunity. EUGENE S. KILGORE. Univ. Calif. *Arch. Intern. Med.* 17, 24-31(1916); cf. *C. A.* 8, 1986; 9, 333.—The typhoidin reaction was applied by making 2 abrasions (without drawing blood) by rotating a chisel having a 2.5 mm. blade. Typhoidin was applied to one spot and the control soln. to the other. The typhoidin consisted of the dried, killed culture of typhoid bacilli in glycerol-bouillon and the control was dried glycerol-bouillon. The typhoidin quotient is the ratio, after 24 hrs., of the diam. of the typhoidin spot to that of the control. While in individual cases the test has a high probable error and is not conclusive, it would seem to be very useful in statistical studies. Values of the quotient considerably greater, or less, than 1.50 indicate immunity and non-immunity, respectively. I. GREENWALD.

The splenic pathology of pernicious anemia and allied conditions. A duodenal method of estimating hemolysis. J. P. SCHNEIDER. Univ. Minn. *Arch. Intern. Med.* 17, 32-41(1916).—Examn. of the duodenal contents of fasting individuals showed a marked increase in the content of bilirubin, urobilin and urobilinogen in cases of pernicious anemia. This is not the case in chronic intestinal hemorrhage. I. G.

Blood urea determinations in 211 cases. HAROLD SCHWARTZ AND CAROLINE MCGILL. Butte, Mont. *Arch. Intern. Med.* 17, 42-77(1916).—Marshall's method was used (cf. *C. A.* 7, 2048, 3979). The urea content of the blood of normal fasting adults varied from 0.108 to 0.252 g. per l. Larger amts. were found not only in nephritis but also in a number of other conditions, particularly when advanced. In lobar pneumonia a high urea content indicates an unfavorable prognosis. The urea content of transudates is approx. that of the blood. I. GREENWALD.

Non-parasitic chyluria. K. I. SANES AND MAX KAHN. Pittsburgh. *Arch. Intern. Med.* 17, 181-92(1916).—Description of a case of chyluria, with results of examn. of urine and blood. The condition was apparently due to a functional disturbance of the kidney cells. I. GREENWALD.

A study of the lipin content of a case of Gaucher's disease in an infant. H. R. WAHL AND M. L. RICHARDSON. Western Reserve Univ. *Arch. Intern. Med.* 17, 238-59(1916).—Description of the changes in the tissues in a case of Gaucher's disease. "In Gaucher's disease the liver and the spleen show not only a marked increase in the lipin content, but also a serious alteration in normal relations of the lipins to each other. The fixed fats are greatly reduced, while the lipoids, such as lecithin and cholesterol, are greatly increased. In our case a lecithin-like body predominated, but a cholesterol compd. may prevail in other cases." I. GREENWALD.

The control of experimental cretinism. H. R. BASINGER. Univ. Chicago. *Arch. Intern. Med.* 17, 260-78(1916).—The expts. were performed on rabbits. From each litter 1 or 2 were kept as controls; the others were thyroidectomized at the age of 2 or 3 weeks. After being kept with the mother until 6 weeks old, they were fed a uniform diet of oats, carrots, alfalfa hay and H₂O. The usual retardation of growth was observed in the thyroidectomized rabbits ("cretins"). The symptoms could be greatly relieved and growth stimulated to almost the normal degree by careful feeding with dried thyroid; discontinuing the feeding led to a return of the symptoms of cretinism. Koch's thyroid metaprotein (*C. A.* 7, 1517) is more active than dried thyroid but is also more toxic. Kendall's ext. B (*C. A.* 9, 1625, 2673) had no effect upon the symptoms of cretinism and was also non-toxic. Transfusion of serum from rabbits that had been fed on thyroid stimulated growth and relieved the other symptoms of cretinism, but not to so great a degree as did thyroid feeding. Serum from normal rabbits was ineffective. "Cretins are more susceptible than the normal animals to the toxic action of thyroid (thyroid feeding). Cretin rabbits, despite their retarded rate of

growth, continue to grow for a considerably longer time (4 to 6 weeks) than the controls of the same litter." I. GREENWALD.

The permanganate reduction index of cerebrospinal fluid. W. O. HOFFMAN AND A. B. SCHWARTZ. Chicago. *Arch. Intern. Med.* 17, 293-302(1916).—The permanganate reduction index of Mayerhofer (*Wiener klin. Wochschr.* 23, 651(1910)) is the number of cc. of 0.1 N KMnO_4 reduced by 1 cc. of cerebrospinal fluid. (H. and S. do not give details.) All normal fluids or fluids obtained from patients without active inflammation of brain or meninges give low indices (below 2). In early stages of inflammation, serous meningitis, encephalitis, etc., the index is between 2 and 2.5. Higher indices, if constant, almost invariably indicate active inflammatory processes, particularly tuberculous meningitis and acute poliomyelitis. The test is considered to have distinct value. I. GREENWALD.

Studies in typhoid immunization. VI. Treatment of typhoid fever by intravenous injections of polyvalent sensitized typhoid vaccine sediment. FREDERICK P. GAY AND HENRY T. CHICKERING. *Arch. Intern. Med.* 17, 303-28(1916).—The results of the treatment of typhoid fever patient by means of injections of a sensitized polyvalent killed typhoid sediment indicate that the treatment may have considerable value. Cf. C. A. 8, 1986; 9, 333. I. GREENWALD.

The interpretation of a positive nitrogen balance in nephritis. HERMAN O. MOSENTHAL AND ANNABELLA E. RICHARDS. Johns Hopkins Hosp. *Arch. Intern. Med.* 17, 329-40(1916).—"A marked positive balance of N in cases of nephritis on a mixed diet is not necessarily followed by a corresponding increase in the non-protein N of the blood. Until these phenomena are elucidated, discretion must be exercised in interpreting a normal figure for non-protein N of the blood as indicating that no N retention has taken place, and in considering a positive N balance as an absolute indication of the inability of the kidney to excrete this substance." I. GREENWALD.

Morphology and function of the ovary under normal and pathological conditions. B. ASCHNER. Halle. *Arch. Gyn.* 102, 446(1915); *Zentr. Biochem. Biophys.* 18, 165 (1915).—A. attempted to study modifications of ovarian function by means of the Abderhalden reaction (decompn. of ovary by serum). Decompn. of ovary or corpus luteum was observed in certain instances of pregnancy toxicosis, but not in normal pregnancy; the result was negative in menstruating women and positive in ovarian hemorrhages. Decompn. of ovary and spleen was observed in chlorosis. Administration of preps. of these organs would appear to be of therapeutic value. H. S. PAINE.

Serum antianaphylaxis in man; measles antianaphylaxis. G. BESSAU. Breslau. *Jahrb. Kinderheilk.* 81, 183-210, 293-312(1915); *Zentr. Biochem. Biophys.* 18, 197 (1915).—B. reports studies of cases of serum disease. Antianaphylaxis, which was especially pronounced in the more severe forms, was detected by intracutaneous tests. Isolated exanthem efflorescence is not considered to be the expression of a local antigen-antibody reaction. Antianaphylaxis is non-specific in serum disease. B. does not regard antianaphylaxis in the case of serum anaphylaxis as an absorption antianaphylaxis in the sense employed by Friedberger. Both tuberculin hypersensitiveness and serum hypersensitiveness are diminished in measles; peptone hypersensitiveness is also diminished during the course of measles. Toxin and endotoxin reactions are not influenced by measles. B. regards the condition of non-sensitiveness in measles as antianaphylaxis. H. S. PAINE.

Diabetes insipidus with the disease aspect of insufficiency of several glands with internal secretion. NOEL ORLANDI. Milan. *L'osped. maggiore* 1914, No. 9; *Zentr. Biochem. Biophys.* 18, 161(1915).—O. studied a case of diabetes insipidus with polyuria,

physical and mental deficiency, obesity and increased tolerance for carbohydrates. This disease aspect is associated with insufficient functional activity of certain glands with internal secretion, especially the hypophysis, ovaries, etc. The marked amelioration which followed hypophysin administration supports the theory of hypophysis insufficiency in diabetes insipidus. Especially noteworthy was the positive outcome of the Abderhalden reaction, *i. e.*, the detection of enzymes which decompd. hypophysis tissue.

H. S. PAINE.

Influence of ovarian transplantation; origin of osteomalacia. ANON. Halle. *Z. Geb.* 77, 49-81(1915); *Zentr. Biochem. Biophys.* 18, 165-6(1915).—A considerable decrease in Ca content of the bones was observed after transplantation of the ovaries of animals (rabbits) of the same litter. Transplantation of the ovaries of offspring to the mother animal caused a moderate decrease, while transplantation of fetal ovaries to the mother animal caused no detectable decrease in Ca content even after 3 mos. No distinct change in Ca content was observed after castration. The Ca content of the blood was not altered by transplantation, castration or injection of ovarian and corpus luteum ext.; neither did the blood of pregnant animals show any variation in Ca content. Injection of ovarian substance caused pronounced hyperemia of the genitals (and even manifestations resembling rut). Internal secretory disturbance of function with hyperfunction of the generative gland probably plays a part in the etiology of osteomalacia.

H. S. PAINE.

Immunity reactions of an inagglutinable strain of *Bacillus typhosus*. JAMES MCINTOSH AND JAMES M. McQUEEN. Aberdeen Univ. *J. Hyg.* 13, 409-21(1914); *Zentr. Biochem. Biophys.* 18, 197-8.—Injection of an inagglutinable strain of *B. typhosus* into rabbits caused the formation of a sp. agglutinin for typhoid bacilli and also the production of group agglutinins for other members of the typhoid-coli group. The inagglutinable strain absorbed the agglutinin; the antigenic properties of the inagglutinable bacillus were not impaired. Chem. agglutinants, especially acids, had an agglutinating action on all typhoid strains, but this agglutination was somewhat retarded in the case of inagglutinable bacilli; the latter owe their property of non-agglutination to some change of a physical nature and not to a loss of receptors. The inagglutinable typhoid bacilli are probably more resistant to physico-chem. influence than are normal typhoid bacilli.

H. S. PAINE.

Prophylaxis of serum disease, especially by antianaphylactic protective inoculations. R. ORTO AND P. A. HOFFER. Berlin. *Z. Hyg.* 80, 1-29(1915); *Zentr. Biochem. Biophys.* 18, 196(1915).—O. and H. detd. the minimal serum doses and min. time required for antianaphylactic protection in the case of anaphylactic guinea pigs. Serum doses of 0.5-1.0 cc., which in themselves only produce slight anaphylactic phenomena in highly hypersensitive guinea pigs, gave sufficient protection against subcutaneous injection of a fatal dose. Subcutaneous injection of 0.5-1.0 cc. serum is recommended for production of antianaphylactic protection in man. O. and H. report results of only practical interest regarding epinephrine and purified serum.

H. S. PAINE.

Application of the dialysis method to the detection of pregnancy; experiments on the recognition of tuberculosis and other infectious diseases in domestic animals. W. PFLEGER, R. STANDFUSS AND E. ROEPKE. *Centr. Bakt. Parasitenk., Orig.* 75, 525-92(1915); *Zentr. Biochem. Biophys.* 18, 189(1915).—Enzymes which decompose placenta as well as tuberculous tissue were detected in the serum of pregnant and tuberculous animals; these enzymes are not regarded as specific. The serum of pregnant animals decompd. tuberculous tissue and the inverse relation was likewise true; other tissues, such as the liver and placenta of other animals, were also attacked. The serum of non-pregnant and non-tuberculous animals frequently gave the Abderhalden reaction with

placental and other tissues. Certain tissues are unusually subject to attack by the serum of pregnant, sick and even normal animals. A critical review of the literature is given.

H. S. PAINE.

Variations of urea content in the cerebrospinal liquid, blood and urine of patients affected with certain epidemic diseases. O. FERRIER. *J. pharm. chim.* 12, 314-8 (1915).—Urea was detd. by the method of Grimbert and by means of Yvon's Hg ureometer. In *tetanus*, an amt. of 1.2 g. of urea per l. of cerebrospinal liquid is liable to be fatal; less than 1 g. in decreasing tendency is very favorable. In *meningitis*, a urea content greater than 0.1 g. per l. must be considered abnormal. In *tuberculous meningitis*, the urea content is very little increased and may even remain normal to the end. In *cerebrospinal meningitis* due to meningococci or paracocci, when specific sera have been injected at once, the max. urea content detd. in 238 tappings is not high (about 0.5 g.) and becomes normal after the 3rd injection. In serious cases of meningitis treated tardily, or having microbic complications, the initial urea content is very high; when it exceeds 0.8 g., the case will probably be fatal. Urea in the blood of 30 typho-vaccinated patients varied between 0.72 and 1.48 g. per l. In healthy persons, the ratio cerebrospinal urea : urea of blood detd. at nearly the same time, is nearly always 1:4. In cerebrospinal meningitis it increases to $\frac{1}{4}$, $\frac{1}{2}$, and in grave uremia to 1 and more. Above 1, the case is quickly fatal. Elimination of urea through urine is considerable in tetanic and meningitic patients during recovery: 25, 28, 35 g. urea per l. and 1.5 to 2 l. in 24 hrs. Still, the ratio, urea in blood:urea in urine, is not reliable diagnostically, owing to its variation in urine within one day and on successive days.

S. WALDBOTT.

Sugar content of the blood in physiological and pathological conditions. II. Blood sugar under pathological conditions. O. SCHUMM AND C. HEGLER. Hamburg-Eppendorf. *Mitt. Hamburg. Staatskrankenanstalt.* 13, 187-200(1913); cf. *C. A.* 7, 639.—The reduction power of the blood was detd., before and after fermentation, in normal and pathological cases with fasting individuals and after feeding 100 g. sugar. The method of Michaelis-Rona-Bang was used. Expts. with the method of Bertrand showed that it was not suitable for the detn. of sugar in blood. The feeding of 100 g. sugar increased the blood sugar content in normal cases from 8 to 34%. The values for the pathological cases showed considerable variation from the normal.

III. O. SCHUMM. *Z. physiol. Chem.* 96, 204-35(1915).—The residual reduction of the blood is not, as Griesbach and Strassner (*C. A.* 8, 1133) supposed, simply a product of the old Bang method. Samples of fermented blood give reducing substances by the method of Lehmann-Maquenne. A part of this residual reduction comes from the yeast. The samples of fresh and well washed yeast used invariably yielded H_2O -sol. reducing substances upon digestion with H_2O . It is not known to what extent the reducing substances of the blood are destroyed by yeast fermentation. Since part of the residual reduction of the blood comes from the yeast used, all the older figures must be considered too high, and, for the same reason, the content of fermentable sugar is too low. The further observations of Griesbach and Strassner, that the reduction and polarization values were practically detd. by the amt. of grape sugar present, needs confirmation by the examn. of a large number of normal cases. Bang's micro-method, with normal human blood, yields high values. The titration must be carried out in CO_2 . With values of 0.05-0.1 mg. of reduction, values can only be detd. as the average of several detns. The method of Lehmann-Maquenne is very suitable for the study of human blood. With small amts. of blood sugar it gives somewhat lower values than the old Bang method.

C. J. WEST.

Agglutination in pertussis, its characteristics and its comparative value in clinical diagnosis, and in determination of genus and species. OLGA R. POVITZKY AND EDWARD

WORTH. N. Y. City Health Dept. *Arch. Intern. Med.* 17, 279-92(1916).—Strongly agglutinating pertussis sera were obtained by inoculating rabbits with living or dead cultures of *B. pertussis*, preferably the former. The agglutination is quite specific, particularly in sera of high titer. Apparently all the strains of *B. pertussis* tested belong to one group. About 33% of human, non-pertussis sera show agglutination in dilutions of 1:40, and 17% in dilns. as high as 1:100. A dilution of not less than 1:200 is necessary for a practically positive diagnosis of pertussis by an agglutination test.

I. GREENWALD.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Therapeutic effect of colloidal gold. FRANCESCHINI. *Gazz. ospedali clin.* 36, 1293-4(1915).—A review of a paper by Basquet (*La presse med.* Sept., 1915). Most of the preps. are made by mechanical pulverization of Au_2O_3 . These suspensions have a blue color and exhibit the Brownian movement. Three concns. are used: 0.0025, 0.001 and 0.01 g. per cc. A violet sol obtained by Bredig's method was injected intravenously into rabbits and dogs. The following results were obtained: *Toxicity*: In a 70 kg. subject the toxic dose was 3.6×10^{-4} g. per kg. *Thermal action*: Sharp increase in temp. followed by abundant sweating, and final decrease in temp. *Action of coagulating power of the blood*: None. *Action on the secretions*: Injections of 0.0001-0.0005 g. per kg. did not noticeably modify diuresis. A dose of 0.01 g. per kg. diminished the renal secretion of the rabbit, and on that day the urine was albuminous. The results are negative in the case of salivary, pancreatic and biliary secretions. *Cardio-vascular action*: Injection of 0.0002-0.0005 g. per kg. produced a rise in max. pressure and a fall in min. pressure lasting about 5 min. After 24 hrs. these pressure effects were reversed and there was a consequent reduction in differential pressure. Colloidal Au does not have, like many other metal sols, a bactericidal action *in vitro*.

H. W. BANKS, 3RD.

History of structural chemistry and its significance for scientific pharmacology. A "pseudo-historical" study. ANON. *Chem. Ztg.* 40, 101(1916). J. H. MOORE.

Arsenic therapy in anemia. EDWIN REINHARDT. Hamburg-Eppendorf. *Mitt. Hamburg. Staatskrankenanstalt.* 14, 51-71(1913).—A review of the literature of As therapy and a report of some expts. with elarson. C. J. WEST.

The danger of poisoning from projectiles. L. LEWIN. *Apoth. Ztg.* 30, 19-20 (1916).—A discussion of the chem. and biological factors likely to operate in the event that projectiles or their fragments are permitted to remain in the body. W. O. E.

Some clinical, physiologic and chemical observations on ptomaine poisoning from "creamed" codfish. M. A. BLANKENHORN, G. E. HARMON AND PAUL J. HANZLIK. Cleveland, O. *Arch. Intern. Med.* 17, 140-52(1916).—A description of general ptomaine poisoning in Lakeside Hosp. The symptoms observed are described. The material responsible was "creamed" codfish. Upon examn. there were found *B. coli communior*, other saprophytes and some staphylococci. The disturbance was not to be attributed to infection but to the presence in the fish of products of putrefaction. These products were capable of producing marked fall in blood-pressure and stimulation of surviving uterine and intestinal tissue. Chem. reactions indicated the presence of a substance resembling diamines such as putrescine, cadaverine and histamine.

I. GREENWALD.

I. ZOÖLOGY.

R. A. GORTNER.

Changes in the weight and composition of fasting lobsters, *SCIROGUS MONGOLIS*. J. Biol. Chem. 24, 137-46(1916).—The comparatively slight loss of wt. exhibited by

fasting lobsters is due to imbibition of H_2O , masking an actual loss of dry substance. Detailed detns. of various tissue components are given. I. GREENWALD.

Changes in the yolk granules of amphibia in intracellular digestion. C. SAINT-HILAIRE. *Zool. Jahrb.* 34, 107-221(1914); *Zentr. Biochem. Biophys.* 18, 148(1915).—The yolk elements are to be regarded as distinct morphological units which exist in the protoplasm as separate living entities; they are not to be considered as merely reserve material. Although the yolk elements show a general agreement in chem. constitution they exhibit certain structural and chem. variations in even closely related animals. Certain const. mutual relations (especially with respect to interchange of material) exist between the protoplasm and yolk granules. The action upon the yolk granules of an enzyme contained in the protoplasm is of especial importance; the granules are gradually decompd. and their decompn. products (especially fat) are incorporated in the protoplasm. H. S. PAINE.

12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

Examination of honey. THURE SUNDBERG. *Kungl. Landbruks-Akad. Handl. Tidskr.* 54, 696-709(1915).—Analytical data of 44 samples and some suggestions on methods. A. R. ROSE.

The analysis of maple products. VI. A volumetric subacetate test for purity of maple syrup. J. F. SNELL, N. C. MACFARLANE AND G. J. VAN ZOEREN. *J. Ind. Eng. Chem.* 8, 241-3(1916); cf. *C. A.* 10, 940.—The volumetric $Pb_2O(C_2H_3O_2)_2$ test consists in diluting the sirup to 10 times its original vol., and titrating with $Pb_2O(C_2H_3O_2)_2$ soln. The end point is obtained by measurements of elec. resistance. Apparently this method will prove the most useful single test for purity of maple products yet proposed. H. S. BAILEY.

Influence of rainfall on composition of tomatoes. W. D. BIGELOW. *Am. Food J.* 11, 58-9(1916).—During seasons of excessive rainfall, many canners find that tomatoes are unusually "sloppy," as indicated by the amt. of water that seeps on the peeling table and in the can. Some canners have the impression that food officials judge the presence or absence of added water by such appearances or by the insol. screened solids, while, in fact, a chem. detn. of sol. solids in the liquor is the basis of judgment. If marked variation in sol. solids corresponded with variation in rainfall added water could not be detd. in this way. During the seasons of 1914 and 1915, a study of the problem was made at the lab. of the National Canners' Assoc. Raw tomatoes, of known variety and obtained from different sources, were examd. as they ripened throughout the season. B. reports that compn. varies through rather wide limits with variation of cultural environment. There was also considerable variation between successive pickings of tomatoes from the same plants, a general tendency toward decrease in sol. solids with advance of season being indicated. There was no significant correlation between sol. solids and excessive rainfall. A table is included giving per cent of sol. solids, rainfall in inches, and the corresponding period of the season. G. A. MENGE.

Determination of caffeine in tea by sublimation. E. PHILIPPE. *Mitt. lebensm. Hyg.* 6, 177-91, 233-47(1915).—P. gives data to prove that caffeine can be sublimed quant. in his app. (*C. A.* 8, 1073) with a max. loss of 1%, and that all the caffeine can be extd. from 3 g. of tea, which has been treated with 10 cc. NH_4OH in a separatory funnel, by shaking 4 separate times with 50 cc. of $CHCl_3$ for 3 min. If the $CHCl_3$ form such an ext. is evapd. and the residue taken up in a little H_2SO_4 water, the loss

on extg. this soln. with ether amounts to 0.06% on 3 g. of tea. The development of these facts led P. to the following method: Transfer 3 g. of finely ground tea, weighed to within 5 mg., to a $\frac{1}{2}$ l. separatory funnel and add 10 cc. of NH_4OH . After a few min. add 50 cc. of CHCl_3 and shake for 3 min. Filter the CHCl_3 through a small folded filter (4 cm. diam.) into a 250 cc. Erlenmeyer flask containing several small pieces of pumice. Should the filtration become retarded the filter paper may be punctured with a fine wire. Add the second 50 cc. of CHCl_3 through the funnel used for filtering, pouring it rapidly enough to fill the filter to its edge, shake for 3 min. and filter into flask. Repeat twice. After evapg. the CHCl_3 on the H_2O bath add 120 cc. of H_2O and 20 cc. of 0.1 N H_2SO_4 or its equiv., and heat to boiling. Filter hot on a small filter and wash with H_2O . After cooling add 10 cc. NH_4OH and a few drops of phenolphthalein and ext. 4 times with 50 cc. portions of CHCl_3 , the pink color of the indicator making a sharp line of demarcation; then filter and wash as before except for piercing the filter. Evap. the CHCl_3 and transfer to small glass dish with a little CHCl_3 and dry in a water oven the flame of which has just been turned off. When dry sublime in P.'s app. A detn. of H_2O was made on 39 teas from China, Ceylon, India and Java with a min. of 6.87%, av. of 9.12% and a max. of 13.85%. A table of caffeine detns. on the same samples is given.

H. A. LEPPER.

Turning green of oysters and their content of heavy metals. F. LIEBERT. *Chem. Weekblad* 12, 978-83(1915).—The green color of certain varieties of oysters arises from wholly different causes. In the case of Marenne oysters the green color originates from the presence of certain algae, while in other cases this color may be due to a high content of Cu compds. Two samples of Truro oysters were analyzed by the author; the greener sample contained 0.244% Cu in the dry material, the less colored only 0.08%. A review of the literature is given.

J. T. FLOHL.

Determination of the water content of meat products. E. FEDER. Aix la Chapelle. *Chem. Ztg.* 40, 157-60(1916).—A discussion of Seel's criticism (*C. A.* 9, 3107) of F.'s "ratio no." (*C. A.* 7, 3170; 8, 3601) for H_2O in chopped meat and sausage. Cf. Schenck and Burmeister, *C. A.* 9, 1949.

J. H. MOORE.

The estimation of fat in food for infants. H. G. CHAPMAN. *Proc. Roy. Soc. N. S. Wales* 46, 469-72(1915).—A food for infants which contained 2.25% H_2O , 2.8% N, 3.55% ash, and 60% of carbohydrates, about $\frac{1}{6}$ of which was insol. in H_2O , when extd. in the Soxhlet app. with anhyd. Et_2O free from EtOH , yielded 7.4% fat. Redried and extd. again, less than 0.02% fat was obtained. Analyses run in quadruplicate checked closely. The same sample, extd. by the Röse-Gottlieb method, gave 16.85%, indicating that with this kind of foods it is impossible to det. the % of fat by the dry extn. methods.

H. S. BAILEY.

The relation of the composition of milk to cheese making. E. HAGLUND. *Kungl. Landtbruks-Akad. Handl. Tidskr.* 54, 583-609(1915).—The change in the total N of the milk does not change the distribution of the N between the cheese and whey. When the fat in the milk is increased there is an increased loss of fat in the whey, both relative and absolute. This loss cannot be corrected by changing the temp. of the milk in the process. Practical suggestions are given.

A. R. ROSE.

Pasteurizing milk by the method of prolonged heating at 60-64°. CHR. BARTHEL. *Kungl. Landtbruks-Akad. Handl. Tidskr.* 54, 610-48(1915). Influence of pasteurizing milk on the tubercle bacillus. CHR. BARTHEL AND O. STENSTRÖM. *Ibid* 649-61.—B. recommends that milk be pasteurized by heating to 60-64° for a period of 30 min. with const. stirring. This treatment changed the taste of the milk and the soly. of the milk albumins and Ca salts. Of the enzymes present the amylase was the only one destroyed. The peroxidase and aldehyde-reductase were not changed. 99.5%.

of the bacteria were destroyed including all the pathogenic and the lactic-acid-forming bact. Milk pasteurized in this way keeps 2 days and should be used within this time. *B. tuberculosis* were killed by heating the milk to 60° for 10 min. A. R. ROSK.

Chemical testing of milk and cream. ROSCOE H. SHAW. U. S. Dept. Agr., *Bur. of Animal Industry A-7*, 38 pp.(1916).—A publication designed for chemists and practical dairymen for the detn. of fat, total solids, sp. gr., acidity of milk and cream and the detection of preservatives. The chem. nature of milk is given. App. used is shown, together with tables of value in computing results. E. H. INGERSOLL.

Freezing of milk. C. BESANA. *L'industria lattiera e zootechnica* 13, 221(1915); through *Ann. chim. applicata* 4, 366.—On cooling milk till it freezes, there is not obtained a homogeneous mass; the lower layers are richer in solids except fats, which predominate in the upper layers; the interior of the mass is richer in solids than the peripheral layers. S. LEVY.

Enzymes of milk. C. BESANA. *L'industria lattiera e zootechnica* 13, 264(1915); through *Ann. chim. applicata* 4, 366.—The enzymes of milk are of 3 kinds: hydrolyzing, oxidizing, and reducing. S. LEVY.

Has light an effect upon the staling of bread? J. R. KATZ. Amsterdam. *Z. physiol. Chem.* 96, 288-91(1916).—As far as could be detd. light does not accelerate or retard the staling of bread. Cf. *C. A.* 9, 1808. C. J. WEST.

Remarkable property of aldehydes to prevent bread from becoming stale. J. R. KATZ. Amsterdam. *Z. physiol. Chem.* 96, 314-22(1916).—Aldehydes (formaldehyde, acetaldehyde, propylaldehyde, *n*-butylaldehyde, isobutylaldehyde and isovalerylaldehyde) are able to prevent bread from becoming stale for a period of at least 2 weeks. Ketones do not possess this property. C. J. WEST.

The political and technical relationship of the substitution of chemical aids for yeast in baking. A. KRAUS. *Chem. Ztg.* 39, 793-4(1915).—The use of yeast in bread-making causes a loss of 1.5-2% in nutritive value. In addition the manuf. of compressed yeast requires the use of maize, barley and malt. In order to aid in the conservation of breadmaking cereals, chem. substitutes for yeast were therefore sought. The best bread was obtained by using a cream of tartar baking powder, but a lactic acid and NaHCO₃ mixt. also gave satisfactory results. E. A. TSCHUDY.

Some overlooked investigations on wheat. W. P. HEADDEN. *J. Ind. Eng. Chem.* 8, 283(1916).—A report of expts. by H. Ritthausen and R. Potts, published in 1872, gives results very similar to those of H. (C. A. 9, 3320), whose article was published before he knew of this earlier work. It is surprizing that Ritthausen's investigation received no attention. H. S. BAILEY.

Tea seed oil (DEUSS) 27.

WOODMAN, A. G.: **Food Analysis: Typical Methods and the Interpretation of Results.** New York: McGraw-Hill Book Co. 510 pp. \$3.00.

Carameling chocolate. E. L. A. SAVY. U. S., 1,173,873, Feb. 29. A thin layer of chocolate is spread upon a rotating drum and treated with a counter-current of air heated to 100-140° to produce a carameling effect within a short time.

Iron added to foods, drugs or beverages. H. L. MARSH. U. S., 1,171,739, Feb. 15. Ferric succrate soln., free from alkali, is heated under pressure to 100-175° and the resulting prepn. is used for ferruginizing foods or beverages or directly as a medicine. The compn. forms no ppt. with most beverages and is free from any pronounced sweetish taste. Cf. *C. A.* 9, 1081.

Preserving potatoes. VEREIN DER SPIRITUSFABRIKANTEN. Ger., 286,106, May 30, 1914. The potatoes are grated raw and inoculated in waterproof pits with pure lactic acid cultures. Shredded or chopped sugar beet or beet-sugar molasses is added to the potatoes before souring, whereupon the potato slurry is warmed to a temp. suited to the lactic acid organism used. A sour mash, which is kept alive in the manner common for yeast cultures in distilleries is employed as the inoculating medium. *E. g.*, raw potatoes are reduced as in potato starch manuf. and pumped, as a slurry, into the souring pits. The addition of the inoculating material (1%) is made in course of the passage from the graters to the pits which are water-tight. After souring is complete, the pits are closed air-tight. If a warm lactic acid organism is used, the mass should be warmed to 50–55°. For the cultivation of the stock culture, a mash is prepd. from sacchariferous materials or materials saccharified by malt, or from non-saccharified potatoes, and the acid stock is transferred, in suitable amts., from one mash to the other. Should the potatoes not contain a sufficient amt. of sugar, molasses may be added.

Milk sterilizer. F. GÄRPHEIDE and H. HOFER. Ger., 286,539, Mar. 28, 1911. The sterilization is effected by the action of a const. high pressure, which can be instantly relieved, or by intermittent action of such pressure, upon the material under treatment.

Converting crystallized honey into sirup form. K. HAUER. Ger., 285,710, May 2, 1914.

Converting pulverulent, lumpy, or doughy starch into granular form. A. P. ANDERSON. Ger., 281,715, Aug. 18, 1912.

14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

Books on purification of water. *Munic. Eng.* 50, 56–7 (1916).—This is a brief bibliography of the leading books. LANGDON PEARSE.

Hints on the design and operation of intermittent sand filter. D. C. FABER. *Eng. Ext. Div.*, Iowa State College, *Bull.* 16 (1916); *Eng. Contr.* 45, 168–9 (1916).—Iowa practice uses 24 in. net depth of sand having a ridge bottom with valleys 6 in. deep, spaced 5 ft. on centers, containing open joint tile underdrains surrounded by gravel. From 100,000 to 500,000 gal. per acre per day are applied with doses 3 in. deep. High rates require const. care. LANGDON PEARSE.

Water softening by filtration. ANON. *Munic. Eng.* 50, 50 (1916).—Synthetic hydrous aluminium silicate (R. Gans) and a similar natural substance (R. N. Kinnaird) reduce hardness in the water during filtration. LANGDON PEARSE.

Hartford (Conn.) waterworks notes. C. M. SAVILLE. *Report Bd. Water Commrs.* 1915; *Munic. J.* 40, 333–4 (1916).—On account of the proximity of high-ways to reservoirs the water is sterilized before delivery. The raw water showed bacterial counts as high as 39,000 per cc. with *B. coli* found from 9 to 23 times in 10 cc. or less, every month. Treatment with 0.95 p. p. m. available Cl has removed *B. coli* and 99.8% of total bacteria. With CaOCl_2 , 1 p. p. m. available Cl was used or 25 lbs. of bleach per mil. gals. Liquid Cl used is 0.65 p. p. m. or 5.4 lbs. per mil. gal. LANGDON PEARSE.

Novel water-treatment plant at Excelsior Springs, Mo. ANON. *Eng. News* 75, 400–1 (1916).—The water supply contains total solids 527 p. p. m., including 420 p. p. m. HCO_3^- . Fe is also present. Treatment comprizes aeration followed by settling, pptn. by using lime, and rapid filtration. Aeration removes 59% CO_2 . 2.6 grains per gal. of lime reduces CO_2 and allows Fe to ppt. After 5 hrs. the water is fairly clear, the

CO₂ reduced to 11 p. p. m. and Fe to 0.2 before filtration. The filtered water contains Fe in less than 0.1 p. p. m.

LANGDON PEARSE.

Death resulting from typhoid fever held to be within the Wisconsin workmen's compensation laws. *Pub. Health Reports* 31, 329-34(1916); *Eng. News* 75, 426(1916).—The death of an employee was caused by typhoid fever contracted by drinking impure water furnished by the employer. The court decided that the death was the result of an accident and that the employer was liable under the Wisconsin law.

EDWARD BARTOW.

Water-borne typhoid at Westfield, N. Y. T. HORTON. *Health News* 10, 373-4 (1915).—The epidemic was caused by infection of water supply by a case of typhoid on the watershed, but was checked by the use of Cl.

J. GAUB.

The preparation of sterile drinking water in the field. *Pharm. Zentralhalle* 56, 49-55, 212-3(1915).—A review of methods employed in the German army.

C. O. EWING.

Field water purification plant. ANON. *Can. Engr.* 30, 189-90(1916).—A portable app. has a capacity of 3000 gals. per hr. A 9 h. p. gasoline engine drives a 2½-in. rotary pump and a 2½-kw. 220 volt d. c. generator. The water is pumped through a pressure filter, and is sterilized by ultraviolet rays.

LANGDON PEARSE.

Purification of water supplies. E. O. JORDAN. Univ. Chicago. *J. Am. Med. Assoc.* 66, 467-71(1916).—An address which gives a general review of water purification in the U. S., especially the more recent developments. Five tables and 10 references are included.

L. W. RIGGS.

Sanitary feature of Los Angeles aqueduct. B. A. HEINLEY. *Munic. J.* 40, 35-7(1916).—The water is brought in 233 miles from Owens River to Los Angeles. The density of the population in the watershed is 1.4 per sq. mi. In addition to the time in the aqueduct, reservoirs increase the normal storage period to 65 days and under present conditions to 468 days. *B. coli* noted were traced to ducks. The mineral content ranged from 15 to 22 grains per gal. Algae growths occasionally cause odors and taste, despite covered reservoirs on the distribution system.

LANGDON PEARSE.

Improving sanitary conditions on the Ashokan reservoir watershed. G. G. HONNESS. *J. N. E. W. W. Assn.* 29, 502-6(1915); *Eng. Contr.* 44, 213(1915).—A review of the methods used for the protection of the water supply of New York City.

S. T. POWELL.

Ground water in the Waterbury area, Connecticut. ARTHUR J. ELLIS. U. S. Geol. Survey, *Water Supply Paper* 397(1916).—The chief supply is in the glacial drift. The av. yield of wells in the cryst. rocks is about 15 gallons per min. Data in regard to supplies for each town are given.

W. D. C.

Water resources of Hawaii, 1913. G. K. LARRISON. U. S. Geol. Survey, *Water Supply Paper* 373(1915).—Discharge measurements are given for certain streams and ditches for 1913.

W. D. C.

Surface water supply of Oregon, 1878-1910. F. F. HENSHAW AND H. J. DEAN. U. S. Geol. Survey, *Water Supply Paper* 370(1915).—After a discussion of the natural features of Oregon, results are given of stream measurements for the time covered.

W. D. C.

Ground water in Paradise Valley, Arizona. O. E. MEINZER AND A. J. ELLIS. U. S. Geol. Survey, *Water Supply Paper* 375-B(1915).—A sketch of Paradise Valley is given with special reference to the underground waters as found in an investigation to discover a suitable supply for irrigation. It is concluded that while the yield and the ultimate supply of ground water will no doubt be found to be much less in Paradise Valley than in the Salt River Valley yet the prospects for obtaining dependable supplies

from underground sources for irrigation on a small scale are sufficiently encouraging to justify the sinking and testing of wells. W. D. COLLINS.

The relation of stream gaging to the science of hydraulics. C. H. PIERCE AND R. W. DAVENPORT. U. S. Geol. Survey, *Water Supply Paper* 375-C(1915).—The authors consider stream gaging as a branch of hydraulic engineering and conclude that, while a large amount of research is needed before hydraulics can be considered an exact science, yet the recent developments in stream gaging point to the possibility that this branch may in time reach such a state of perfection that all problems connected therewith may be solved with mathematical exactness. W. D. C.

Equipment for current-meter gaging stations. G. J. LYON. U. S. Geol. Survey, *Water Supply Paper* 371(1915).—Numerous plans accompany technical descriptions of types of equipment for current meter gaging stations that have been found most effective in facilitating observations and insuring accurate results. Tables give bills of material for parts of the equipment. W. D. C.

Stream-gaging stations and publications relating to water resources, 1885-1913. XII. North Pacific Slope drainage basins. B. D. WOOD. U. S. Geol. Survey, *Water Supply Paper* 340-L(1915); cf. C. A. 9, 2785.—Twelfth and last part of *Water Supply Paper* 340, containing a list of all gaging stations in the district covered and a list of all Survey publications relating to that section. W. D. C.

The fundamental principles of the activated sludge process of sewage treatment. T. C. HATTON. *Indiana San. and W. S. Assoc.* 1916; *Eng. Contr.* 45, 235-6(1916).—The activated sludge process depends on the presence of biological life in the sludge under aerobic conditions. LANGDON PEARSE.

The activated sludge process of sewage treatment. G. J. FOWLER. *Can. Eng.* 30, 227-8(1916).—F. sketches the historical development of the process, and dwells on the "M7" process of adding bacterial cultures in the presence of Fe in soln. Activated sludge has 3 broad actions: (1) a clotting or clarifying action, (2) a rapid carbon oxidizing process and (3) nitrification. Much research is still required. L. P.

British and American patents on activated sludge. T. C. HATTON. *Eng. News* 75, 189-90(1916).—U. S. patent 1,139,024 issued to L. C. Frank (cf. C. A. 9, 1647) and 4 English patents (Oct. 11, 1913 to Apr. 11, 1914) issued to Jones and Atwood have identical process and apparatus claims. Americans have developed continuous flow app. LANGDON PEARSE.

The activated sludge experiments at Salford. W. H. DUCKWORTH. *Surveyor* 48, 648-52(1915); *Assoc. Mgrs. Sewage Disposal Works* 1916; *Munic. J.* 40, 199-200(1916).—Continuation of the Salford expts. (cf. C. A. 9, 679) has given satisfactory purification of sewage with 2-hrs. blowing of air, even in winter, and part of the time with only 1 hour of aeration. The presence of trade wastes of a sterilizing nature at times necessitates longer periods of blowing to restore the activity of the sludge. Success with some of the air jets clogged up leads to the conclusion that a smaller amt. of air might be used. In continuous treatment 60,000 gallons per day are treated in an aeration tank of 12,000 gals. capacity with 4 tanks of 1,500 gals. capacity in series for recovery of sludge carried on from the aeration tank. From each of the first 2 settling tanks sludge is pumped back to the inlet of the aeration tank about 5 min. every $\frac{1}{2}$ hr., while the other 2 require pumping back only about 2 min. per week. Conclusions have not been reached in regard to cost of operation or disposal of excess sludge.

W. D. COLLINS.

Recent improvements in the construction of cultivation tanks. W. D. S. MONCRIEFF. *Surveyor* 48, 596-7(1915).—For the best results in conversion of org. substances into their inorg. equivs. it is necessary that bacterial processes be zonal in their

action and that the process be continuous without disturbance of the zones of activity. At Chertsey 300,000 gallons of sewage per day passed through "cultivation" tanks, 60 by 30 ft. by 3 ft. deep, for a month, forming only 7,000 gallons of sludge. The tank has a level perforated false floor, and the sewage passing under this floor moves upwards to the level of a series of 4 in. land drains laid in lines 2 ft. 6 in. apart, which pass through the further wall of the tank, and discharge into a channel that conveys the effluent to the distributors of the downward filters. The tank effluent was very unstable. The O-consumed figure fell automatically in 18 hrs. from 84 to 44 p. p. m. A sample of effluent from a cultivation tank followed by 3 ft. of downward filtration kept 7 years without further change. M. considers the process ideal for domestic sewage, as it is in keeping with the processes of nature, but the zonal action must be kept uniform.

W. D. COLLINS.

The disposal of sewage by dilution: a biochemical method of purification. W. E. ADENEY. *Surveyor* 48, 600-4(1915).—The general principles of purification by diln. with water containing O are set forth, with reference to the well known expts. recorded in the reports of the Royal Commission, the Metropolitan Sewage Commission of New York, and others. Attention is especially directed to the injurious effects of decomposing sewage solids settling in pools in water courses, to be washed out later by freshets. Normal sewage is not likely to exercise any poisonous action on a stream when mixed in safe proportions for oxidation. Trade wastes discharged raw might be poisonous, but it is common experience in biological purification works that they are not often present in sufficient quantity to cause trouble. A.'s definition of normal sewage is: "'Normal' sewage matters are refuse matters, the fermentable organic constituents (both in solution and in suspension) of which can be purified, without previous treatment of any kind, by living organisms."

W. D. COLLINS.

Sewage disposal by dilution. EDIT. *Surveyor* 48, 593-4(1915).—In discussing the paper by Adeney (cf. preceding abst.) it is pointed out that there are places where effluents discharged into large bodies of water are purified more than is necessary, but it is believed that in all cases provision should be made for max. removal of solids in suspension. So far as England is concerned "the number of rivers with a large minimum flow of highly oxygenated water is so small and the number of cases in which the only available outlets for sewage effluents consist of small rivers or streams is so large that in the majority of schemes it will still be necessary to provide filters and all other possible means of securing highly purified effluents."

W. D. COLLINS.

Eight years of Imhoff tank design and operation. KARL IMHOFF. *Eng. News* 75, 14-9, 52-5(1915).—In the past 8 yrs., 175 Imhoff tanks were built in Germany, and 70 in the United States. The best form of tank is the horizontal flow. Round sludge chambers are cheapest, and even round tanks may be cheaper. Deep tanks are preferable, as they produce denser sludge. Coarse screens with an opening of about 2 inches are necessary. A grit chamber is required in a large plant on a combined system. Velocities of 8 to 12 in. per sec. should be maintained. Three units are preferable. Where sludge is pumped a secondary tank is now provided, affording storage of 1 week. Sedimentation periods of 1.5 to 2 hrs. are provided, equiv. to 2.6 hrs. on the av. daily flow. The sludge chamber should have a capacity in cu. ft. *per capita* varying from 0.8 to 2.4 on separate systems, and 1.2 and 3.6 on combined systems. On an av. 1 sq. ft. of sludge drying area will serve 3 people. In operation, the walls of the settling chamber may require cleaning. The inclination should be 1.2 vertical to 1 horizontal. Ripened sludge is alk., black and odorless. The use of CaO to prevent acidity in the sludge is not advised. Proper decompn. depends upon the sludge. Sludge should be discharged every 2 to 6 weeks. The sludge level should be kept 3 feet below the slots. Sludge level may be detd. by lowering a thin sheet iron disc 12 in. in diam. Stirring the

sludge is helpful. Inoculation of new by old sludge favors proper decompn. A properly designed sedimentation plant should remove 95% of settling solids. Disinfection of sewage in the settling chamber is practical in the Imhoff tank. This may be followed by chem pptn.

LANGDON PEARSE.

Lime to correct acid sludge in Imhoff sewage tanks. W. L. STEVENSON. *Eng. News* 75, 430-1(1916).—At the Pennypack Creek Sewage works, the sewage of 4500 people is handled. The sludge dried slowly and was very acid, containing 2,200 parts per mil. acid to phenolphthalein. The addition of about 10 bu. of lime a month to a flow of 1.25 mil. gal. per day produced a good sludge, readily drying and of neutral reaction.

LANGDON PEARSE.

Discharge of sewage into streams. U. S. Pub. Health Reports 31, 421, 465-7 (1916).—The Supreme Court of Oregon decided that a municipality might discharge sewage into a stream in case the pollution did not cause a menace to health. (State Bd. of Health vs. City of Silverton, 71 Oreg. 379, 142 Pac. Rep. 609.) L. P.

Electrolytic sewage treatment in Boro of Queens. J. W. ROUTH. *Munic. Eng.* 50, 19-20(1916).—R. calls attention to discrepancies in published reports on Landreth app., principally in cost data which do not include essential cost of app. Degree of purification is not definitely established. Sludge disposal is not solved by the electrolytic process, as the amount is as large or larger than for chemical pptn., with equal quantities of lime. The tests at Elmhurst were made when the sewage was weakest. L. P.

Utilization of the constituents of city waste water. PAUL FISCHER, Fürstenwalde, AND E. BESSEMFELDER, Charlottenburg. *Chem. Ztg.* 40, 29-31(1916).—F. considers B.'s figures on the annual saving (cf. C. A. 10, 239) as being much too high, and thinks sewage could be more profitably used for feeding fish, for which a plan is outlined. B. replies.

J. H. MOORE.

Largest Imhoff tank plant nearly ready to treat Rochester's (N. Y.) sewage. C. A. POOLE. *Eng. Record* 73, 204-8(1916).—The plant consists of 6 detritus tanks, fine screens, and 10 Imhoff tanks. Construction features are detailed.

F. B.

Remodel septic tank into two-story tank. N. N. CAMPBELL. *Eng. Record* 73, 219(1916).—Lake Forest, Ill., tanks had outgrown their capacity. Cost of remodeling was \$4,000.

FRANK BACHMANN.

West Riding sewage disposal problems. Destructive trade effluents. ANON. *Surveyor* 48, 657(1915).—Acids discharged from picric acid works and explosives factories have damaged distributing systems and other machinery of sewage works so that the West Riding Rivers Board does not permit the discharge of such wastes directly into streams until measures have been taken to remove the acidity.

W. D. C.

Single house sewage disposal plant, Lewisville, Ark. *Eng. News* 75, 434(1916).—A three-section septic tank holding 150 gals.

LANGDON PEARSE.

Fish diseases in their relation to sewage. P. SCHIEMENZ. *Allg. Fischerei Ztg.* 13, 189-93, 201-8(1915); *Wasser u. Abwasser* 10, 109-10(1915).—The majority of diseases to which fish are subject are of parasitic origin. It is almost impossible to combat these diseases in large ponds and flowing waters. As a rule epidemics die out gradually. The influx of sewage is very detrimental. The org. content of the sewage deprives the water of its O. The sewage is much more readily digested in still water. The ice formed in winter prevents re-aeration. Potash liquors are harmless in flowing water. In stagnant water the salts diffuse to the bottom, thereby endangering fish-life, particularly in winter. In the discussion of the paper Hofer objects to S.'s views on the hopelessness of combating fish epidemics. He claims that an optimistic view is justified in the light of latest observations.

ARTHUR LEDERER.

Modern methods of garbage disposal in cities and villages. J. W. FOLIN. *Pub. Health, Mich. Bd. of Health* 3, 664-70(1915).—Av. Am. garbage contains 70% H_2O , 3% grease, 20% animal and vegetable matter other than grease, 7% rubbish or combustible matter and weighs from 1100 to 1200 lbs. per cu. yd. The various methods of disposal are discussed.

J. GAUB.

A new sampling apparatus for the determination of aerial dust. G. T. PALMER. *Am. J. Pub. Health* 6, 54-5(1916).—The app. consists of a glass bulb with tubular elongations at each end. The lower tube is U-shaped and in its lower part or trap are placed about 40 cc. of distd. H_2O . As air is exhausted from the upper end of the bulb by means of a No. 00 Sirocco blower, the H_2O is displaced from the U-tube and on reaching the bulb enlargement it breaks into a fine shower. The force of the air stream keeps the H_2O in constant spray formation and the air is washed free of its suspended matter as it passes through the shower. The air is measured by a special Venturi meter placed over the inlet of the U-stem. The manometer is calibrated in cu. ft. per min. After a run is completed the H_2O is decanted and the glass bulb rinsed with H_2O , making the total vol. up to 100 cc. The dust is then estd. either by comparing with a set of turbidity standards, counting the particles under the microscope or by weighing the solids after filtration through a Gooch crucible or after evapn. The app. weighs 17 lbs. The advantage of this app. over the sugar filter is that it is possible to collect large vols. of air; also the estn. of the dust is possible in more than one way. The sugar filter requires 7 hrs. to filter 100 cu. ft. of air, an amt. necessary for weighing purposes unless the air is very dusty. The new app. passes this amt. in 30 min. due to the resistance being less than in the case with pads of sugar, paper or cloth.

J. GAUB.

Tests on recirculation of washed air. G. L. LARSON. *Heating Vent. Mag.* Feb., 1916, No. 2, 36-7.—Conclusions are: 15 cu. ft. per min. per person is ample; humidity 50-70% and temp. 18.3° are comfortable; up to 20 parts CO_2 does not indicate bad air under these conditions; recirculation and air movement greatly reduce cost of heating; air washing removes dust and CO_2 but not bacteria. H. V. MAIN.

Ventilation standards. E. V. HILL. Chicago Health Dept. *Heating Vent. Mag.* 1916, No. 2, 40; cf. preceding abstract.—Chicago uses the following standards: 30 cu. ft. per person per min. with 2½ ft. per sec. velocity; CO_2 , 8 parts per 10,000; temp., 20°; humidity, 42%; dust count, 100,000 particles per cc.; bacteria, 12 colonies per plate.

H. V. MAIN.

The increase of the disinfecting strength with decrease of the toxicity of phenols. HANS FRIEDENTHAL. *Nikolasche. Berl. klin. Wochschr.* 52, 1019-22(1915).—Two new disinfectants, "sagrotan" which is chloroxyleneol, and "grotan" which is a complex *p*-chloro-*m*-cresol compd., form the subject of the discussion in this paper. It is shown that while they have a stronger bactericidal action than lysol, cresol, or phenol, they are not injurious to the skin and are comparatively non-toxic when taken internally. F. shows that just as lysol is better than phenol, so "sagrotan" is better than lysol and "grotan" is better than "sagrotan." It is believed that finally substituted phenols will be discovered that are so strong bactericidally and yet so little toxic that they can be used in the therapy of infectious diseases.

JULIAN H. LEWIS.

WATSON, M.: *Rural Sanitation in the Tropics.* London: J. Murray. 320 pp. 125.

Purifying water. J. W. BLOCK. U. S., 1,173,698, Feb. 29. In purifying H_2O by use of $Al_2(SO_4)_3$ as coagulant, Ti sulfate or other sol. Ti compd. is added to facilitate the pptn. of the coagulant.

Purifying water. F. R. WEBB and W. H. WEBB. Brit., 22,048, Nov. 5, 1914. Water is purified, decolorized, deodorized, and clarified by addition of bleaching powder or other hypochlorite followed by an acid salt such as $\text{Al}_2(\text{SO}_4)_3$ or $\text{Fe}_2(\text{SO}_4)_3$, or an acid such as H_2SO_4 , which reacts upon $\text{Ca}(\text{HCO}_3)_2$ in the H_2O to liberate CO_2 , which increases the decompn. of the bleaching powder. CO_2 or $\text{Ca}(\text{HCO}_3)_2$ may be added. The H_2O , after settling, may be passed through a series of perforated trays to remove residual CO_2 .

Purifying water for use in brewing. E. JALOWETZ, E. RICHTER and A. SCHURCKNER. U. S., 1,172,998, Feb. 22. CaCO_3 and MgCO_3 are removed from the H_2O immediately after pptn. which is effected by heating, with vigorous agitation, in an open vessel exposed to the air.

Purifying water for use in brewing. E. JALOWETZ, E. RICHTER and A. SCHURCKNER. U. S., 1,172,528, Feb. 22. MgCO_3 and other insol. carbonates are pptd. from H_2O by heating, with simultaneous vigorous agitation, to a temp. above the b. p., in a closed vessel.

Apparatus for purifying water by chemical treatment. E. CLAUSSEN. U. S., 1,173,709, Feb. 29.

Filter containing carbon for purifying water. MALACAPIT-GES. M. B. H. Ger., 286,428, May 14, 1912. The carrier for the C is satd. with broken down albuminous matter in aq. soln., ignited, cooled, washed, and then mixed with a ppt. of hydroxides of Fe, Al, Mn, Ni, or Co, and charged with CaCO_3 , by means of reagents which give these ppts. E. g., granulated porous fire brick are satd. with a 5% aq. soln. of peptone obtained by the action of alkali on albumin, dried, ignited, cooled and washed, and then satd. with solns. of salts of Fe, Al, Mn, Ni, or Co. Pptn. is effected then with lime water to which gypsum has been added, obtaining hydroxides, and then CaCO_3 is pptd. by means of a sol. carbonate acting on the gypsum.

Apparatus for removing iron from water. J. ZÖLLNER. Ger., 286,295, July 30, 1913. The removal of Fe is effected by means of atm. O, and the H_2O is then filtered. Suitable construction is specified.

Boiler feed-water purifier. H. HELLER. Ger., 285,992, July 12, 1914. The H_2O , flowing over plates arranged one above the other, is heated by means of boiler steam.

Purifying sewage. W. M. BECKETT. Brit., 21,985, Nov. 4, 1914. In purifying sewage by aeration, air is passed into closed sewage tanks under such pressure that, after passage through the sewage, it retains a pressure greater than atm., and the air together with gases evolved from the sewage is used as a blast for a steam generator furnace, refuse destructor, or gas producer. The sewage, after passing through a detritus tank, is passed into closed tanks having air-supply pipes leading to a pervious bottom formed of porous tiles, perforated plates, or pipes, etc.

Purifying sewage. W. JONES and JONES & ATTWOOD. Brit., 21,976, Nov. 4, 1914. Purifying sewage by aerating it in the presence of bacterial sludge which may be obtained by passing air in small bubbles through raw sewage and aerating the sludge obtained in presence of further quantities of sewage, or by aerating sewage in presence of humus obtained from filter beds. The sewage is aerated in presence of a third to a half of its vol. of sludge for 1-5 hrs. After settling, the clear liquid is withdrawn from the surface, and any excess of sludge is removed. The aeration is carried out by forcing air through porous bodies, such as porous earthenware, textile fabrics, coconut fiber, or Pb wool. A suitable app. is shown.

Mixtures of formaldehyde and steam for disinfection. G. A. RANFT. Ger., 285,262, Sept. 24, 1912. A practically full yield of HCHO in aq. soln. or admixt. with steam may be obtained from polymeric HCHO (paraform, trioxymethylene), under

ordinary pressure, by heating mixts. of H_2O and polymeric $HCHO$, with the addition of glycerol, in open vessels. *E. g.*, paraform 5 g., H_2O 25 cc., and glycerol 4 cc., are heated in an open vessel, or steam is conducted through a mixt. of paraform 5 g. and glycerol 4 cc.

Vacuum disinfection. APPARATEBAUANSTALT UND METALLWERKE AKT.-GES. Ger., 286,130, July 22, 1913. Addition to 284,972. A plurality of suitable small vessels, serving as containers for various solid or pulverulent disinfectants, are connected with the vacuum vessel in such manner that, upon heating a particular vessel, a desired disinfecting vapor is generated.

15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

Agricultural chemistry and vegetable physiology. N. H. J. MILLER. *Ann. Repts. Progress Chem. (London)* 11, 213-37(1914).—Investigations during 1914 relating mainly to soils and plant nutrition are reviewed. E. J. C.

The sphere of adsorption phenomena in the soil. A. N. SOKOLOVSKIY. *Zhur. Opytn. Agron.* 15, 67-117(1914); *Expt. Sta. Record* 33, 22-3(1915).—Studies are reported of adsorption phenomena in the different layers of chernozem and podzol soils, with particular reference to their nature and the factors conditioning them. The adsorptive power for bases was found, with 1 or 2 exceptions, to bear a close relation to hygroscopicity, and the activity of both factors decreased at higher temps. It is pointed out that water content, excluding the influence of salts, is a function of the so-called specific surface of the soil and increases with it. Adsorption appeared to bear no relation to the amt. of zeolitic constituents or the amt. of silt present. The amt. of NH_3 adsorbed from NH_4Cl varied with the soil layers according to the quantity of displaced bases. Adsorption with exchange of bases occurred to a rather low limit, beyond which the exchange of bases ceased. The adsorption of NH_3 varied with the amt. of dry residue obtained by displacing the soil soln. with 96% alc. The soil components which determine adsorption are characterized by a great specific surface and a susceptibility to thermal and chem. influences, and the adsorption phenomena beyond a certain limit are not accompanied by exchange reactions. The max. specific surface and the max. susceptibility to thermal influence are found in the upper soil section in which the colloid formation processes are most intensive, thus showing a specific relation between adsorption and the soil colloids. On the assumption that the thickness of the water film on the soil particles remains constant, the following conclusions are drawn: The adsorptive power of the adsorbing medium decreases with a decrease in its effective surface. The adsorption of Ca in the different layers of chernozem soil depends on the content of Ca which is already adsorbed and is displaced by NH_4Cl soln. and not on its total Ca content. The podzol soil, on account of its extremely leached-out condition and poverty in adsorbed matter, shows a series of concordant results for P_2O_5 , as well as for bases. Chernozem, on the other hand, on account of its complex formation, produces a regular series of results only for NH_3 . Removal of humus by oxidation with acid-free H_2O_2 showed that for chernozem, humus, even in the layers rich in it, did not appear to be an exclusive factor of adsorption. In podzol soils the decrease in NH_3 adsorption due to this treatment amounted to 65% of the original quantity.

W. H. FRY.

The effect of removing the soluble humus from a soil on its productiveness. WILLIAM WEIR. Rothamsted Expt. Sta. *J. Agr. Sci.* 7, 246-53(1915).—Sol. humus was removed from soil by washing with dil. HCl and was then repeatedly extd. with

dil. NaOH. Some 40% of the N was thereby removed. Vegetation expts. on both untreated and extd. soils showed that the removal of the sol. humus had no effect in diminishing the productiveness of the soil in spite of the fact that the soil used was known to respond to nitrogenous fertilizers. Lab. expts. indicated that the removal of the sol. humus increased the amt. of NH_3 but diminished that of nitrates produced in the soil, and that the sum of NH_3 and nitrates was usually less than in the untreated soil. The number of bacteria, however, was considerably increased. No marked difference was produced in case 0.5% untreated soil was added to replace the bacterial flora that might have been destroyed by the acid and alkali treatment.

W. H. FRY.

Correlation between humus and mineral matter in dark colored soils. A. A. BLAGONRAVOV. *Zhur. Opytn. Agron.* 14, 457-8(1913); through *Expt. Sta. Record* 33, 720(1915).—Assuming that degraded dark-colored soils have been at one time less degraded and comparing their chem. compn. by calcg. the % compn. of the zeolitic portion, it is found that the changes in the mineral part of these soils correspond with the changes of the humus content. On this basis, and assuming that the CaO is carried from the higher horizons downward in the form of Ca crenate, a series of "simple correlations" is calcd. between the CaO and crenic acid, for which Mulder's formula, $\text{C}_{24}\text{H}_{20}\text{O}_{14}$, is taken. With the aid of these correlations it is considered possible, from the difference in the humus of any 2 soils and the amt. of CaO in one, to calc. the content of the zeolitic lime in the other. The values so calcd. differ from those found by actual analysis only in hundredths of 1%. Other constituents of the zeolitic portion are also found by means of calcns. from a whole series of ratios. On the basis of correlations between different elements so obtained the difference in the compn. of 2 soils is expressed in the form of formulas by the aid of which, having previously detd. the CaO, the contents of all the other constituents are calcd. Then accepting for humic acid Detmer's formula $\text{C}_{60}\text{H}_{44}\text{O}_{17}$, the ratios to humic acid of the various bases sol. in 10% HCl are found and from these ratios, guided again by the relation between humus and CaO (1:4), a formula is deduced for the compn. of the mineral constituents of a given soil. Soils of different regions are reduced to a small number of groups, the criterion being the ratio of the amt. of C in the humus to the sum of mineral substances (from 10% HCl soln.).

W. H. FRY.

Quantitative media for the estimation of bacteria in soils. R. C. COOK. *Soil Science* 1, 153-61(1916).—Na asparaginate agar, albumin agar, and urea- NH_4NO_3 agar will give a greater colony development than other media in common use for bacteriological work. The albumin agar in which the albumin is dissolved in NaOH will give more consistent results than if the albumin is used in an aq. soln. A 5-day incubation period gave higher bacterial counts than a 3-day period. Sterilization either by flowing steam or at a pressure of 1 atm. will give equally good results.

J. J. SKINNER.

Studies in soil protozoa. S. A. WAKSMAN. *Soil Science* 1, 135-52(1916).—Moisture, humus content and the structure of the soil are the important factors governing the activities of the protozoa; sterilization of soil and addition of sol. org. matter will make the conditions optimum for protozoan activities at lower moisture content than the corresponding unsterilized or untreated soils. The flagellates are the most common soil protozoa found active in the soil with moisture content too low for the development of the other groups. The flagellates are the largest group and the greatest number are found just below the surface. The ciliates are found at a depth of 4 in., the number decreasing with depth; below 12 in. the soil is practically free from protozoa. Protozoa do not have any appreciable influence upon ammonification by bacteria. The presence of protozoa acts detrimentally upon bacterial numbers. The detrimental effect of the protozoa upon bacterial number, their non-detrimental and even beneficial

effects upon the soil, and their influence upon ammonification might be explained by (1) destruction of bacteria and non-ammonifying organisms; (2) the protozoa themselves taking part in the process of ammonification; or (3) the disintegration of bacterial cells resulting in decompn. products which might be responsible for high NH_3 production.

J. J. SKINNER.

The Actinomyces of the soil. S. A. WAKSMAN AND R. E. CURTIS. *Soil Science* 1, 99-134(1916).—The work was conducted with the purpose of demonstrating the occurrence of *Actinomyces* in different soil types, at different depths and under different cultural and climatic conditions. Soils from N. J., Oregon and California were studied. The number of *Actinomyces* and bacteria are greatest in the surface soil, but while the bacteria decrease rapidly below a depth of 4 in. the number of *Actinomyces* is practically constant at depths from 8 to 30 in. in humid soils. There is a striking difference between humid and semi-arid soil. In the surface 8 in. of the N. J. soils studied, *Actinomyces* make up an av. of 14.2% of the micro-flora exclusive of the higher fungi, while in the Cal. soil this av. is 26.8%, which indicates that semi-arid surface soils are relatively much richer in *Actinomyces* than are those of humid regions. Over 100 organisms have been isolated from the soil. These represent 30 species, which are described. The morphology and physiology of the organism were studied. A review of the literature is given.

J. J. SKINNER.

Observations on the formation and layer distribution of nitrates in soils with different nitrogen fertilizers. V. I. TKACHENKO. *Khosialstvo* Nos. 37-40(1912); *Zhur. Opytn. Agron.* 14, 585(1913); through *Expt. Sta. Record* 33, 422-3(1915).—In a study of the amt. and distribution of nitrates at different depths in the soil from June 27 to Sept. 9, 1911, and from April 8 to May 10, 1912, it was found that the minimum amt. of nitrate was present in the latter part of Aug. and the earlier part of Sept., but no direct connection between nitrate and temp. and moisture was observed. Fertilizing with NaNO_3 in general increased the nitrate content of the soil, but not in all cases. Cyanamide and $(\text{NH}_4)_2\text{SO}_4$ increased the accumulation of nitrates in the soil to a greater extent than NaNO_3 . There was little leaching of nitrates during rainy periods and this was not noticeable in any case below 25 to 50 cm. The observations in the spring of 1912 were made on the same plats used in the earlier expts. which had in the meantime been seeded to winter wheat. In general, considerably less nitrate was found than during the preceding summer. The loss of nitrates by leaching was less pronounced on plats fertilized with nitrogenous materials and which, therefore, had a heavier growth of wheat.

W. H. FRY.

The question of the formation of secondary minerals in the ortstein-producing horizons of soils. B. B. POLYNOV. *Esheg. Geol. Min. Rossii* 14, 273-80(1912); *Zhur. Opytn. Agron.* 15, 228(1914); through *Expt. Sta. Record* 33, 814(1915).—A brief morphological description and mechanical and chem. analyses of each layer of 2 podzol soils are reported. A marked increase in absorptive power and in amt. of sesquioxides, chemically combined water, alk. earths, K, and mechanical clay (less than 0.01 mm.) was observed in the ortstein-producing subhorizons as compared with the upper horizons. The increase in absorptive power for NH_3 is attributed to the presence in the ortstein-producing layers of "secondary soil minerals," such as the colloidal hydrates of SiO_2 and Fe_2O_3 , which have a high absorptive power for NH_3 , and also to accumulations in these layers of zeolite-like secondary hydrous Al silicates of Mg, K, and Ca.

W. H. FRY.

The action of gaseous ammonia on superphosphate and the use of the ammonium and phosphate salts thus obtained. GERLACH. *Z. angew. Chem.* 29, I, 13-4, 18-20 (1916).—When gaseous NH_3 is allowed to act upon superphosphate, an exothermic reaction occurs, and the NH_3 is rapidly absorbed. The products of this reaction, due

to the presence of gypsum in the superphosphate, are Ca phosphate and $(\text{NH}_4)_2\text{SO}_4$. If the superphosphate is placed in a slowly rotated drum, and the NH_3 passed through this, most of the NH_3 will combine in a very short time. The mass left in the drum after the reaction has ceased is dry and can be ground fine with ease. An analysis of the product thus prep'd. shows its compn. to be as follows: Water (hygroscopic) 3.42. $(\text{NH}_4)_2\text{SO}_4$ 33.71, di-Ca phosphate (2 mols. water) 2.74, tri-Ca phosphate 30.10, gypsum 22.55. Fe and Al phosphates 2.96, insol. 4.26, total 99.74%. No NH_3 is lost even after months of storage. Treatment with NH_3 converts most of the sol. phosphoric acid contained in the superphosphate into a form insol. or difficultly sol. in water. In cold water satd. with CO_2 , however, the phosphates thus formed are sol. Expts. made by using the NH_3 and phosphate salts thus obtained as fertilizer for oats showed the superiority of this material over superphosphate containing NH_3 salts admixed.

E. A. TSCHUDY.

Some chemical and agricultural effects of fertilizer mixtures containing calcium cyanamide. C. J. KING. *Com. Fert.* 10, 14-6(1915); *Expt. Sta. Record* 33, 25.—Continuing previous work by Brackett (*C. A.* 7, 4036) the author studied changes in the sol. P_2O_5 and N content in mixts. of acid phosphate, Ca cyanamide and KCl, and also the effect of such mixts. on the growth of cotton. The results confirm those of previous expts. in showing that there was considerable reversion of P_2O_5 in the mixts. after standing a few months. After 6 months of storage the amt. of insol. P_2O_5 had increased from 0.4 to 2.01%. There was no appreciable loss of N in that time. The field tests of the mixts. on cotton indicated a depreciation in their fertilizing effect within one month after the mixts. were made.

E. J. C.

The phosphatic deposits of Perlis (Malay States). W. *Indische Mercur* 38, 133-5(1915); *Bull. Agr. Intelligence* 6, 1038-40(1915).—The deposits occur in large open caves on the hillsides, and consist of dry sandy material of a light gray color with occasional black or yellow veins. The origin is probably purely mineral. The P_2O_5 is mainly in the form of CaHPO_4 or $\text{Ca}_3(\text{PO}_4)_2$. Some analyses have shown N, usually not exceeding 1%, probably due to the excrement of birds. The N does not notably increase the market value of the phosphate. A large portion of the P_2O_5 is sol. in weak acids, resembling that of basic slag; it acts more rapidly than that of bone meal. Analyses and expts. are given, the av. P_2O_5 content being about 18%. F. W. S.

Connection between the composition of Javanese tobacco and that of the soil on which it grows. N. H. COHEN. *Proefstation voor Vorstenlandsche Taback. Mededeeling*, No. 11, 18 pp.(1914); *Bull. Agr. Intelligence* 6, 1064-5.—Chem. and mechan. analyses have been made of samples of 20 Javanese tobacco soils. The samples were taken to a depth of 9 in. for the surface soil, and from 9 to 15 in. for the subsoil; the following detns. were made: potash sol. in 25% HCl, P_2O_5 , lime (surface soil only). P_2O_5 sol. in 2% citric acid, lime sol. in 10% NH_4Cl . Detns. for the tobacco included: ash, K_2O , P_2O_5 , CaO, MgO and Cl; in addition, the exact color of the ash was detd. by a scale of 10 shades of gray obtained by mixing 5, 10, etc., up to 50% of animal charcoal with CaCO_3 . It was found that: (1) The citric acid-sol. P_2O_5 decreases as the soil becomes heavier and more disintegrated. (2) The content of so-called "available" lime in the various soils is proportional to the amt. of the "very fine" fraction of the soil. (3) The proportion between the lime sol. in 25% HCl and the amt. of "available" lime is in inverse ratio to the amt. of "very fine" soil and approaches unity. (4) There is no connection between the amts. of K_2O present in the tobacco and the soil, resp. (5) There seems to be some relation between the amt. of P_2O_5 in the tobacco and in the soil; heavy soils poor in citric acid-sol. P_2O_5 produce a tobacco with a lower phosphate content than tobaccos grown on light soils. (6) There is a certain connection between "available" lime in the soil and the lime content of the tobacco. (7) In the case of the

tobacco, no connection could be established between Cl and potash contents and combustibility. (8) On the other hand, some connection exists between the lime content and the color of the ash; the higher the lime content, the lighter the color of the ash. (9) There is no certain connection between the amt. of MgO present in tobacco and the color of the ash. E. J. C.

Fertilizing with catalytic substances of vine ash. S. CETTOLINI. *Bol. quind. soc. agr. ital.* 20, 431-8(1915); *Expt. Sta. Record* 33, 841.—Data are given and discussed showing the effect on the quantity and compn. of the must and wine of grapes fertilized with CaSO_4 , $\text{Al}_2(\text{SO}_4)_3$, MgSO_4 , KMnO_4 , Fe_2SO_4 , NaCl and S, resp. E. J. C.

The action of sulfur on crops. T. PFEIFFER AND W. SIMMERMACHER. *Landw. Ztg.* 64, 243-55(1915); *Bull. Agr. Intelligence* 6, 1044.—These results indicate that S has no favorable after-effect on yield and may have a slight unfavorable effect on N-utilization. E. J. C.

The action of common salt and kainite applied with ammonium sulfate and sodium nitrate. SCHNEIDEWIND. *Landw. Wochschr. Provinz Sachsen* [1] 17, 3-5(1915); *Bull. Agr. Intelligence* 6, 810.—Considering that the particularly favorable action of NaNO_3 on beets is due partly to the Na, an attempt was made to increase the efficiency of $(\text{NH}_4)_2\text{SO}_4$ by the addition of NaCl. The expts. showed that a mixt. of the 2 salts gave better results than the $(\text{NH}_4)_2\text{SO}_4$ alone. E. J. C.

The influence of zinc vessels in culture experiments. K. GHEDROIZ. *Selsk. Khoz. Liesof.* 345, 625-7(1914); *Bull. Agr. Intelligence* 6, 57-8(1915); *Expt. Sta. Record* 33, 623-4(1915).—Pot expts. during 3 years showed that ZnSO_4 and ZnCl_2 had almost the same effect on the growth of mustard. The effect on barley differed from that observed in the case of mustard, as with 0.02% Zn the growth of mustard ceased, while barley gave a relatively good yield. Zn in very small quantities, however, stimulated the growth of mustard, but had a depressing effect on barley. Long-continued expts. with Zn pots showed that red clover grown in acid soils lost its germinating power and made feeble growth in the 3rd year. The injurious effect of the Zn pots was apparent in the case of clover in the 2nd year. It was most pronounced in the case of acid soils. W. H. FRY.

Factors influencing the protein content of soy beans. J. G. LIPMAN AND A. W. BLAIR. *Soil Science* 1, 171-8(1916).—Thicker planting of soy beans caused an increased utilization of atm. N by means of symbiotic bacteria. Nodule formation is not depressed by N fertilizers. The amt. of N in a number of different varieties of soy bean grown in pots was detd. J. J. SKINNER.

Soy beans. N. GILL. *Ann. Rept. Kumaun Govt. Gardens* 1913-14, 2-4; *Expt. Sta. Record* 32, 830.—This article gives the results of tests with several varieties of soy beans on soils, the chem. and phys. analyses of which are given. The data show yields, oil percentage, moisture, ash content and wt. of 100 seeds. E. J. C.

The insecticidal properties of various sulfides and polysulfides. P. J. PARROTT AND W. J. SCHOENE. *J. Econ. Entomology* 8, 204-5.—The amt. of S in proprietary insecticides contg. sulfides and polysulfides of the different bases varies greatly, ranging for the Na prepn. from 1.79 to 58.92%, K 2.39 to 38.72%, Ca 3.97 to 26.4%, and Ba 16.54 to 44%. The work so far points in general to the conclusion that the strength of a prepn. with regard to its S content is a more important consideration than the nature of the base of the sulfides and polysulfides. E. J. C.

Note on lime and sulfur. D. R. EDWARDS-KER. *J. Southeast. Agr. Col. Wye* 1913, 368-70; *Expt. Sta. Record* 34, 51.—From expts. with lime and S mixed intimately for use as a fungicide, it is concluded that there is no chem. action on mixing either quicklime or slaked lime with flowers of S. Consequently, considered from a chem.

point of view, there is no obvious advantage in adding lime to this form of S when designed for use as a fungicide. E. J. C.

The theory of wetting, and the determination of the wetting power of dipping and spraying fluids containing a soap basis. W. F. COOPER AND W. H. NUTTALL. Watford. *J. Agr. Sci.* 7, 219-39(1915).—In the detn. of the wetting power of a dip or spray fluid, a thick paraffin oil (liquid vaseline), free from acid, was taken as a standard to represent the greasy surface, *e. g.*, a greasy hide or a waxy leaf. The surface tension of this was detd. once for all. To compare the wetting power of any 2 preps., it was then only necessary to det. their surface tensions and their respective interfacial tensions towards the standard oil, and to substitute these values in the equation $T_2 - (T_1 + T_{12}) = \text{wetting power}$, where T_2 is the surface tension of the oil, T_1 that of the prep., and T_{12} the interfacial tension. Various examples of the application of this method are given. A short bibliography is appended. W. H. FRV.

Wetting sprays. V. VERMOREL. *Prog. agr. vit.* 35, 180-2(1914); *Expt. Sta. Record* 33, 450.—Gelatin added to sprays gives them excellent spreading and wetting qualities and perfect adherence. Casein is one of the best agents for use to increase the wetting capacity of a spray, and to leave almost entirely intact the chem. compn. of the Cu ppt., which it is adapted to distribute and fix upon the leaves. E. J. C.

Japanese cane (SCOTT) 28. Determination of iron and alumina in mineral phosphates (KOCHETKOV) 7. Fixation of atmospheric nitrogen (cyanamide) (LANDIS) 4.

KNOX, G. D.: *The Spirit of the Soil: or An Account of Nitrogen Fixation in the Soil by Bacteria and of the Production of Auximones in Bacterized Peat.* London: Constable & Co. 242 pp. 2s, 6d.

MCCALL, A. G.: *Field and Laboratory Studies of Soils.* New York: Wiley. 77 pp. \$0.60.

Fertilizer. A. J. GRINBERG and B. FELDMAN. U. S., 1,172,021, Feb. 15. A mixt. of bran 6 oz., sawdust 6 oz., CaO 1 oz., corn starch 4 drams, dil. NH_4OH 4 drams, H_2O 1 qt. with sufficient Fe scrap to produce heating by oxidation, is added to the soil around plants, in amt. equal to about 2% of the wt. of the soil near the roots, and further quantities of H_2O , corn starch and NH_4OH are added from time to time. Phosphates and nitrates are rendered available by fermentation.

Fertilizer. S. B. NEWBERRY and H. N. BARRETT. U. S., 1,173,303, Feb. 29. A citrate-sol. fertilizer is made by mixing natural phosphate with 5-25% of NaHSO_4 or KHSO_4 and heating the mixt. at about 1400-1500° for 20-70 min. to decompose the bisulfate and drive off SO_2 .

Fertilizer. F. S. WASHBURN. Can., 165,845, Nov. 2, 1915. A fertilizer containing N and P combined as a double salt in a form available as a plant food, and K intimately associated therewith also in an available form.

Fertilizer. F. S. WASHBURN. Can., 165,846, Nov. 2, 1915. Fertilizers containing N, P and K in forms available as plant food are produced by providing a double compound of NH_3 and P containing N and P in available forms, and adding thereto a residue containing K_2O , SiO_2 and Al_2O_3 obtained as an intimate mixt. after roasting the mineral alunite.

Fertilizer from phosphate rock. H. P. BASSETT. U. S., 1,172,420, Feb. 22. A mixt. of feldspar 50, NaHSO_4 100 and C 1-3 parts is heated to redness and the fumes given off are used to react upon phosphate rock, which is maintained at a temp. of 100-200°, to form available acid phosphate.

Treating grain and seeds. C. E. DE WOLF and H. E. FRY. *Brit.*, 21,888, Nov. 2, 1914. Treating grain and seeds before sowing by steeping them in a soln. of organic or chem. fertilizer (including Zn salts, H_2SO_4 , HCl, and H_3PO_4) with a salt of Fe, e. g., $FeCl_3$, or a soln. of NaCl, $Ca(NO_3)_2$, nitrolime, or HNO_3 or HNO_2 , with or without a salt of Fe, and then spraying with petroleum or benzoline. Cf. C. A. 9, 2790.

16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Determination of essences in vermouth. X. ROCQUES. *Ann. chim. anal.* 21, 35-8(1916).—Vermouth of the French type is prepd. from white wine to which a small quantity of a sweet wine is added; the alc. strength of 18% is obtained by the addition of pure alc. Flavoring is effected by maceration of the herbs in the wine. R. sought to decide the question whether or not vermouth is to be classified among the beverages flavored by essences (for only in this case is it subject to special taxation). In a sample of wine intended for the manuf. of vermouth, the volatile I-absorbing constituents were detd. before and after flavoring. The flavoring effected only a minute increase in the I-absorption of the distillate. A gravimetric detn. of the essential oil in vermouth (cordial) gave a similar result. Both results lead to the conclusion that the proportion of essences contained in vermouth (cordial) is negligible. The expts. further revealed that by the titration of the essences (by I-soln.) only part of the SO_2 content is found.

L. W. HAAS.

Detection and determination of citric acid in wine. F. SCHAFER and E. GURY. *Mitt. lebensm. Hyg.* 6, 247-51(1915).—S. and G. have modified various methods for citric acid detn. which are based on Denigès' test. Make 25 cc. of wine alk. with NH_4OH , evap. on water bath to 10 cc., add 10 cc. of 7% $CuSO_4$ and evap. to 10-15 cc. After cooling transfer to a 25 cc. flask and complete the vol. with H_2O . Filter on dry paper, add 1-1.5 cc. of Denigès' reagent to 10 cc. of the filtrate, and heat to boiling. After boiling and filtering into an Erlenmeyer flask, heat again to boiling and add drop by drop 1% $KMnO_4$ until the Mn oxides begin to sep. Remove these with a few drops of H_2O_2 . Centrifuge the soln. and ppt. in a graduated centrifuge cylinder for 5 min. at 1000-1200 r. p. m. The number of cc. of ppt. $\times 0.021$ equals the citric acid in g. per l. of wine. The ppt. may be identified by the test of Baier and Neumann (C. A. 9, 2685). Small quantities of ppt. treated directly with Fe_2Cl_3 will give a red coloration. S. and G. confirm the statement of Kunz (C. A. 9, 687) that some wines naturally contain as much as 0.08% of citric acid.

H. A. LEPPER.

Wines of the harvest of 1914. G. FILANDEAU. *Ann. fals.* 8, 363-72(1915).—A discussion of the characteristics of the 1914 wines from various districts of France. Much less data are given in this report than in former years, so that generalizations are impractical.

H. S. BAILEY.

Analyses of some Roumanian wines of the 1914 vintage. AL. NITESCO. *Ann. fals.* 8, 416(1915).—A table giving analyses of 15 Roumanian wines.

H. S. B.

Study on the variation of the principal acids of the juice of the grape during the process of maturation. E. GARINO-CANINA. *Ann. r. accad. agr. Torino* 57, 233-90(1914); *Expt. Sta. Record* 34, 43.—The expts. here reported in detail included a phys. and chem. study of the changes taking place in the juice of different varieties of grapes during maturation and during the formation of wine.

E. J. C.

Distillation of cider apples. E. SAILLARD. *Mon. sci.* [5] 6, 25-9(1916).—The article is an official report on the standing of the production of alc. from cider apples. S. finds it possible to work up apples in sugar-beet distilleries, but some more experience

is desirable. A short description of the working processes for cider apples alone and as adjunct to sugar beets is included. L. W. HAAS.

17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

The manufacture of pharmaceutical preparations, and means for assuring its development in France. Report of a conference held by the society for the fostering of national industries. E. FOURNEAU. *Ann. fals.* 8, 403-11 (1915). H. S. B.

The papaw and papain. H. F. MACMILLAN. *Tropical Agriculturist* 44, 179-84 (1915); *Bull. Agr. Intelligence* 6, 1066.—Some notes are given on the cultivation of the papaw tree and the prepn. and commerce of papain. Cf. *C. A.* 9, 1529.

E. J. C.

Injection gelatin. HANS TRUNKEL. *Pharm. Ztg.* 61, 65-6 (1916).—The following procedure is recommended for the production of gelatin suited to injection: Dissolve in the steam bath 200 g. best gelatin in 800 cc. H₂O, using for the purpose a 2 liter Jena flask covered with a glass plate. After soln., neutralize with 30 cc. N NaOH. Cool to 45°, stir into the soln. the beaten whites of 4 eggs and heat the covered beaker 90 min. in a sterilizer; then pass through a double folded filter (using a hot water funnel) into a Jena 2 liter flask having a mark for 1000 cc. Return the first 100 cc. to the main portion, continue the filtering operation to completion, finally washing with H₂O sufficient to yield 1000 cc. filtrate. Treat the soln. 3 hrs. with CO₂ at 37° without transferring the liquid to another container. The delivery-tube passing through a 2-holed stopper reaches to the bottom of flask while the exit hole carries a drying tube filled with cotton. Add 5 g. acid carbollic liq., mix thoroughly, fill into suitable container and sterilize immediately at 60° and again at 60° after 24 hrs. W. O. E.

The uses of amyl acetate. T. H. DURRAN. *J. Chem. Technology; through Chemist Druggist* 88, 181-2 (1916).—An article dealing with the industrial applications of amyl acetate. C. O. EWING.

Oil of *Librocedrus decurrens*. ANON. *Perfumery Essent. Oil Record* 6, 214 (1915).—The oil from the needles of *Librocedrus decurrens*, a California conifer, has a sp. gr. of 0.8756, $[\alpha]$ —0° 51', and $n = 1.47544$. It dissolves in 7 vols. of 90% alc. with turbidity. About 22% of the oil passes over at 158-60°. This fraction has a sp. gr. of 0.864 and $[\alpha] = -18^\circ 40'$. It contains a considerable amt. of *l*- α -pinene. In the fraction b₁₆ 60-8°, β -pinene was identified. The higher boiling fractions had a marked odor resembling that of carvone, but no semicarbazone could be obtained. C. O. EWING.

Hernandia oil. ANON. *Perf. Essent. Oil Record* 6, 264 (1915).—The stem wood of *Hernandia peltata* yielded from 1.03 to 2.06% of a volatile oil having the following characteristics: d₁₅ 0.958 to 0.963, optical rotation +83° 45' to +104° 12', n_D 1.49695 to 1.50111. It contains from 75 to 80% of aldehydes (chiefly dihydrocummic aldehyde) with traces of free acids and a small amt. of esters. The root wood yielded 0.5% of an oil having d. 0.9667, optical rotation +126° 15', n_D 1.50383, and an aldehyde content of 92.5%. The whole fruit gave 0.5% of oil of d. 0.9528, optical rotation +50° 10', n_D 1.49554, and an aldehyde content of 49%. The almond-like seeds gave 1.38% of oil of d. 1.0044, optical rotation +87°, n_D 1.50614, acid value 7.3, and ester value 110.4. The fruit oil did not appear to contain any dihydrocummic aldehyde. C. O. EWING.

Mustard oil and the composition of black mustard seeds. C. A. HUBER AND P. VAN DER WIELEN. *Pharm. Weekblad* No. 39 (1915); through *Perf. Essent. Oil*

Record 6, 341-2(1915).—The amts. of fixed and volatile oil in black mustard seeds from various sources were detd. Dutch, North-Holland, English, Russian, Caucasian, Italian, Sicilian, Rumanian and Bombay mustards contained, resp., 1125, 976, 630, 362, 1690, 910, 964, 490 and 290 seeds per g. wt. In general the smaller seeds, i. e., those having the greatest surface in proportion to their wt., yielded less fixed oil and more volatile oil. The yields of volatile oil were, resp., 1.23, 1.15, 1.07, 0.63, 1.07, 0.87, 0.94, 0.66 and 1.07%. The yields of fixed oil were, resp., 25.7, 28, 31.4, 37.01, 29.8, 32.5, 32.9, 35.7 and 33%. The sp. gr. of the fixed oils varied from 0.919 to 0.923, n_D^{22} 1.4712 to 1.4731, I no. 113.5 to 126 and sapon. no. 182 to 190. Refining produces an oil that is in no way inferior to olive oil for culinary use. C. O. EWING.

Substitute for tamarind pulp. SCHNABEL. *Pharm. Zentralhalle* 56, 416(1915).—As substitute for Pulpa Tamarindorum of the Ger. Pharm. S. recommends the pulp of prunes to which 10% tartaric acid has been added. C. O. EWING.

Cassia pulp as a substitute for tamarind pulp. E. GOLDMANN. *Pharm. Zentralhalle* 56, 496(1915).—G. recommends the pulp of the fruit of *Cassia fistula* as a substitute for tamarind pulp. C. O. EWING.

Extractum Pini silvestris. P. BOHRISCH. Dresden. *Pharm. Zentralhalle* 56, 257-9, 293-9, 313-20(1915).—B. gives comparative tabulated analyses of 4 com. samples, and of 6 samples prepd. by himself from the tips and young twigs of pines (*Pinus silvestris*) and spruces (*Pinus abies*) collected in May. The method of prepn. given in the supplement of the Ger. Pharm. is faulty because the aromatic volatile oil is lost during the evapn. of the aq. ext. This can be remedied by sepg. the oil from the condensed vapors and adding it to the ext. The yield by this procedure is twice as great. The following characteristics are useful in distinguishing between pine and spruce needle exts.: The volatile oil of the pine is levorotatory, that of the spruce dextrorotatory; the Et₂O ext. of pine is dark green, that of spruce light green. The com. exts. gave analyses similar to those of the authentic specimens. The *Extractum Pini silvestris* of the market is prepd. largely from *Pinus abies*. The latter has a stronger and more pleasant aroma. C. O. EWING.

Karl Arnold August Michaelis. R. KOBERT. *Chem. Ztg.* 40, 157(1916).—Died Jan. 31, 1916. An obituary. J. H. MOORE.

Citrate of magnesia in aqueous solution. FRANCINE SWART AND C. BLOMBERG. Amsterdam. *J. pharm. chim.* 12, 387-91(1915); cf. *Pharm. Weekblad* 1908, 1071, 1534; *C. A.* 9, 1973, 2058; and following abstract.—Aq. solns. of this salt, after several days, form an amorphous, white ppt., then a cryst. ppt. of $Mg_3C_2 \cdot 13H_2O$ (Ci = $(C_4H_5O_7)''$), sol. in H_2O (1.8 in 100 at 25°). To avoid pptn., Wijer (1908) doubled the acidity, giving the following formula: Citric acid 25, $MgCO_3$ 10, H_2O 75, simple sirup 25 g. Erkelens uses an excess of citric acid, then a corresponding amt. of $NaHCO_3$. J. Dekker believes that bacterial action is the cause of pptn. and sterilizes the soln. with steam. Bouvet (*Bull. assoc. pharm. de Saône-et-Loire* 1887) also sterilizes at 100°, not to destroy bacteria, but the "germs of crystals of Mg_3C_2 " in the bottle from the air of the pharmacy store. S. and B. confirmed this by a previous expt., having added $HCHO$ to solns. of Mg_3C_2 to destroy bacteria; crystn. nevertheless ensued. As the salt has no bitter taste, the concn. of the Mg ion must be small. It is probably ionized into complex Mg ions: $Mg_3C_2 \rightleftharpoons [Mg_2C]^{+} + [MgC]^{-}$. The slowness of crystn. is due to the moderate speed of ionic reactions with complex ions (cf. *C. A.* 9, 3155). The existence of a readily H_2O -sol. salt with 7.6 H_2O claimed by Léger (*C. A.* 9, 1973) is doubted. The formation of a basic salt Mg_3C_2OH (*Pharm. Weekblad* Sept. 25, 1915) by soln. of MgO in soln. of Mg_3C_2 is explained by means of the ionic theory. S. W.

Reply to Francine Swart and C. Blomberg's article on magnesium citrate in aqueous solution. E. LÉGER. *J. pharm. chim.* 12, 391-4(1915); cf. preceding ab-

The ppt. is digested repeatedly with 65% by vol. alc. until the alk. reaction of the digestion agent disappears, then with a little abs. alc., then with ether, and finally dried at the ordinary temp. The process must be carried out away from daylight, since rapid reduction results from the action of the active rays of the sun. A yellowish brown granular mass is obtained which contains, in 100 parts, from 25 to 30 parts of Hg in colloidal form. The product dissolves readily in H₂O to a clear liquid of a yellow color by transmitted light.

Complex mercury compounds of the safranin series. SACCHARIN-FABRIK AKT.-GES. v. FAHLBERG, LIST & Co. Ger., 286,097, Mar. 10, 1914. Phenosafranin and its homologs are treated with Hg salts. The mercurized safranines are therapeutically applicable.

Lipoid phosphorus-containing compounds from high molecular fatty acid derivatives. F. HOFFMANN-LA ROCHE & Co. Ger., 286,515, Apr. 26, 1914. Addition to 281,801 (C. A. 9, 2292). The hydroxyphosphinic acids, obtained according to the parent process, are esterified according to the usual methods.

Catalytic hydrogenation. C. F. BOEHRINGER & SÖHNE. Brit., 21,883, Nov. 2, 1914. In the hydrogenation of unsatd. substances in the presence of a suboxide of the Ni group as catalyst, the substances are treated in aq. soln. or suspension. In examples in all of which Ni suboxide is used as the catalyst and the substance dissolved in H₂O, dihydroquinine is obtained from quinine-HCl, dihydromorphine from morphine, hydrocinnamylcocaine from cinnamylcocaine, hydrocinnamic acid from cinnamic acid, and ethylenediamine from aminoacetonitrile.

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

Determination of the yield in the production of nitric acid by the oxidation of ammonia. KARL KAISER. Charlottenburg; BERLIN-ANHALTISCHE MASCHINENBAU AKT.-GES. *Chem. Ztg.* 40, 112(1916).—Disputes as to methods. Cf. C. A. 10, 806. J. H. MOORE.

The nitrate industry. ENRIQUE CUEVAS. *J. Ind. Eng. Chem.* 8, 195(1916).—According to the latest official report of the inspector general of the Chilean nitrate deposits the zone of nitrate-bearing ground comprises 200,000 sq. kilometers of which less than 3% has been surveyed and prospected. In this surveyed area alone there is enough nitrate to supply the world for 100 years measured at the present rate of production. Under present conditions the cost of producing the commercial salt is 50 c. (U. S.) per quintal (104.4 lbs.). H. L. OLIN.

The preparation and commercial uses of hydrogen. ANDRÉ DUBOSC. *Bull. soc. ind. Rouen* 43, 109-14(1915).—The various methods are discussed in the following order: (1) Action of acids on metals, (2) action of steam on metals or other substances, (3) electrolytic processes, (4) diverse methods. MILES R. MOFFATT.

Plastic masses from yeast. H. BLÜCHER. *Chem. Ztg.* 39, 934(1915).—The product sold under the trade name "Ernolith," formerly prepd. from the residues from yeast ext. manuf. (cf. Ger. pat. 275,857, C. A. 9, 361), is now made directly from yeast and HCHO, with the addition of fillers, coloring agents, etc., if desired. The product is dried, powdered and then subjected to hydraulic pressure at 90°; it may be used under certain conditions as a substitute for such materials as galalith, bakelite, resinite, celluloid, etc. The material (free from admixts.) has a dense structure, conchoidal fracture, can be prepd. as hard and brittle or as somewhat soft and elastic, has a d. of 1.33-1.35, is almost non-inflammable, and is carbonized with difficulty. F. W. SMITHER.

The grading industries. EDWARD S. WIARD. *Met. Chem. Eng.* 14, 91-6, 191-7 (1916).—The word "grading" is used in the sense of prep. material according to size or sizes. Various separators and classifiers involving air and water currents are described in detail and the mathematical theory of screens and screening discussed.

H. L. OLIN.

The transport of material in the form of dust. T. C. CLOUD. *J. Soc. Chem. Ind.* 35, 7-8(1916).—A short review and discussion of the methods of dust removal in the industries. A vacuum-producing plant installed for the removal of the As_2O_3 from furnace gases is briefly described.

F. W. SMITHER.

Talc as a lubricant. P. ROHLAND. Stuttgart. *Chem. App.* 3, 6(1916).—Ground very fine it may be used alone or mixed with H_2O or oils. When used with H_2O it must be fine enough to pass through a filter. Cf. *C. A.* 8, 3706.

J. H. MOORE.

The organization of scientific research. J. A. FLEMING. *Electrician* 76, 710-2 (1916).—F. deals with the methods of research, the means of conducting such research and outlines a course of preliminary training.

C. G. F.

Gaging of storage tanks. K. B. HOWELL. New York. *J. Ind. Eng. Chem.* 8, 286-7(1916).—A criticism of the article by Ogden (*C. A.* 10, 668) in which it is shown that the method is not particularly accurate.

F. A. HARVEY.

Action of gaseous ammonia on superphosphate (GERLACH) 15. System lead sulfate-sulfuric acid-water (DONK) 6. Fixation of atmospheric nitrogen (LANDIS) 4. Kimmeridge oil-shales (MANFIELD) 22.

BURR, W. H.: **Elasticity and Resistance of the Materials of Engineering.** 7th ed. New York: Wiley. 928 pp. \$5.50.

Purifying solution containing colloidal silicic acid. H. W. BARON DE STUCKLÉ. *Ger.*, 286,302, Dec. 8, 1912. Cf. *Fr.*, 265,817.

Sulfuric acid. W. S. LANDIS. *U. S.*, 1,173,524, Feb. 29; *Can.*, 165,773, Nov. 2, 1915. An excess of gases containing over 6% of nitrous gases is produced by catalysis of a mixt. of NH_3 and air and combined with SO_2 to form H_2SO_4 .

Titanic oxide concentrate. A. J. ROSSI and L. E. BARTON. *U. S.*, 1,171,542, Feb. 15. Titaniferous iron or ilmenite ores are mixed with sufficient crude Na_2SO_4 and C to insure formation of FeS from most of the Fe in the ore, of Na titanate from the Ti and Na silicate and aluminate from the SiO_2 and Al_2O_3 combined in the gang and this charge is melted in a C-lined elec. furnace. The melt produced, after cooling and crushing, is allowed to stand for 1-2 days to disintegrate and is then boiled with dil. H_2SO_4 in sufficient amt. to dissolve Fe and Na as sulfates and leave a residue containing about 80% or more of Ti_2O_3 (from an ore originally containing about 50%).

Hydrogen sulfide from sulfur dioxide. J. B. GARNER and H. D. CLAYTON. *U. S.*, 1,173,566, Feb. 29. SO_2 is combined with natural or producer gas or other gaseous fuel containing H, in the presence of wood charcoal at a temp. of about 500-600°. Excess H from the fuel gas combines with the S produced, forming H_2S .

Lead arsenate. J. A. SCHAEFFER. *U. S.*, 1,172,741, Feb. 22. A suspension of "fumed" PbO in H_2O is mixed with a soln. of Na arsenate or other sol. arsenate and the mixt. is heated to the b. p. to promote the formation of Pb arsenate.

Binder for silicon carbide. T. B. ALLEN. *U. S.*, 1,172,659, Feb. 22. MgAl silicate (free from any impurities which react with carborundum at high temps.) is vitrified with carborundum to serve as a binder for it. 25% of a ground, sintered reaction product formed from MgO 30, kaolin 55 and flint 15 parts may be molded with

75% of carborundum (with a small amt. of gluten to serve as a temporary binder) and fired at 1400°.

Furnace for calcining aluminium sulfate, etc. H. HOWARD. U. S., 1,173,428, Feb. 29.

Cyanides. NITROGEN PRODUCTS CO. Ger., 286,086, Dec. 15, 1912. Cyanides are obtained from N, C, and an alkali or alk.-earth metal at an elevated temp. Cf. U. S., 1,116,559 (C. A. 9, 129).

Oxidizing aluminium sulfite to aluminium sulfate by means of air. C. A. BERINGER. Ger., 286,366, Apr. 4, 1914. Addition to 269,749 (C. A. 8, 2259). A mixt. of SO₂ and air is allowed to act, under a high pressure and high temp., upon an aluminiferous substance which, at the normal pressure and temp., is only slightly, or not at all, attacked by SO₂.

Compounds of the rare elements. GEBR. SIEMENS & CO. Ger., 286,019, July 17, 1913. Addition to 284,889 (C. A. 10, 100). According to the principal process and addition 286,018, compds. of the rare earth metals, *e. g.*, the double fluorides, are obtained by pptg. dissolved compds. of the rare earths, with others, with fluorspar. The tendency to the formation of the double fluorides is especially great if the solns. contain oxalic acid or other organic acid, which may be contained in the solns. as impurities, or which may be added. The soln., (HOCO)₂, and fluorspar may be mixed at the same time and heated, or the soln. and (HOCO)₂ may be allowed to react upon each other first, and then the fluorspar may be added. The amt. of (HOCO)₂ to be used should be about 5% of the pure content of rare earths. The double fluorides sep. in granular form and may be washed readily. The soln., however, may be heated further, whereby the double fluorides can be converted into the single fluorides of the rare earths. These fluorides have the granular form of the double fluorides, and are no longer amorphous, as are the compds. obtained by the principal process. *E. g.*, 13.5 kg. of pure oxides of the rare earths are dissolved in the least possible excess of HCl or HNO₃ and the soln. is dild. with H₂O to 100 kg. To this soln. is added 1 kg. of a satd. (HOCO)₂ soln. At first a light ppt. is formed which redissolves upon heating. As soon as the soln. boils, 9.6 kg. fluorspar are added and the mass is boiled for 2 hrs. The yield of dry fluoride is 15.6 kg., *i. e.*, 96% of the theoretical yield.

Magnesium chloride. W. S. RAWSON. Brit., 21,261, Oct. 20, 1914. MgCl₂ soln. made by dissolving magnesite in HCl is purified by adding to the concd. and hot, preferably boiling, soln. finely divided MgO, preferably burnt magnesite, until the ppt. no longer increases in d. The ppt. settles readily, and the soln. may be decanted or the whole may be filtered.

Continuous dissolution of potassium chloride. J. SCHNITZLER. Ger., 286,303. May 2, 1914. The continuous dissoln. of KCl and like salts is effected by heating in a stationary vessel, with the introduction of solvent and salt in counter flow.

Dehydrating perborates. DEUTSCHE GOLD- UND SILBER SCHEIDE-ANSTALT V. ROSSLER. Ger., 286,545, Apr. 23, 1914. The crystd. perborates are heated in the presence of liquids which do not dissolve the perborates and which are not oxidized thereby, and which have the property of removing the H₂O which splits off from the perborates upon heating, and preventing it from reuniting therewith. *If, e. g.*, NaBO₃·4H₂O is heated with about twice its wt. of abs. or approximately abs. alc. to 50-70° while stirring, all or a greater part of the crystal H₂O is split off after a short time. After filtering off the alc., a rapidly drying powder of dehydrated NaBO₃ remains. Even the readily oxidizable MeOH is not oxidized thereby, and the loss of H₂O is not attended by a loss of active O. From 500 kg. perborate with a content of 10.37% active O, 327 kg. of a perborate with 15.6% active O are obtained. If the alc. is used again

for dehydrating, a product of less O content, about 12-14% is obtained. The alc., however, can be dehydrated by rectification or by means of lime, to render it suitable for reuse. Instead of alc. certain hydrocarbons may be used such as benzene, toluene, C_6H_5Cl , and the like. Instead of dry crystd. perborates, moist centrifuged perborates may be subjected to this treatment.

Soluble alkali metal silicates. J. W. SPENSLEY and J. W. BATTERSBY. Can., 165,910, Nov. 9, 1915. Anhydrous silicate is ground in the presence of water by means of a hard abrasive material. Cf. C. A. 9, 2972.

Recovery of alkali carbonates. R. BLOM and W. S. NORMELLI. Can., 165,879, Nov. 9, 1915. A process for recovery of alkali carbonates from alkali nitrate obtained by the absorption of nitrous gases in alkali carbonates and simultaneously producing NH_4NO_3 comprizes the steps of absorbing nitrous gases in a soln. of a carbonate of an alkali, transforming the nitrite content of the product obtained thereby into nitrate, reacting upon the resulting nitrate with NH_4Cl to form NH_4NO_3 and an alkali chloride; this chloride is sepd. and reacted upon with $(NH_4)_2CO_3$ to form a carbonate of the alkali.

Continuous production of crystallized ammonium hydrogen carbonate. CHEM. FABRIK BRUGG A.-G. Ger., 286,241, July 4, 1914. The process is dependent upon the continuous production of a warm satd. soln. of NH_4HCO_3 by conducting CO_2 continuously through satd. NH_4OH soln., on the counter-current principle. The satn. is effected in a column containing filling, fed continuously from above with NH_4OH and from below with CO_2 . The column is built up of a series of truncated conical sections, the cross section being larger at the lower end. The lye is cooled in each element in such manner that the temp. of the lye in the column increases towards the bottom, the satd. bicarbonate lye leaving the column at a temp. of 50-60°, whereby no crystn. of the salt takes place in the column.

Making articles from nitrides. E. PODSZUS. Brit., 21,378, Oct. 22, 1914. See Ger., 282,748 (C. A. 9, 2437).

Generating hydrogen. C. ELLIS. U. S., 1,173,417, Feb. 29. A mixt. of CO with 4 to 5 times its volume of H_2O vapor is passed in contact with a counter current of CaO moved by screw conveyers, about 5% of oxide of Mn or Fe being added to the CaO as a catalyst. A reaction temp. of 500-550° is maintained.

Hydrogen. K. SCHAEFFER. U. S., 1,172,908, Feb. 22. Heated Fe is alternately oxidized and reduced by treatment with reducing gas and steam to form H. At the beginning of the operation the Fe is heated with gas and an excess of air and the charge is periodically reheated by passing air through it. The use of an excess of air prevents local superheating and sintering of the charge. Cf. C. A. 10, 98.

Catalyst for synthesis of ammonia. A. MITTASCH. U. S., 1,173,532, Feb. 29. A soln. of K ruthenate and KOH is applied to asbestos, pumice or other carrier and reduced by heating with H and N.

Ammonia. W. S. LANDIS. Can., 165,745, Nov. 2, 1915. A soln. of $Ca(CN)_2$ is heated to a reacting temp., and then the applied heat is decreased and the reaction proceeds under its own evolved heat.

Ammonia from its elements. BADISCHE. Ger., 286,430, Sept. 10, 1911. Addition to 249,447. As specified in the parent patent and its additions (254,437, 258,146, and 262,823), a material increase in the activity of the catalyzers used in the synthesis of NH_3 from its elements results from the presence of various admixts. By the present method, especially good results are obtained by the employment of metal mixts. if these be so chosen that metals or substances are present together, of which the one contains or may take up principally or exclusively H, while the other contains or may take up N. E. g., NH_4 molybdate is gently heated so that a portion of the NH_3 escapes.

The porous granules are satd. with a concd. Pd nitrate soln. (20% Pd nitrate, calcd to the molybdate), then the mass is calcined to decompose the nitrate and reduced with H, or charged directly into the contact furnaces.

Separating gas mixtures. E. ROHLF. Ger., 286,365, Mar. 24, 1914. Lycopodium, when dried *in vacuo*, possesses the property of condensing and combining gases upon its surface and giving them off to surrounding objects. This property of lycopodium is applied in sepg. liquefied gases. The procedure consists in taking up the gas or liquid mixt. by surface condensation on, or satn. by the lycopodium, at the suitable temp., and allowing the gases, by progressive heating, to vaporize in the order of their b. p.

Heat-insulating compositions. BEINDORFF & CO.'S FABRIEK VAN KETEN-BEKLIEDING EN ISOLATIESTOF "ISOLA." Brit., 21,437. Oct. 23, 1914. A heat-insulating compn. consists of preferably 20-60% of wood pulp or like fibrous organic pulp 1-7% of resin, and 15-50% of a mixt. of kieselguhr, and sawdust with or without alum and fillers, such as chalk. The mixt. is molded without pressure. The wood pulp and resin are first finely ground together so as not to destroy the fiber.

Molding with phenol-aldehyde condensation products. E. HEMMING AND HEMMING MFG. CO. Brit., 21,264, Oct. 20, 1914. Mfg. molded bodies with the aid of phenol-aldehyde condensation products. An initial condensation product is prepd. by reaction between a phenolic compd. and a methylene compd., according to any of the known processes, at a temp. below 95°, the reaction being arrested when the product has a sp. gr. between 1.15 and 1.25. This product, which is of a suitable consistency for cold-molding, or which may be brought to this condition by thickening by heat or thinning with a solvent, is mixed with a filler, molded under pressure and at ordinary temp., and hardened by heat after removal from the mold.

Plastic phenol-formaldehyde product. W. T. BONNER. U. S., 1,173,337, Feb. 29. Cellulose acetate is dissolved in a fluid reaction product of PhOH and CH₂O and the mixt. is afterward molded and hardened.

Phenolic resins used in stereotype matrix. G. S. WILLIAMSON. U. S., 1,173,907, Feb. 29. A matrix for stereotype plates is formed of blotting paper impregnated with a sol. silicate and a plastic phenolic condensation product which is rendered infusible by heating.

Adhesive mixture for use with mineral substances. F. TOMPKINS. U. S., 1,171,905, Feb. 15. Spent vegetable tanning liquor is concd. to 48° Tw. and used as a road binder, subsequently, after diln. with H₂O as desired. It may also be used as an adhesive for molders' sand cores, for uniting wood, paper or pasteboard and for other purposes. The concn. facilitates preservation until desired for use.

Elastic material. M. BARRICELLI. Can., 166,177, Nov. 23, 1915. The manuf. of an elastic material by producing an elastic paste of a gelatinous substance, water and glycerol, incorporating in this paste first a quantity of Sb₂O₃, then a quantity of HOAc, maintaining the mass so produced in a molten state until it is to be molded and adding to the same immediately before the molding operation a quantity of a liquid containing formalin and HOAc.

Wire, ribbon, and other articles of molybdenum. CHEM. FABRIK VON HEYDEN. Ger., 286,534, June 20, 1912. The products heretofore obtained from pulverulent Mo and a binder by subsequent ignition *in vacuo* or in a reducing or indifferent gas, had inferior strength and flexibility. Additions of other metals had little effect in correcting this fault. Products which possess the required properties, at both high and low temps., are obtained by adding to the Mo, instead of metals, the oxide of Mg or Ba, or a compd. which upon ignition yields one of these oxides. A suitable mixt. consists, e. g., of 100 parts of Mo powder and 20 parts of MgCO₃. A wire prepd. in this manner, having a

cross-section of 0.17 mm. and a length of 14 cm., supports a load of 1400-1500 g., while a wire made from Mo powder, having the same section and length, supports a load of only 1000-1100 g.

Removing iron from kieselguhr by treatment with acid. VEREINIGTE DEUTSCHE KIESELGURWERKE G. M. B. H. Ger., 286,240, Dec. 9, 1913. By this process a pure white product is said to be obtained, with nearly complete recovery of the acid. The kieselguhr is mixed with acid of about 13° Bé., to a liquid slurry, and this mixt. is heated to about 80°, the freshly mined kieselguhr having been first dried and calcined. About 3 parts by wt. of acid are used to 1 part by wt. of kieselguhr. After heating, the mixt. is cooled and finally pressed into cakes by means of filter presses, whereby the acid is expressed and collected for reuse. The pressed cakes are dried in the usual manner and ignited to remove particles of C. HCl is preferred as the acid.

Nitrogen compounds of silicon and aluminium. O. SERPEK. Can., 166,161, Nov. 23, 1915. Compds. of SiO_2 and Al_2O_3 are subjected with C to the action of a current of N, first at a temp. below 1500° to 1600° to form Si_3N_4 and then at a higher temp. to form AlN.

Separating organic liquids. A. GOLODETZ and B. BENEDIX. Ger., 286,425, Nov. 22, 1911. The process is applicable in the sepn. of constant-boiling liquids and those which contain components with b. p. lying near one another.

Bleaching sand. J. G. A. RHODIN. U. S., 1,173,385, Feb. 29. Sand which is colored by the presence of Fe is bleached by mixing with NaCl soln., drying, roasting and lixiviating the roasted charge.

Artificial lithographic stone. V. H. J. HERENG. U. S., 1,172,796, Feb. 22. See Brit., 5,859 (C. A. 9, 2297).

Dental cement. G. S. MILLER. U. S., 1,172,723, Feb. 22. H_3BO_3 or borax is mixed with powdered washed beryl and Na Al fluoride, the mixt. is satd. with $\text{H}_4\text{P}_2\text{O}_7$ and formed into a thin pasty mixt. with H_2O and heated to obtain a melt which is cooled and powdered and subsequently prepd. for use by the further addition of $\text{H}_4\text{P}_2\text{O}_7$.

Luminous coating. A. JUNGHANS. U. S., 1,173,110, Feb. 22. Luminous coatings such as figures on clock faces are formed by filling recesses in the surface treated with an adhesive and ZnS or other radio-responsive material, coating this material with a layer of adhesive and then with an overlying layer of active material.

Effecting reactions of gases on solids. J. R. C. RUDOLPHS and A. G. THISSELL. U. S., 1,173,390, Feb. 29. In reducing metal oxides with reducing gas, treating CaC_2 with N or removing silicic acid from C mixts. or metal oxides by treatment with F, casings, which may be formed of chamotte, containing a sheet Fe box and a core are filled with the solid charge within the box and around the core and the space between the box and casing is filled with CaO, MgO or other refractory material. The Fe box and core are then removed. A series of such charges is heated in a furnace by combustion gases and then treated with the reaction gas; the porous enclosures prevent deleterious mixt. of the different gases used around and within the casings for heating and subsequently effecting the reduction or other desired reaction.

Gas- and vapor-forming disinfectants and fire extinguishers. R. ZIMMERMANN. Ger., 286,271, June 25, 1914. The preps. are made from aromatic sulfonated diazo compds. which are partially dried on an indifferent surface at a temp. below that of their decompn. and then mixed with an indifferent, non-volatile substance, or they are mixed, while moist with the specified substance, and the mixt. is subsequently dried. The incompletely dried aromatic sulfonated diazo compds. may be mixed with a volatile, indifferent substance which volatilizes when the compds. are decomposed. E. g., 1,4-diazonaphthalenesulfonic acid (with 3% H_2O content) 600 g. is mixed with 400 g.

kieselguhr of like H_2O content, and worked up in the mortar or by rolling, with moderate pressure. The resulting mixt., packed in a box or glass vessel, burns quietly and without flame when kindled with a spark. This prepn. may be obtained more readily by the direct addition of kieselguhr to naphthionic acid, diazotizing, draining, washing, and centrifuging the mixt., and drying it at 45° in small pieces on paper. In this manner may be obtained a very homogeneous mixt. which upon burning loses about 20% in gases and vapors. This prepn., and a similarly prepd. mixt. of 1,4-diazobenzene-sulfonic acid and SiO_2 in equal proportions by wt. of the components, are not only stable but are not affected by friction. They may without danger of decompn. be completely dried on the water bath and rubbed up with the pestle under strong pressure.

19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

The manufacture in France of laboratory glassware. PR. LINDET. *Ann. fals.* 8, 412-4 (1915).—Report of a symposium. H. S. BAILEY.

Effect of temperature on the coefficient of absorption of certain glasses (GIBSON) 2. Toning with cobalt sulfide (NAMIAS) 5.

Glass manufacture. T. J. I. CRAIG and P. SPENCE & SONS. *Brit.*, 21,231, Oct. 20, 1914. The siliceous residues resulting from the treatment of bauxite or other aluminous ores, China-clay, or calcined coal-measure shales with H_2SO_4 for obtaining Al compds. are utilized for the manuf. of glass. The residues are mixed with suitable material such as lime, Ca, etc. Na_2CO_3 to neutralize the acid, and other materials may be added.

Machine for blowing bottles. GLASMASCHINENFABRIK SYSTEM J. WOLF G. M. B. H. *Ger.*, 286,298, Feb. 6, 1914.

Porous composition for use as filtering media. J. E. PORTER. *Brit.*, 22,080. Nov. 5, 1914. Filtering media, of the kind made by fusing together sand and powdered glass, are made by adding a small proportion of infusorial earth to the mixt. before firing. Plates having strata of varying porosity may be made by arranging the sand in layers of different grain. The product resists the action of acids, alkalies and heat, and, in addition to its principal use as a filtering medium for liquids, may be used as a filtering or distributing medium for air and gases as in the dry concn. of ores; in aerating liquids as in the cyanide process of extg. ores and the manuf. of soda and H_2SO_4 as a retainer of liquids, e. g., acetone, in gas cylinders, as a vehicle for catalytic agents in chem. processes, and as a heat insulator.

White enamels. VEREINIGTE CHEM. FABRIKEN LANDAU, KREIDL, HELLER & Co. *Ger.*, 286,038, Oct. 25, 1912. See *Fr.*, 462,587 (*C. A.* 8, 3106).

Clouding agent for manufacturing white enamels. E. HEILMANN. *Ger.*, 285,822. Nov. 24, 1911. The clouding agent consists of a mixt. of MgO and Al_2O_3 or of ZnO and Al_2O_3 , which is so highly heated that spinels are formed or, with an excess of one of the components of the mixt., solid solns. of the spinels with MgO or Al_2O_3 result. The clouding agent may contain, in addition to the solid solns., white refractory materials such as SiO_2 , SnO_2 , ZrO_2 , or TiO_2 , whereby the clouding effect is strengthened. A sufficient addition is 10% of the wt. of the mixed oxides, to obtain a marked increase in the clouding effect. The ignited mixt. may be prepared more cheaply than the SnO_2 used heretofore in larger amts.

Zirconium silicide, zirconium salts, and zirconium oxide. P. JOST and P. PLÖCKER. *Ger.*, 285,981, Feb. 1, 1914. ZrSiO_4 is not attacked, or only slightly by HF or other mineral acids, even upon heating. The sepn. of the SiO_2 from the ZrSiO_4 was effected only by fusing the latter with hydroxides or carbonates of the alkalies at high temps. By the present process a sepn. of the SiO_2 , or at least a decided disintegration of the silicate, can be effected, without the employment of alkalies, by mixing the pulverized material with $1\frac{1}{2}$ times its wt. of coal, and heating this mixt. to whiteness. By this treatment the silicate is reduced to silicide, and CO_2 escapes. By treating the resulting reaction product with dil. mineral acids and filtering from the excess coal, a very pure Zr salt, free from SiO_2 and completely free from alkali, is obtained in soln., from which, by ignition of the sulfate or nitrate, ZrO_2 is obtained. The resulting oxide which, if the ignition is not carried out at too high a temp., contains some basic Zr salt, is especially suited for the production of enamels.

Refractory vessels from the rare earths and from the oxides of thorium and zirconium. O. KNÖFLER & Co. *Ger.*, 285,934, Jan. 22, 1913. The purest obtainable oxides of Th, Zr, and the rare earths, without the addition of binders (by which the m. p. would be lowered), excepting some pure H_2O which is driven off during the process without residue, are shaped by compression in suitable forms under high pressure, whereby the oxides adhere by virtue of their inherent plasticity. Upon subsequent burning in furnaces of known construction, at $1400\text{--}1600^\circ$, the shaped bodies acquire the requisite solidity and hardness. A contraction results from burning, but does not continue upon heating to $1800\text{--}1900^\circ$ and the product does not sinter at this temp. The vessels may be heated to 2000° and above, for a long time, without fusion.

Furnaces for smoking and burning ridge tiles. C. LENGSHOLZ. *Ger.*, 286,294, Nov. 30, 1913.

Tile-cutting device. E. KLÜCKMANN. *Ger.*, 285,860, Jan. 27, 1914. The device is designed for cutting roof tiles before burning.

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

The role of the chemist in the cement industry. C. N. WILEY. *J. Ind. Eng. Chem.* 8, 276-8(1916).—An address. E. J. C.

The hydration of slaked dolomitic lime. L. KIEPENHEUER. *Tonind.-Ztg.* 39, 696(1915).—Analysis of 4 commercial hydrated limes showed that only the CaO was slaked, the MgO being only partially hydrated. Limes with 26.9% to 37.7% MgO had 6.13% to 21.28% less H_2O than required theoretically for hydration. J. S. L.

Cold weather tests of concrete. ANON. *Cement World* 8, No. 12, 56-8(1915).—Tests on briquets made of standard Ottawa sand with Lehigh Valley cement (2:1) and broken after standing at different temps. for certain times, showed that the lower the temp. at which setting took place, the less the breaking strength. If 5% salt soln. was used instead of H_2O , the briquets were even less strong and did not set as rapidly on standing. R. L. S.

Destruction of concrete by hydrogen sulfide. HEYER. *Chem. Ztg.* 40, 102 (1916).—Analyses are given of samples of damaged concrete from sewers, the cause being traced to H_2S in waste water from a brewery. Cf. Sartori, *C. A.* 10, 377.

J. H. MOORE.

Blast-furnace slag and portland cements. HERMANN PASSOW. *Tonind.-Ztg.* 39, 759-60, 765-6, 771-2, 775-6, 781-2, 792(1915); cf. *C. A.* 9, 1986.—Test pieces made up of 1 part cement to 5 parts sand were observed for 1 yr. in 10% Na_2SO_4 soln. Tests

made with 6 brands of slag cement were volume const. and did not decrease in strength. Tests made with portland cements were disintegrated. Slag cements made up with considerable portland showed bad effects due to portland. Hardening of slag cements is promoted by NaOH set free from Na_2SO_4 by $\text{Ca}(\text{OH})_2$ of portland cement, some slag cements which failed in pure H_2O being sound in Na_2SO_4 soln. All tests kept in 10% MgSO_4 soln. failed in one year except 1 special slag cement. Sea water concd. 5 times had less effect than 10% MgSO_4 or Na_2SO_4 . No slag cements expanded in ordinary sea water and only in a few cases in 5 times concd. water. All portland cements showed effects due to sea water. In use in sea water the life of portland cement depends on the formation of a protecting coating. The use of slag cement in marine work shows a rapid increase. To be most resistant slag cement should be low in CaO and Al_2O_3 .

J. S. LAIRD.

Plaster of Paris from a technical point of view. G. GALLO. *Gazz. chim. ital.* 45, I, 386(1915).—G. comments on the similarity of results obtained by R. Grengg (cf. *C. A.* 9, 1586) to those published by himself (*C. A.* 9, 134) in 1912 to which Grengg failed to refer.

E. J. WITZEMANN.

Zinc chloride as a preservative. ALFRED H. CLARKE. *Wood Preserving* 2, 74 (1915).—C. sought to det. the effect on wood treated with ZnCl_2 of the higher temps. such as are at times found in some parts of factories. Selected loblolly pine sapwood test pieces were impregnated with 4% ZnCl_2 soln. and then subjected to a temp. of 150°F . for 40 days. The av. moisture content of the wood in the treated and control specimens was found to be the same. The treated specimens were found to be more

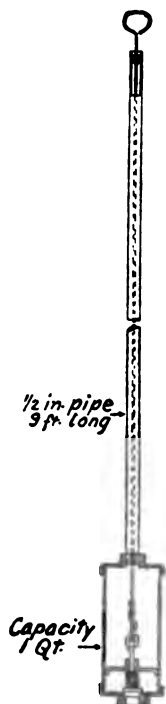
brittle and showed a modulus of rupture only 83% of that of the controls. Further tests will be made to det. the rate of destructive action, the range of atm. conditions where danger lies and the chem. and botanical factors involved.

E. J. C.

Preservative treatment of fence posts. G. B. MACDONALD. Agr. Expt. Sta., Iowa State College of Agr. and Mech. Arts, *Bull.* 158(1915).—Coal-tar creosote is the most important fence-post preservative. The life of woods commonly used for posts may be doubled by effective creosoting; many species now almost valueless can be made to last 25 years or more. Figuring simple interest at 6%, creosoting reduces the annual cost of the less durable woods by about $\frac{1}{2}$. Detailed instructions are given for treating different species commonly found in Iowa. GEO. M. HUNT.

Water sampling in creosote oil. Report of committee on wood preservation. *Proc. Am. Ry. Eng. Assoc.* 17(1916); *Bull.* 184.—After very careful tests of several methods of sampling for the detn. of water in creosote in a tank car, it is tentatively concluded that for accurate results it is necessary to sample from several zones, giving to each zone a wt. detd. by the relation of the vol. of the zone to the vol. of the car. Cross section sampling is of little value. The best results were obtained with a sampler similar to that shown. Further work is desirable. Cf. *C. A.* 10, 107.

GEO. M. HUNT.



Capacity
1 Qt.

Tank Car
Sampling Device

Transport of material in dust form (CLOUD) 18.

DANCASTER, E. A.: *An Elementary Treatise on Limes and Cements*. London: C. Lockwood & Son. 200 pp. 5s.

Cement. A. DENNY and D. G. ANDERSON. Brit., 21,987, Nov. 4, 1914. A quickly setting cement having an alk. reaction is produced by mixing substantially anhydrous gypsum with 1 to 10% of portland cement.

Operation of furnaces for burning lime, cement. AMME, GIESECKE & KONEGEN AKT.-GES. Ger., 286,014, July 6, 1913.

Treatment of woods. R. A. MARR. Can., 165,322, Oct. 5, 1915. A process of treating woods of low sp. gr. consists in impregnating the woods with a mixt. of resin and a melted hydrocarbon material containing a finely divided solid material.

Continuous flooring from bituminous cork masses, especially on concrete. E. MÜLLER and E. EICHERT. Ger., 285,368, Apr. 2, 1914. The cork mass layer is produced *in situ* by stirring granulated cork in molten petroleum pitch, brown coal-tar pitch, coal-tar pitch, or the like, and it is hardened, instead of by compression, by the addition of finely ground, S-containing slags, such as artificial pumice. The liquid cork mass is spread upon the base to a depth of 2-4 cm., and it solidifies by the action of the S slag after 10-15 min. without pressure to a uniform and resistant mass.

Decorative building materials. A. SINDING-LARSEN and R. BOYESEN. Brit., 21,787, Oct. 30, 1914. Friezes, cornices, columns, capitals, panels, etc., are made by lining a mold with stone chippings, broken pieces of stone, glass, etc., and pouring in a backing of cement, gypsum, concrete, etc. The faces of the pieces of stone which are to be exposed are, before being fitted in place, covered with a material capable of preventing the molding material employed from adhering to the exposed face of the finished product. The mold may be lined with a coat of an adhesive such as pitch, paraffin, wax, etc., and the pieces of stone may be then stuck on the mold, which is afterwards filled in with the molding material.

Plaster from calcined lime. F. J. BEHARRIELL. Can., 165,132, Sept. 28, 1915. Process of reducing high-calcium lime to a plaster, by applying to the calcined limestone a certain quantity of H_2SO_4 or dil. HCl.

Artificial stone. C. SCHNEIDER. Ger., 286,423, Jan. 5, 1914. Addition to 285,602 (C. A. 10, 521). The stone is made from cement and comminuted combustible matter.

Brick made from slag. E. R. SUTCLIFFE. U. S., 1,171,676, Feb. 15. Molten slag is granulated in a thick mixt. of $Ca(OH)_2$ and H_2O , drained, dried and compressed.

Artificial stone. P. ROBERT. U. S., 1,172,225, Feb. 15. Clayey earth after heating to dry it is mixed with an equal volume of pine needles, and the heating is continued until the mixt. is dry; crude pine sap is added, the plastic mixt. formed is further heated to drive off the moisture present and the product is molded, *e. g.*, into bricks or sewer pipe.

21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

Scientific utilization of coal. W. A. BONE. *Iron Coal Trades Rev.* 91, 343(1915). --Presidential address read before the chemistry division of the British Assoc.

H. L. OLIN.

The utilization of energy from coal. WILLIAM A. BONE. *Colliery Guardian* 111, 123, 170-1, 220-1(1916); *J. Gas Lighting* 133, 206-8, 253-6, 305-8(1916); *Gas World* 64, 79-81(1916).—A series of lectures reviewing the status of scientific problems relating to the character and uses of coal.

H. L. OLIN.

The microscopic constitution of coal. GEO. HICKLING. *J. Soc. Dyers Colourists* 32, 9-11(1916).—Early attempts at cutting micro-sections of coal showed that in many

cases minute spores of plants are present in great quantities. Their presence was attributed to their original resinous character and it was assumed that the presence of these spores imparted a resinous character to the coal. There is reason to believe, however, that the old theory of coal formation through the successive stages of peat, lignite, etc., is not correct, but that a large portion of the carboniferous vegetation was reduced through decompn. (probably bacterial) to a liquid then absorbed by the undecomposed residues of the vegetation. Recent work separates coals into two dominant types, the bituminous or "humic" and the canneloid or "sapropelic," the latter commonly being the coals rich in spores. There seems to be good reason to believe that anthracite coals may develop from either of these types by some process of alteration. L. A. O.

Boiler economy. C. E. STROMEYER. *Iron Coal Trades Rev.* 91, 447-8(1915).
—A classification and discussion of the various items of cost in steam boiler operation.
H. L. OLIN.

Low-temperature carbonization. ANON. *Iron Coal Trades Rev.* 91, 421(1915).
—The primary object of the new process is to produce from non-coking and semi-coking coals a large volume of light hydrocarbon oils free from tar acids or S compounds, and secondarily, the formation of a residue suitable for conversion into a freely burning smokeless briquet. To accomplish this a small percentage of powdered CaCO_3 is added to the coal. This dissociates at a low temp. in contact with coal high in O_2 and the free CaO liberates the organic bases at low temps.
H. L. OLIN.

Smoke as a source of atmospheric pollution. W. F. M. GOSS. *J. Franklin Inst.* 181, 305-38(1916).—A report and discussion based upon investigations made in the city of Chicago during the past 6 yrs. Cf. *C. A.* 9, 2141. F. W. SMITHER.

Peat as a source of fuel oil. W. H. HELM. *Colliery Guardian* 111, 220(1916).
—The oil obtained in the distn. of peat yields on redistn. light oil, fuel oil, paraffin, phenols and pitch. The fuel oil is especially suitable for use in the engines of torpedo boats because of its low S content.
H. L. OLIN.

Simultaneous firing of solid and gaseous fuels. A. DOSCH. *Feuerungstechnik* 4, 1-3, 21-3, 34-7, 42-5(1915).—D. compares in detail the firing of solid and gaseous fuels used independently and when burned simultaneously, particularly with respect to the reactions occurring during combustion and the heat losses from flue gases. The compn. of the final combustion gases varies considerably with the compn. of the gaseous fuel. For the same gaseous fuel, the compn. of the final combustion gases is dependent on the kind of combustion of the solid fuel, i. e., the air excess with which the combustion of the solid fuel results. Most of the article is in the form of equations, tables and curves.
H. R. GUNDLACH.

The use of copper oxide for fractionation combustion of hydrogen and carbon monoxide in gas mixtures. G. A. BURRELL AND G. G. OBERFELL. *J. Ind. Eng. Chem.* 8, 228-31(1916).—A gas analysis app., embodying a CuO tube heated by a small elec. furnace, but containing no new principle, was used for the fractional combustion of H and CO by Jäger's method. The method is more satisfactory than the absorption methods ordinarily employed in detg. CO and H, and its wider use is recommended.
E. A. TSCHUDY.

A new accurate method of gas analysis. O. A. KRONE. *J. Ind. Eng. Chem.* 8, 231-7(1916).—Details are given of the arrangement of app. and of manipulation whereby a complete estn. of CO_2 , illuminants, O_2 , CO, CH_4 , C_2H_6 , H and N may be made in 20 min. The usual method of calcg. corrected results may be greatly simplified.
H. M. LANCASTER.

A suction gas producer using bituminous coal. R. V. FARNHAM. *Colliery Guardian* 111, 165-6(1916).—The essential features of the producer are a rizing and

falling grate and a sliding plate. In firing from the cold, ordinary gas coke is first used with the grate in its lowest position and an incandescent bed is formed. The grate is then raised 10 in. to the level of the slide, this is driven across the fire between the bottom of the fuel bed and the grate and the latter is lowered to its initial position. Bituminous coal is now packed upon the grate, the slide is removed and the hot bed is allowed to settle down upon the fresh fuel. The gas when used in internal-combustion engines leaves no trace of tar in the valves. The coal consumption is 1.74 lbs. per b. h. p.

H. L. OLIN.

Coal tar and its products. ANON. *Iron Coal Trades Rev.* 91, 479(1915).—A general discussion of the uses and properties of the various fractions. H. L. O.

Metallic calcium and its use in gas analysis (SIEVERTS) 7.

HAYS, J. W.: *Combustion and Smokeless Furnaces.* 2nd ed. Chicago: The Author. \$2.00.

RATHBUN, J. B.: *Gas Engine Troubles and Installation.* Chicago: C. C. Thompson Co. 440 pp. \$1.00.

Burning powdered fuel. H. M. CHANCE. U. S., 1,173,708, Feb. 29. Air is supplied to the burning fuel in intermittent pulsations which agitate and suspend the lighter particles.

Fuel briquets. L. J. CURTMAN. U. S., 1,173,779, Feb. 29. Finely divided coal is molded and baked, with a binder formed of crude molasses 90%, neutralized sirupy concd. sulfite pitch 9% and water-gas tar 1%.

Briqueted fuel. M. ROSSI. U. S., 1,171,660, Feb. 15. Coal, with a binder of tar or pitch, is treated with CS_2 to soften it and is then molded.

Motor spirit. H. GOLDSTEIN. Brit., 21,316, Oct. 21, 1914. A motor spirit consists of a mixt. of 86 vol. of 95% EtOH and 10 vol. of ether, with or without a denaturing agent such as 1 vol. wood spirit and 3 vol. benzole.

Apparatus for supplying air and steam to gas generators. J. M. RUSBY. U. S., 1,172,226, Feb. 15.

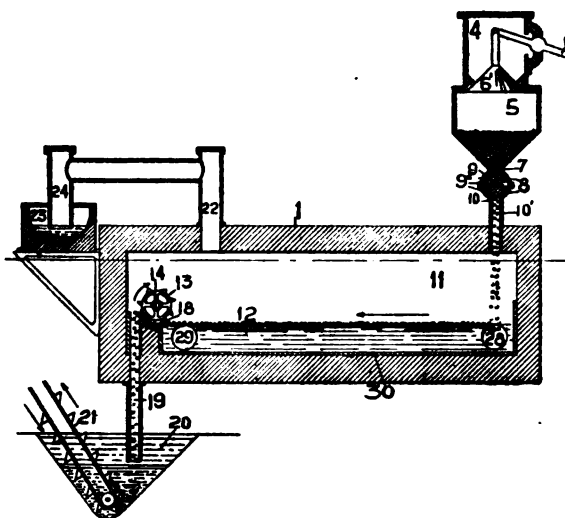
Recovering sludge from gas-washers. H. A. BRASSERT and W. MATHESIUS. U. S., 1,171,696, Feb. 15. The wash H_2O from a blast furnace gas washer is discharged into a settling tank from the bottom of which the sludge is removed by gravity, conveyed to the bottom of the skip hoist of the blast furnace and discharged into the furnace.

Gas-washing apparatus. H. A. BRASSERT and C. J. BACON. U. S., 1,172,930. Feb. 22.

Purifying gases. E. L. HALL. Brit., 21,525, Oct. 26, 1914. See U. S., 1,120,475 (C. A. 9, 243).

Nitrogen compounds from air in gas products. O. BENDER. U. S., 1,172,863, Feb. 22. In operating gas producers, some N is oxidized and some fixed as NH_3 by operating under pressure and injecting finely divided H_2O into the fuel. Al_2O_3 is preferably added with the H_2O to increase the fixation of N. When operating with a furnace temp. of 2000° , the gases formed contain 1% NO and 0.25% NH_3 . Cf. C. A. 9, 699.

Producing gas. K. E. BARTH. U. S., 1,172,925, Feb. 22. Vaporized liquid fuel, such as oils or tar, is alternately passed upward and downward, through a body of incandescent solid fuel, to obtain heating or illuminating gas (at about 1000°) or in the production of H (at higher temps.), to secure uniformity of action throughout the charge.



Coal gas. H. L. DOBERRY. U. S., 1,172,682, Feb. 22. Crushed coal is fed from the hopper 5 on to a flowing body of molten Pb 12 which is circulated through a heating chamber (not shown) and the retort 11. The coke produced is skimmed off by paddles on the rotating drum 13 and gas passes off through the pipe 22. A gas of higher heating and lighting value per unit of coal employed is obtained than in the usual distn. in commercial processes, due to the

employment of a uniformly low temp. in distg. the coal. A temp. as low as 425° may be maintained, for effecting complete distn.

Gas producers. S. GLOVER and J. WEST. Brit., 21,517, Oct. 26, 1914. In a gas-producer furnace, the door by which access is obtained beneath the grate is connected to one or more dampers adapted to regulate the area of outflow from the producer, so that when the door is opened for the purpose of clinkering, etc., the area of outflow is correspondingly restricted, to prevent any increase in the flow of air through the furnace.

Discharging retorts. A. M. DUCKHAM. Brit., 21,191, Oct. 19, 1914. A vertical retort is continuously discharged by means of a water-seal trough movable beneath the lower end of the retort and operating in connection with a fixed scraper. The trough may either oscillate to discharge the coke at both sides, or it may reciprocate, in which case one side of the retort is extended to form the scraper.

Coking and gas-generating oven. W. FRICKS. U. S., 1,171,418, Feb. 15.

Removing hard pitch from cooling pans. C. STILL. Ger., 286,243, Oct. 3, 1914. A chain is laid in the pan, and after cooling the mass is broken out by means of this chain.

Fixed coke separator. A. G. GLASGOW. Ger., 286,261, Feb. 5, 1914. The app. is designed to sep. fine coke and slag from the coke mass.

22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

Kimmeridge oil-shales. W. H. MANFIELD. *Engineering* 101, 164-5(1916).—A general review and discussion of the methods of utilization of the oil-shales of the Kimmeridgian series in England and Scotland. The principal English deposits occur in Dorsetshire. In Scotland shales are chiefly mined in Edinburghshire, and Linlithgowshire, the annual output being about 3-4 mil. tons, averaging about 24 gal. of oil per ton. The Tarless Fuel Co. carries out the distn. in a vacuum, using the Tozer retort with internal heating. With the Del Monte retort no vacuum is employed, but internal

heating is effected by burning some of the uncondensable gases in a tube passing through the charge; the retort is inclined at about 15° to the horizontal, and the charge is fed at the lower end, and worked upwards by means of a spiral screw. Except for about 1/3 of its length at the lower end, the retort is heated externally by burning the uncondensable gases with compressed air in jets placed at intervals of about 3 ft. Uncondensable gas is passed in at the top of the retort to drive the vapors down to the cool end, where a considerable part of them, including all the heavy and medium oils, is condensed by the fresh, cold charge, and collected; the remaining vapors are passed through a water-cooled condenser to obtain the lighter oils. It is claimed that this system yields an average of 80 gal. per ton from Kimmeridge shale, and the S content is below 3% (the standard of the Admiralty for fuel oils). M. thinks it would be preferable (instead of the usual process) to pass the crude oil from the Dorset shales through a converter yielding some 20-30% of motor spirit, and to use the residue as fuel oil. In Scotland an average of about 45 lbs. of $(\text{NH}_4)_2\text{SO}_4$ per ton is obtained; shales rich in oil are usually poor in NH_3 , and vice versa. The Dorset shales are rich in NH_3 ; the seam giving the most oil yields 45 lbs. of $(\text{NH}_4)_2\text{SO}_4$ per ton. Many of the shales poorer in oil yield much larger amts. of NH_3 and could be profitably worked by extg. the NH_3 from the vapor without the use of H_2SO_4 by the Burkheiser process, or some modification of it. The removal of S has been the greatest drawback to the shale-oil industry; most of the shales worked contain less than 1% of S, but the shales richest in oil contain the most S, and oil distd. in the ordinary way from the best Kimmeridge shales contains 5 to 8% of S.

F. W. SMITHER.

Lubricating oil for Diesel engines and air compressors. H. MOORE. *Engineer* 120, 176(1915).—The compressors used with Diesel engines have generally been fitted with Cu coils for air cooling, but in some cases these coils have worn thin somewhat rapidly; the thinning occurs from the inside of the tube and mainly round the section of the tube furthest away from the center of the coil, indicating that it is caused by erosion, probably assisted by corrosive action. The greatest care in testing oils for acidity did not prevent a repetition of the corrosion. Investigation showed that under the action of high pressures and temps. some lubricating oils permitted acids to form, which were particularly noted in the drainage from the compressed air vessels. The liquid drained from the receivers was neutral to methyl orange, but strongly acid to phenolphthalein or litmus, and reduced KMnO_4 . Conc'n. by distn. and the extn. of the distillate with ether (after adding NaCl) yielded a small amt. of a strongly acid oily substance, possessing a pungent odor of burnt oil; the "acid" was volatile in steam and appeared to undergo oxidation if exposed to air. M. concludes that this "acid" is a mixt. of org. acids and other O-containing compds. formed by the oxidation of certain constituents of the oil. The formation of such weak acids is considered very briefly from a theoretical viewpoint, from which M. concludes that the I value should provide an indication of the liability of an oil to form acids under compressor conditions. Whether the Cu of the coolers acts as a catalytic agent in the formation of this product has not yet been decided. Tests of numerous oils show that the acid-forming tendencies of oil vary greatly and are certainly to some extent dependent on the I value, though by no means proportional to it. Among petroleum products the I value bears a relationship to the d.: lamp oil (d. 0.807) had I value 5.9-6.5; lubricating oil (d. 0.876) had I value 15.4; heavy fuel oil (d. 0.977) had I value 19.3. The detn. of acid formed was made by titration of the receiver liquor with 0.1 N NaOH and phenolphthalein. The concn. of acid varied from 0.02 to 0.2 N, depending upon the oil, the compressor, and the atm. conditions. The actual wt. of acid cannot be detd. as acidity are not known. No commercial metals were found which are attacked by acid, so that the main point is to prevent the formation

of the acid. Of the ordinary materials tested, mild steel and ordinary brass were the worst and Al the best, Cu and phosphor-bronze coming next to Al. Lubricating oils used in Diesel engines must not only satisfy the requirements of the air compressor, but those of the engine itself. In connection with the latter the conditions are: (a) The oil is exposed to heat from the pistons and cylinders and must not be injured thereby, nor must its viscosity be too much reduced; also it must not give off gases. When testing oils, particular attention should be paid to viscosity and the distn. test at various temps. (b) The oil must be suitable for using over and over again many times without unduly losing its lubricating property. (c) The oil should be capable of being cleaned by filtration and decantation. Oils vary very much in this quality. This property cannot very well be tested in the lab., but should be made the subject of practical tests.

F. W. SMITHER.

Spirits fires and preventive measures. F. BENNINGSON. *Chem. Ind.* 38, 444-5 (1915).—A discussion of fires by lightning and other causes in industrial plants.

F. W. SMITHER.

Distinguishing between natural and artificial asphalt. E. GRAEFFE. *Z. angew. Chem.* 29, I, 21-5 (1916).—A review and brief discussion of the various methods reported in the literature, together with a discussion of the formation of natural asphalts and the manuf. of oil asphalt. The following S test is proposed; it is based on the fact that natural asphalts are formed at relatively low temps. for long time periods, and that oil asphalts are produced at higher temps. for short periods, during which the asphaltic action of the S is rapidly effected. Place 1 g. of the asphalt (dried at a low temp. if necessary) in a test tube and stopper with a cork holding a strip of moist Pb(OAc)₂ paper extending to 1 cm. above the sample; heat an oil bath to 200-205° and hold lower portion of test tube in bath for exactly 5 min.; natural asphalts produce a decided blackening of the paper, oil asphalts an inappreciable coloring. Expts. are reported, with photographs of the paper strips showing influence of temp. and time. Mixts. of natural and oil asphalts react like natural asphalt, though in a less marked degree. "Glance pitches" or asphaltites do not give the test; California asphalts (oil) and the residue from Trinidad crude oil react feebly; exts. of asphalt rocks (except Travers) give a faint but distinct test. The pitches show no uniformity in their behavior; wood pitch gives a faint test; the residue from the distn. of the acid resins obtained in the purification of brown coal-tar oils give the test on standing at room temp. The reaction does not depend upon the amt. of S present, but upon how it is bound in the mol. The odor of the various materials as a means of differentiation in experienced hands is briefly touched upon. A table is given showing S content of various natural asphalts, oil asphalts, glance pitches, asphalt rocks, and pitches as detd. by G.'s method (*Z. angew. Chem.* 17, 617 (1904)). Numerous references to the literature are given.

F. W. SMITHER.

The chemical engineering of the hardwood distillation industry. JAMES R. WITHROW. *J. Ind. Eng. Chem.* 7, 912-6 (1915); *Chem. Eng.* 23, 33-7 (1916); *Mel. Chem. Eng.* 13, 797-9 (1915).—An address delivered at the Seattle meeting of the Am. Chem. Soc. Sequence of chem. engineering operations is given in a tabulated outline, which covers also details of manuf. of refined and derived products, including alc., acetic acid and acetone.

J. R. W.

Commercial value (of loblolly pine) for turpentine. CHARLES H. HERTY. N. Carolina Geol. Economic Survey, *Bull.* 24, 53-4 (1915).—When the loblolly pine is wounded it exudes in clear limpid drops fairly large quantities of an oleoresin. Crystn. of the dissolved acids takes place very rapidly; this leads to the rapid evapn. of its content of spirits of turpentine. Crude turpentine from the first 4 weeks' chipping in July contained 17.58% spirits of turpentine; after 4 weeks more the content was 14.11%.

The oleoresin contains only 4.2% unsaponifiable matter. The rosin left on distn. of the spirits of turpentine has an acid no. 172. Cf. C. A. 10, 965. E. H.

Apparatus for distilling mineral oils. A. LACKMAN. U. S., 1,171,524, Feb. 15. The oil is passed successively through a series of stills and preheated by vapors from each still before passing into the next succeeding still.

Separation of hydrocarbon oils. S. W. WHITMORE. Can., 165,359, Oct. 5, 1915. Naphthalene is added to the hydrocarbon and the resultant mixt. is distd.

Separating hydrocarbon oil into its constituents. S. W. WHITMORE. Aust., 7,114, Sept. 23, 1914.

Cracking oils. STANDARD OIL CO. Brit., 21,273, Oct. 20, 1914. In the production of gasoline and other light oils from heavy hydrocarbons by distg. at 650–850° F. under a pressure of 4 atms. or more, the distn. is conducted in the presence of extensive catalytic surfaces, which may consist of plates immersed in the liquid or of plates arranged in the vapor space. With this arrangement about $\frac{1}{3}$ of the charge may be distd. off, the residue constituting an asphalt. The catalytic surfaces may consist of steel, brass, Cu, or other metal in the form of plates or gauze, or of mineral fibers such as asbestos or glass. Cf. 29,862, 1912 (C. A. 8, 2058).

Apparatus for generating and burning oil gas. H. C. WADE. Brit., 21,868. Nov. 2, 1914.

Containers for combustible liquids such as benzine, petroleum. K. MÜLLER. Ger., 285,224, July 16, 1912. Addition to 233,101.

24. EXPLOSIVES AND EXPLOSIONS.

CHARLES E. MUNROE.

High explosives. VIVIAN B. LEWES. *Iron Coal Trades Rev.* 91, 251(1915).—A lecture on the manuf. and properties of modern high explosives. H. L. OLIN.

Storage and handling of explosives in mines. C. E. MUNROE. *Eng. Mining J.* 101, 349–52(1916).—In handling explosives, of which there are 1,500 mixts. of different compn., natural as well as accidental causes of detonation should be guarded against. Any considerable quantity of explosive should be bought on specification. It is bad practice to store different kinds of powder in one magazine. Detonators should never be stored with powder. The subject is discussed under the following captions: Growing number of explosive compns.; many factors affecting security from accident; considerations in handling explosives; best practice in storing explosives; temp. considerations in magazines, as to storing powder underground; open no explosives in the mine.

O. D. SWETT.

The nature of explosives. A. MARSHALL. *Nature* 96, 637–9(1915).—A glossary of terms relative to explosives, their characteristics, constitutions and behaviors, and of materials from which they are produced.

CHARLES E. MUNROE.

Propagation of flame in mixtures of hydrogen and air. W. A. HAWARD AND T. OTAGAWA. *J. Chem. Soc.* 109, 83–9(1916).—Using tubes of 9, 11.5 and 25 mm. diam., resp., and mixts. of H and air ranging from the lower to the higher limit of inflammability the max. speed of propagation of flame was obtained with 38–45% (by vol.) of H, thus confirming the finding of Mallard and Le Chatelier that the max. speed occurs with higher than the $H_2 + O$ (29.5% H) proportions. M. and Le C. have also stated that on either side of the max. the speeds vary proportionately with the H contents of the mixt. but this is not confirmed by H. and O.'s results, using Wheeler'

CHARLES E. MUNROE.

Protection of cartridges against moisture. O. MERTENS. Düsseldorf. Z. ges. Schiess-Sprengstoffw. 11, 25-6(1916).—The cartridges are made waterproof by grooving the ring between the primer and the case. The air-tightness of the cartridge may be proved by placing a cold cartridge in warm water and noting whether air bubbles appear on the surface, or by placing zinc iodide starch paper in the cartridge and attaching the open end to an air pump and the primer end to a flask in which N_2O_5 is being generated. The paper turns blue if the gas reaches it. O. L. THOMAS.

Measuring the velocity of the detonation for modern explosives. R. FÖRG. Z. ges. Schiess-Sprengstoffw. 11, 17-22(1916). O. L. THOMAS.

West Riding sewage disposal problems. Destructive effluents from explosives works 14.

HILL, W. A.: **Practical Study of the Rough Side of Nitroglycerin as Used in the Oil and Gas Fields.** Tulsa, Okla.: Democrat Printing Co. \$2.00.

Explosives. A. E. VERGÉ. Can., 166,035, Nov. 16, 1915. An initial mixt. of nitrotoluenes containing essentially 45-85% of $m\text{-NO}_2\text{C}_6\text{H}_4\text{Me}$, is nitrated, whereby a liquid $(\text{NO}_2)_2\text{C}_6\text{H}_3\text{Me}$ is produced. $(\text{NO}_2)_2\text{C}_6\text{H}_3\text{Me}$ is dissolved therein, nitroglycerin is added and in this soln. is dissolved nitrocellulose. On oxidizing salt is incorporated in the resulting gelatinous mixt. Cf. C. A. 9, 380, 381.

Explosive. W. C. WADDELL. Can., 165,605, Oct. 19, 1915. A blasting explosive composed of shot-like aggregate of small imperforate rounded units, each such unit being of uniform character and density throughout and the several units being substantially uniform in size.

Hexanitrodiphenylsulfone. C. HARTMANN. Can., 166,160, Nov. 23, 1915. $[(\text{NO}_2)_2\text{C}_6\text{H}_4]_2\text{S}$ is suspended in acid, the mixt. heated and an oxygen carrier is added with stirring.

Blasting. F. ENGELING. Ger., 285,024, July 30, 1913. A safety explosive of high disruptive power is used, with H_2O or other liquid, under pressure, as tamping, whereby a complete utilization of the explosive energy is secured, with up to 75% saving of explosive, while at the same time better mineral samples, and, in coal mining, less coal dust are obtained and the after-damp is decreased. In salt or sylvite mines a satd. soln. of MgCl_2 , end lyes, or the like, is used for tamping.

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

The dyeing of faded garments. C. M. WHITTAKER. J. Soc. Dyers Colourists 34, 59(1916).—After long exposure the wool fiber of a garment becomes burnt by sun and atm. combined and in many cases it is impossible to redye it any color but black. The problem is one of faded wool fiber rather than faded color. Scoured undyed flannel was exposed to sun and weather for two weeks in August and typical dyes were then dyed upon patterns of the exposed and unexposed flannel. Basic colors dyed the exposed flannel a heavier shade. Direct cotton colors have no fixed rule and show considerable variation. Mordant colors also vary but are not much used in garment dyeing. Some acid dyes are wholly unsuited for garment dyeing but there are others which cover the faded equally as well as the unfaded portion. A strongly acid bath seems to cover the fades better than a weakly acid bath. Indigo does not dye faded wool at all while sulfide blacks dye the faded wool heavier than the unfaded. The experience of the garment dyer shows that an oxidizing treatment is the least remedy.

for cutting up or equallizing fades. Nitric acid works well but cannot be used because it tenders the cotton stitchings and linings. The problem of treating faded garments will probably remain unsolved, because it is due to a definite change in the wool, which gradually approaches complete destruction. Proper selection of dyestuffs in some cases may give satisfactory results with colors other than black, but in most cases only black can be dyed satisfactorily.

L. A. OLNEY.

Observations on garment dyeing. F. E. ROBERTSON. *J. Soc. Dyers Colourists* 32, 44-5 (1916).—It is important that the sp. gr. of the dye bath should be comparatively low; 2° Tw. should not be exceeded. Several advantages are to be gained with H_2SO_4 in the dyeing of acid colors. If the garment has previously been dyed with acid colors they will boil off; stains not removed in cleaning will often be removed in H_2SO_4 bath. Stripping with $Na_2S_2O_4$ is now largely used. Oxidation treatment has the greatest effect in cutting up or equallizing the fades, HNO_3 being recommended when goods will stand it. Colors which exhaust slowly give most level results. L. A. OLNEY.

The multicolored discharge on indigo of diazos combined with vat colors. A. JUTEAU. *Bull. soc. ind. Rouen* 43, 16-7 (1915).—The diazos of nitroanisidine or of naphthylamine mixed with hyposulfite colors and with 240 g. $BaCl_2$ per kg. are printed, then steamed and passed open width through four consecutive vats. The 1st contains 15 g. Na_2CO_3 per l., the 2nd has 10 g. $K_2Cr_2O_7$ per l., the 3rd is a washing tank, the 4th contains 40 g. each of $H_2C_2O_4$ and HCl . In the 1st bath the $BaCl_2$ is changed to $BaCO_3$, in the 2nd the $BaCO_3$ becomes $BaCrO_4$, which in the 4th bath is decomposed with liberation of free chromic acid; this discharges the indigo. A formula is given for the indanthrene color paste.

MILES R. MOFFATT.

Hyposulfite discharge of indigo without steaming. A. JUTEAU. *Bull. soc. ind. Rouen* 43, 14-16 (1915).—A paste is prepd. with 150 g. hyposulfite powder (B. A. S. F.), 30 g. ZnO , and 100 cc. ice water. 100 g. 60° Bé $ZnCl_2$ are added with stirring, and the mixt. is made to 1 kg. with British gum. Print, dry (the drying does not cause decompn. as with hyposulfite), and pad 10-15 seconds in a boiling bath containing 10 cc. 40° $NaOH$ per l., which completes the reduction of the indigo. Then pass through a 2nd bath containing 5 g. Na silicate per l., which removes the leuco-indigo. The advantages of the process are low cost, simplicity, and keeping qualities of the printed cloth. The padding soln. must be renewed frequently, since it becomes strong with hyposulfite which attacks the unprinted portions.

MILES R. MOFFATT.

Preservation by cold of solutions of sodium aluminate. G. A. LEROY. *Compt. rend.* 162, 74-5 (1916).—Two 5-liter flasks were filled with a soln. of Na_2AlO_2 having a sp. gr. of 1.3324 and containing 21.90 g. of Al_2O_3 in 100 cc., and corked. Flask A was allowed to remain at 20°; flask B was kept continuously at -1 to -2°. After 1 month the soln. in A had a sp. gr. of 1.2736, and 100 cc. contained 7.4 g. of Al_2O_3 , while the soln. in the refrigerated flask B had a sp. gr. of 1.3322 and 100 cc. held 21.88 g. of Al_2O_3 . Pptn. began within a day or two in flask A and continued throughout the month.

L. W. RIGGS.

Process of resisting wool against dyeing. A. SAGET. Sealed letters No. 847, 878, and 879. *Bull. soc. ind. Rouen* 43, 21-34; and report on same by A. Juteau, *Ibid* 18-20 (1915).—Sealed letter No. 847. The Meister, Lucius, and Bruning process consists in: (1) Boiling the wool 1 hr. with 25% tannin soln.; (2) a cold treatment in a 15% emetic soln.; (3) 20 min. cold in 3° $SnCl_2$ soln. Saget simplifies this method by omitting the emetic bath, and combining the tin salt and tannin baths, adding oxalic acid to Sn tannate in soln. The following are the proportions he recommends: Tannin ether 10, oxalic acid 1, $SnCl_2$ 1.5, HCl 22%. The goods are entered at 40°, raised slowly to a boil, and boiled 1 hr. The presence of Fe or Cu is injurious. In No. 879 Saget admits that the M. L. & B. 3-bath process gives better results than his

single-bath method, especially if the goods must be given a light alk. treatment before dyeing or fulling. He then returns to a three-bath process, as follows: (1) $\frac{1}{2}$ hr. at boil with 10% SnCl_2 ; (2) 1 hr. at 95–100 in 25% tannin and 2% H_2SO_4 , then rinse, ext.; and (3) treat again at 89–100° in bath No. 1 to which a further addition of 2% of SnCl_2 has been made, and dry.

MILES R. MOFFATT.

Necessity of an American dyestuffs industry to aid export trade in textiles. HENRY HOWARD. *J. Ind. Eng. Chem.* 8, 273–5(1916).—An address. E. J. C.

Analysis of textiles. PONTIO. *Compt. rend.* 162, 81–3(1916).—P. suggests certain modifications of the method of Vetillard. Two solns. are employed: (A) KI 3 g., H_2O 100 g., resublimed I in excess. (B) H_2SO_4 (66° Bé.) 24 g., H_2O 16 g., glycerol (22° Bé.) 16 g. The acid and H_2O are first mixed and cooled, the glycerol is then added and mixed under the cold water tap. This reagent should be made fresh at least monthly. The fiber is boiled in dil. NaOH (2 g. to 100 g. H_2O) for 15 min., the liquid poured off and the treatment repeated. The NaOH is then poured off and the fiber washed until neutral. NaClO (1° Bé.) dild. with 3 vols. of H_2O is then added to the fiber and boiled exactly 2 min., the liquid discarded and the fiber washed thoroughly. It is then treated with NaHSO_3 (5° Bé.) dild. with an equal vol. of H_2O for 5 min. and washed to neutral reaction. The sample thus prepd. is preserved in a tube with H_2O . For the microscopic examn. the sample is dried with blotting or filter paper and placed in contact with soln. (A) for 2 min., then completely dried. Soln. (B) is then added and the cover glass placed. This treatment of fibers does not change their histologic characters. The color changes produced by the action of the reagents are best learned by comparative tests upon fibers of known origin. Also in *Ann. chim. Anal.* 21, 45–9(1916).

L. W. RIGGS.

Causes of damage in bleaching of linen and cotton textiles. J. F. BRIGGS. *J. Soc. Chem. Ind.* 35, 78–80(1916).—Mechanical damage can be detd. by an examn. of the frayed ends of the cut threads, and in some cases by noting the method of weaving, as when a loosely spun weft is combined with a warp of hard-twisted 2-ply yarn. Under the heading *chem. damage*, attention is called to the methods of the modern laundry where the same chemicals are used as in bleaching but with less expert knowledge. Chem. damage during bleaching may result (1) during boiling by the exposure of a portion of the goods above the surface of the boiling liquid; also by crystn. of CaCO_3 in the fiber, a mechanical damage from chem. causes which may be recognized by a microscopic examn. of the fiber. A type of damage which appears in the boiling but is not caused by it, is sometimes observed in fabrics woven from "creamed" linen yarn which has been "overliquored" by the yarn bleacher. (2) Damage by the bleach liquor is the most frequent source of tendering. The tests for the detection of oxycellulose are: reduction of Fehling soln.; formation of a bright yellow ext. on boiling with NaOH, the liquid afterwards turning brownish yellow; and the increased affinity for basic dyes, e. g., methylene blue. These tests will not distinguish oxycellulose caused by overbleaching from hydrocellulose produced by the action of acids. The foregoing tests can only be applied directly to fully purified cellulose; the non-cellulose residues of the fibers after treatment with bleach liquor respond to the tests in much the same way as oxycellulose. General tendering through overliquoring is usually due to a miscalculation of the chem. activity of the later bleach liquors, when the goods no longer have the protective action of a coating of non-cellulose materials. Sharply localized tendering may be caused by the action of metallic impurities, lubricating oils, and unequal immersion in the bleach liquor. Damage in the Na_2O_2 bleaching process is often so complete as to leave little evidence of its cause. The damage may be reproduced by digesting strips which have been spotted with dirty lubrication oil, brass filings suspended in clean oil, ink spots, and aq. solns. of CuSO_4 or FeCl_3 . (3) The

only source of damage by acids is the imperfect washing out of the final sour. A trace of acid left becomes concd. during the process of drying on heated cylinders and causes tendering. This acid may be detected by methyl orange if the goods have not been laundered. Cf. Lester, *C. A.* 10, 119.

L. W. RIGGS.

LUCKIESH, M.: *Color and Its Applications*. New York: D. Van Nostrand Co. 360 pp. \$3.00.

Dyeing apparatus. D. M. HEY. U. S., 1,172,240, Feb. 15.

Yellow dyes. R. SCHÜLE. U. S., 1,172,061, Feb. 15. Tetrazotized diamino-triphenylmethanesulfonic acid is combined with equimol. proportions of an arylmethylpyrazolone and an arylmethylpyrazolonesulfonic acid. The resulting dyes give a greenish yellow or orange-yellow on animal fibers in an acid bath. They are yellow to brown powders, readily sol. in H_2O with a yellow color unchanged by addition of HCl but rendered paler by addition of NaOH.

Brown disazo dye. F. ACKERMANN. U. S., 1,173,077, Feb. 22. A dye of the formula $(HO_3S)(OH)(NH_2)C_{10}H_4.N:N.C_6H_4.NH.CO.NH.C_6H_4.N:N.C_6H_4(OH)_2$ is made by combining tetrazotized 4,4'-diaminodiphenylurea with 2-amino-8-naphthol-6-sulfonic acid and resorcinol. It is a dark brown powder, sol. in H_2O ; it dyes cotton reddish brown which is rendered fast to washing by treatment with CH_3O .

Azo dyes. J. R. GEIGY A.-G. Ger., 286,091, Jan. 3, 1913. See Brit., 30,055 (*C. A.* 9, 1695).

Dyes. Soc. ANON. J. R. GEIGY (formerly ANILINFARBEN UND EXTRACT FABRIKEN, VORM. J. R. GEIGY). Brit., 22,070, Nov. 5, 1914. The monoazo dyes obtained from diazotized 2,3-Cl(NH₂)C₆H₃CO₂H and salicylic or *o*-, *m*-, or *p*-cresotinic acid are heated with solns. of alkalis, whereby the Cl atom is replaced by the OH group. The products are yellow mordant wool dyes and may also be used for calico printing with chrome mordants.

Vat dyes. KALLE & Co. Ger., 286,151, Dec. 21, 1913. α - or β -Naphthoquinone or α -naphthoquinone-2- or β -naphthoquinone-4-sulfonic acid, or their heteronuclear derivs., are condensed with indoxyl or hydroxythionaphthene, their substitution products, homologs, or analogs. The resulting dyes can, furthermore, be acylated, alkylated, or treated with amines.

Vat dyes of the naphthalene series. M. KARDOS. Ger., 286,098, Jan. 10, 1914. Addition to 276,357 (*C. A.* 8, 3243). Instead of the naphthalenedicarboxylic acid imides or the products resulting from the treatment of acenaphthenequinone with hydroxylamine or the substances split off from these, as specified in 276,357, other N-containing derivs. of acenaphthenequinone or its oxidation, reduction, or decompn. products are employed. If necessary, these compds., before or after their conversion into the dyes, may be treated with N-substituting agents.

Vat dyes of the anthracene series. M. KARDOS. Ger., 286,096, Jan. 7, 1914. Addition to 275,220 (*C. A.* 8, 3242). The process of 278,660 (*C. A.* 9, 1997) is modified in that, for the production of N-substituted dyes, the dyes obtained according to 275,220 are treated with alkylizing or aralkylizing agents.

Improving the fastness of wool dyed with vat dyes other than indigo. F. RECHBERG. Ger., 286,340, Dec. 14, 1913. Before dyeing, the wool fiber is treated with chromates or dichromates and an auxiliary mordant such as HCOOH.

Preparations for indigo fermentation vats. FARBW. v. M. L. & B. Ger., 286,338, Mar. 18, 1914. Malt husks are disintegrated by means of alk. reacting agents and thickened. The mass, however, may be preserved by working it up with concd. H_2O .

sol. carbohydrates or their substitutes, and with or without concn. to a sirupy consistence, or drying by evapp. Finally, indigo or indigo white, or indigo white preps., may be incorporated with the preps. obtained in this manner.

N-Anthraquinonylisatins. BAYER & Co. Ger., 282,400, Feb. 27, 1914. Oxalyl chloride is allowed to act on arylaminoanthraquinones, with the addition of condensation agents such as AlCl_3 , FeCl_3 , or P_2O_5 . The resulting isatins form valuable initial material for the manuf. of dyes. Cf. C. A. 9, 2598.

Anthraquinone acridones. BAYER & Co. Ger., 286,095, Mar. 3, 1914. The N-anthraquinonylisatins or anthraquinonylisatinic acids, or their salts, are treated with condensation agents such as AlCl_3 , H_2SO_4 , alkalis, obtaining thereby the acridones, valuable as vat dyes.

Arylidoanthraquinonesulfonic acids. FARBW. v. M. L. & B. Ger., 286,092, Aug. 26, 1913. 1-Amino-2-alkoxyanthraquinones which contain an acid substituent in the *p*-position to the NH_2 group, are brought into reaction with aromatic amines or their sulfonic acids, and the resulting arylido derivs. are sulfonated. Valuable violet dyes with uniform covering power are obtained in this manner.

Color lakes. P. THOMASCHESKI and P. TUST, and SYNTHETIC PATENTS CO., INC. and BAYER & Co. Ger., 286,308, Aug. 5, 1913. Addition to 285,310, U. S. 1,126,664, Jan. 26, 1915. According to 285,310 (addition to 281,422, C. A. 9, 2153), the sulfonic acids of purpurinamide (1-amino-2,4-dihydroxyanthraquinone) are converted into their alumina lakes. The sulfonic acids of 1-amino-4-hydroxyanthraquinone have now been found to yield equally valuable red-violet to violet-blue lakes, and through these the color scale of the lakes specified in the principal patent is extended further towards blue. E. g., Na 1-amino-4-hydroxyanthraquinone-3-sulfonate (obtainable by sulfonating 1-hydroxyanthraquinone, then nitrating and reducing), 1 part, is dissolved in 10-15 parts by wt. of H_2O , boiled with a soln. of 10 parts $\text{Al}_2(\text{SO}_4)_3$ (18% Al_2O_3) in 100 parts H_2O , and then pptd. hot with a soln. of 4 parts calcined soda in 40 parts H_2O . The lake is then prepd. in the usual manner, and yields clear violet coatings of great permanence.

Color lakes. BAYER & Co. Ger., 285,310, Jan. 9, 1913. Addition to 281,422 (C. A. 9, 2153). The principal process is modified in that the purpurinsulfonic acid is substituted by aminopurpurinsulfonic acids. The resulting lakes have a bluer shade than do those of the principal patent. The aminopurpurinsulfonic acids may be obtained from the corresponding purpurinsulfonic acids by treatment with NH_3 ; they dissolve in H_2O with a red color, and in dil. alkali with a red-violet color. The yellow soln. in concd. H_2SO_4 becomes orange in color upon the addition of H_3BO_3 . E. g., 1 kg. Na aminopurpurin sulfonate and 20 kg. $\text{Al}_2(\text{SO}_4)_3$ (18% Al_2O_3) are dissolved in 180 liters of hot H_2O . The filtered soln., while boiling, is mixed with 80 liters of a 10% soda soln., whereby the aminopurpurinsulfonic acid is pptd. as alumina lake with $\text{Al}(\text{OH})_3$. The color lake shows a deep purplish red color, and can be applied as a paste, or dry.

Color lakes from basic coal-tar dyes. BADISCHE. Ger., 286,467, Aug. 9, 1913. Expts. have shown that the basic coal-tar dyes are pptd. by phosphometatungstic acid and its salts in insol. form, and that the resulting ppt. is applicable as a color lake, as it is waterproof, brilliant, and fast to light, greatly excelling in these respects the usual tannin lakes.

Dyeing pelts, hair, feathers. FARBW. v. M. L. & B. Ger., 286,339, May 5, 1914. Aminohydroxynaphthalenes, with *p*-diamines, together with oxidizing agents, are dyed out on mordanted or unmordanted materials.

Dyeing pelts, hair, feathers. CHEM. FABRIK GRIESHEIM-ELKTRON. Ger., 286,337, Apr. 25, 1914. After the preliminary mordanting, the materials are treated with a soln. of *m*-hydroxydiphenylamine with the addition of suitable oxidizing agents.

Preparing vegetable fiber for spinning and weaving. C. MELHARDT. Ger., 286,270, Oct. 1, 1914. The H_2O sol. portion is sepd. from the incrusting substance, with prevention of fermentation, then the vegetable portion sol. in alkali carbonates or like solvents is sepd. from the other constituents. The vegetable fiber is boiled in H_2O until no more soln. is apparent. The product is then boiled for 12–18 hrs. in a soda or potash soln. of about 1%. The residue remaining in the fiber is then entirely removed with soap soln. or the like.

Cellulose products. GLANZFEDEN-AKT.-GES. Ger., 286,297, Aug. 17, 1913. The pptg. bath contains, besides caustic alkalies, $CuCO_3$ which has been formed in the bath itself by the addition of $Cu(OH)_2$ and alkali carbonate. During the spinning the necessary amts. of alkali carbonate are added to the bath from time to time, as the $Cu(OH)_2$ is introduced with the thread, the latter being converted continuously into $CuCO_3$. E. g., $NaOH$ 400 kg. and Na_2CO_3 50 kg. are added to 10,000 liters H_2O . $Cu(OH)_2$, about 50 kg., is then dissolved in the bath. This need be added but once, since during the spinning of the $CuO-NH_3$ -cellulose solns. a certain portion of the $Cu(OH)_2$ goes over into the bath and is converted into $CuCO_3$ by the soda added during spinning. In such a bath a rate of spinning of 45 m. per min. may be secured, in spite of the lower concn. of the $NaOH$. To freshen the baths, a portion of the bath is carried back from time to time, so that always a desired amt. of $CuCO_3$ remains in the principal bath. The portion drawn off is regenerated by evapn., whereby the NH_3 is recovered in the usual manner, and the $CuCO_3$, readily decomposed at a b. temp., seps. as a granular anhydrous salt, without the use of the otherwise necessary reducing agent.

Acetylcellulose filaments. KNOLL & Co. Ger., 286,173, Oct. 10, 1912. In the manuf. of artificial silk thread from acetylcellulose, the difficulty experienced heretofore in unwinding the thread for further spooling, on account of electrification, is overcome by passing the thread, after washing, before or after drying, through a soap bath or a bath of H_2O -sol. oil. In this manner the sep. threads adhere but slightly, and may be unwound easily.

Machine for dressing silk stuffs. E. SCHNEEBELI & Co. Ger., 286,209, Aug. 9, 1912. The freshness, texture, and luster of the material are retained, while the time of treatment is shortened and various treatments are possible.

Loading silk. I. KREIDL. U. S., 1,173,195, Feb. 29. Silk is loaded by dipping in a soln. of a salt of Zr, Yt, Ce or Th, followed by treatment with a phosphate soln. as usual in loading with Sn.

Loading silk. I. KREIDL. U. S., 1,173,196, Feb. 29. Silk is loaded by satg. with a colloidal soln. of Zr hydroxide or other rare earth hydroxide, followed by treatment with Na phosphate.

Apparatus for bleaching yarn. H. R. ANDERS and E. U. SCHÖEDLER. U. S., 1,173,474, Feb. 29.

Apparatus for bleaching yarn. S. BARKER. U. S., 1,173,160, Feb. 29.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

The blackness of ink spots on paper. W. MECKLENBURG. Z. *Elektrochem.* 22, 23–7 (1916).—The Schluttig and Neumann method of comparing strips of paper streaked with ink and air-dried is qual. only. "Blackness" is defined as the absorption capacity shown by ink spots under given conditions. M. det. blackness by means of a Tyndall meter (cf. C. A. 8, 2974; 9, 742, 2831). The light passing through a gypsum plate is used as a comparison standard. Ink streaks prepd. according to S. and N., or blots on

filter paper, are placed at an angle of 45° to the axis of the ray and the reflected light is observed in a direction perpendicular to the axis of the ray and in an angle of 45° against the plane of the ink spots. The reflected light is compared by means of a Lummer-Brodhun cube with the light direct from the gypsum plate, the brightness of the comparison ray being reduced by a system of rotary nicols till of same intensity as that reflected from the spots. The angle is read off on a scale and gives a measure of the brightness of the light reflected by the ink spots. Spectral examn. shows that the characteristic "ink black" obtained from an Fe-tannate ink free from dyes is not a dark (deep) neutral gray, but that the green and red rays of the spectrum are more strongly absorbed than the greenish blue. Expts. with ink blots on filter paper show that the relative amt. of the reflected light from the greenish blue is 515μ (the blue field of the spectrum could not be measured with certainty), olive-green 560μ , red 665μ , wave length. Similar, but not identical, results were obtained with strips prepd. according to S. and N. from a commercial Fe-tannate ink after removing dyes with 50% alc. Expts. with the S. and N. and the filter-paper methods showed that the "blackness" of the ink spots diminished very slightly with decreasing amts. of tannin substances and Fe until high dilutions are reached, due to the "hiding power" of a relatively thin layer of the ink "body." It appears possible that although the blackness of the spots from diluted ink is slightly less than that from concd. ink, the permanence of the former follows closely that of the latter. The expts. of S. and N., in which inks made from equal wts. of various components are compared, give no information as to the permanence of the characters or spots from the same inks after different dilutions. Further work is in progress. Tables and curves are given. Cf. Hinrichsen, *C. A.* 1, 783; 2, 1670, 1888; 4, 121, 1550, 1813; 8, 2069; 9, 2155; Kedesdy, 2, 3152.

F. W. SMITHER.

Standard methods of testing varnishes. W. G. SCOTT. *Drugs, Oils and Paints* 31, 249-52(1915), 288-9, 326-7(1916).—For detn. of *viscosity* use the Scott viscosimeter at 70° F., H_2O being used as the standard. Det. *sp. gr.* with Westphal balance or hydrometer. Det. *n* with Abbe refractometer. *Color density*: Compare samples with standard solns. prepd. from solns. of $FeCl_3$, $CoCl_2$ and $CuCl_2$; complete directions are given for this detn. For detn. of *flash point* use open tester. S. states that a chem. analysis is of no value except for the detn. of thinner and the detection of rosin. *Time of drying*: Flow sample on a glass plate and dry at an angle of 60° ; when a minute quantity of fullers' earth is dropped on the surface and none adheres when blown off with the breath, the film is "set free from dust;" when the finger ceases to give an imprint, the film is dry. For examn. for *mixing properties*, any ppt. or cloudiness which occurs on dila. with turpentine or with benzine is noted. *Waterproof qualities*: The effect of water on films of varnish on glass and on varnished panels is noted. *Gas-proof properties*: Freshly varnished panels are dried in a box in which two gas jets are burning. Any cracking or flattening of the film during drying is noted. Working properties, flowing quality, "setting" point and physical defects are noted by panel tests. *Fullness or body*: Directions are given for measuring the thickness of films with a micrometer or by calcn. from the wt. and sp. gr. *Metal plate films*: Sn, Cu or brass plates are coated with Hg and the varnish applied. When dry the film can be stripped from the plate and examd. *Paper film*: Blotting paper is sized with starch and when dry is coated with the varnish. When the film is dry, the paper is soaked in water and the film removed and examd. *Luster, gloss and brilliancy*: Samples are compared with each other or with arbitrarily selected standards. For this comparison, an under coat of dead black is recommended. *Hardness and toughness*: The hardness is roughly measured by laying a piece of duck on the varnished surface and applying a weight. Whether or not a print is made in the film is noted. *Elasticity* is roughly tested by means

of the point of a knife blade. S. condemns accelerated "weathering" tests, made in the lab. For actual weathering tests, he recommends that the varnish be applied to painted steel plates. Directions for painting the plates and carrying out the tests are given.

E. W. BOUGHTON.

Trade intoxications through celluloid varnishes in the aviation industry. F. KORTSCH. *Münch. med. Wochschr.* 62, 1567-9(1915).—The wings, etc., of aeroplanes are varnished with acetylcellulose dissolved in various solvents, among which tetrachloroethane is used. Nine workmen handling such a varnish were taken sick with gastrointestinal symptoms, swelling of the liver and icterus, besides some nervous symptoms such as vertigo or paresthesias. The disease is referable to tetrachloroethane, which is readily absorbed through the skin and by inhalation. Simple masks do not protect against the inhalation of the fumes.

S. AMBERG.

Plastic masses from yeast (BLÜCHER) 18.

Inking rolls. C. NEUBERT. *Ger.*, 286,368, Mar. 5, 1914. The rolls are made of glycerol-gelatin or other colloidal substances, with a coating of rubber. The rubber coating, applied by dipping or spreading, is vulcanized with the usual vulcanizing agents, such as SCl_2 or CS_2 . This rubber coating combines firmly, as a colloid, with the glycerol-gelatin mass, and offers a strong resistance against the pigment diluents used in printing, such as benzene, turpentine, and the like. The rubber surfacing remains smooth and intact.

Etching autotype printing forms. W. J. WILKINSON. *Ger.*, 285,563, May 20, 1913. The plate, prepd. in the usual manner for etching, is first etched flat, then unscreened copy of the original in chromate-glue is transferred to the plate, and the plate is then etched again. By this double etching of the plate a greater contrast is secured.

Pigment etching. A. NEFGEN. *Ger.*, 286,285, Apr. 21, 1914. In pigment etching the interruption of the process and its later completion is often desirable. This is accomplished without difficulty by removing the etching agent with alc., which stops the action of the etching agent without affecting the gelatin film. *E. g.*, the greater portion of the FeCl_3 is rinsed off in a very short time with cold H_2O , and then the pigment layer is washed with dil. and then with concd. alc. The work can then be examined deliberately, treated as desired, and the etching process can be resumed.

Mineral pigments. M. LOEWE. *Ger.*, 285,882, Dec. 31, 1913. Suitable reagents are allowed to act upon the metal compds. of base-exchanging substances. *E. g.*, a K_2CrO_4 soln. is allowed to act upon the Pb compd. of a base-exchanging compd., produced by heating zeolite prepd. by fusion, for 15 mins., with a 10% $\text{Pb}(\text{NO}_3)_2$ soln. and washing out the resulting product. According to the conditions of the expt., *i. e.*, working in the cold or in the heat, and depending upon the Pb content of the base-exchanging compd., a chrome yellow of varying shades is obtained. If a 5% K_4FeCy_6 soln. is allowed to act on the Fe_2O_3 compd. of a base-exchanging compd., a beautiful Prussian blue is obtained.

Pigments. M. LOEWE. *Ger.*, 285,883, Jan. 24, 1914. Addition to preceding pat. Lake-forming org. compds. or their sol. salts are allowed to act on metal compds. of base-exchanging compds. Those bases which are necessary for the formation of the lake are first introduced into the base-exchanging substance. If the org. dye is allowed to act upon these metal compds., the lakes of the particular dyes with the metals are formed. The several bases can be combined with each other, with the production of special shades. For this purpose, the salt solns. of the bases to be combined are mixed in the required proportion, and this mixt. is allowed to act upon the base-exchanging compd., whereby the combined bases are taken up by the base-exchanging compd. in

the desired proportion. *E. g.*, the Al compd. of the base-exchanging substance is obtained by heating an artificial, finely pulverized zeolite, for 30 min., with a 5% $\text{Al}_2(\text{SO}_4)_3$ soln. This is washed out until no trace of $\text{Al}_2(\text{SO}_4)_3$ remains in the filtrate, whereupon it is brought into reaction with a soln. of Na alizarinsulfonate. The resulting red lake is sepd. from the liquid, washed, dried, and slimed.

Pigments. N. W. TURKIN. U. S., 1,173,330, Feb. 29. Color pigments such as Biebrich scarlet are boiled with a mixt. of alizarin oil, basic Al acetate, C_{10}H_8 and fish oil to produce a colloidal soln., which solidifies on cooling, for use in paints, dyes or varnishes.

Flat paint. C. ELLIS. U. S., 1,173,183, Feb. 29. A paint drying with a dull surface is formed of white lead or other pigment and natural linseed oil with a small addition of hydrogenated linseed oil.

Paint- and varnish-remover. J. M. WILSON and C. N. FORREST. U. S., 1,173,628, Feb. 29. A clear soln. of 2.5 oz. of paraffin and a clear soln. of 2.5 oz. of collodion are mixed with CCl_4 1 qt., turpentine or acetone 1 qt. and C_6H_6 2 qts. or with C_6H_6 3 qts.

Paint- and varnish-remover. C. ELLIS. U. S., 1,172,772, Feb. 22. A sirupy finish remover is formed of Na benzoate 5 lbs., dry soap 10 lbs., ceresin wax 25 lbs., celluloid 45 lbs., MeOH 2.5 gals., EtOH 50 gals., C_2Cl_4 40 gals. and $\text{C}_2\text{H}_5\text{Cl}$ 10 gals.

Paint- and varnish-remover. C. ELLIS. U. S., 1,172,773, Feb. 22. C_6H_6 40, MeOH 30, acetone 10, hard paraffin (m. 60° or higher) 0.5-1.0, pyroxylin 3-4, benzyl alc. 8 and pine oil 7 parts are mixed to form a finish remover.

Varnish. E. GIRZIK. Ger., 286,049, May 10, 1913. Train oil and like half-drying oils are used in the manuf. of oil cloth, linoleum, etc. Cf. Fr., 468,003 (C. A. 9, 1398).

Acetylcellulose varnish. L. CLÉMENT and C. RIVIÈRE. U. S., 1,173,931, Feb. 29. A varnish is formed by dissolving acetylcellulose in a mixt. of $\text{C}_2\text{H}_5\text{Cl}$ 90% and amyl alc. 10%.

Surfacing material. F. BURGESS. Can., 165,137, Sept. 28, 1915. A wall or floor surfacing material consists of a layer of varnish, a layer of coarsely ground nut shell embedded therein, a second layer of varnish, a filling layer of finely ground nut shell and a final layer of varnish.

Packaging shellac. B. K. FORD. U. S., 1,173,257, Feb. 29. Orange shellac or similar material is put up in metal receptacles which are lined with Cu to avoid action on the metal.

Coating metals with phenolic resins. W. B. JONES. U. S., 1,171,725, Feb. 15. Articles formed of sheet Fe or other metal are coated with phenolic condensation products with an intermediate layer of linseed-oil varnish between the coating and article to effect a firm union.

Viscose used with phenolic condensation products. J. M. TAYLOR. U. S., 1,172,073, Feb. 15. Viscose produced in the usual manner from 10 parts of cotton or wood pulp is mixed with PhOH 12 and CH_2O 12 parts and the mixt. is heated to obtain a hard dense product somewhat resembling shellac, suitable for the manuf. of molded articles or for use in varnish.

27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

A study of wool fat. ANDRÉ DUBOSC. *Bull. soc. ind. Rouen* 43, 136-40(1915).—An analysis of the sample, which apparently was Yorkshire grease, is given, with some

exptl. results on purifying the sample with EtOH, 66° H₂SO₄, aq. NaOH, and alc. NaOH. Of all these treatments D. concludes that the one with aq. NaOH is the most practical and economical provided that excessive agitation resulting in emulsification is avoided.

MILES R. MOFFATT.

Completely hydrogenated fats. E. THIELE. *Seifensieder-Ztg.* 43, 26-7(1916).—Two tables are given showing I nos. of 10 completely hydrogenated fats. The figures range from 0 to 1.2.

E. SCHERUBEL.

Catalytic hardening of fats by nickel oxide. W. MEIGEN. Freiburg i/Br. *J. prakt. Chem.* 92, 390-411(1915).—M. defends his former assertion that it is metallic Ni which transfers H to oils and fats instead of some suboxide of Ni as maintained by Erdmann and Bedford (cf. *C. A.* 9, 3136). New expts. are described, some in detail, on the hardening of sesame and soy bean oils at 240-280°, using Ni oxides and at 170-180°, using reduced Ni as catalyzers. Results of tests for metallic Ni, evolution of H, elec. cond. and formation of Ni(CO)₄ are given. *Summary:* (1) Ni oxide is an active catalyst only when free metal is present. (2) Erdmann's objections to M.'s former expts. are based on false assumptions. (3) The presence of free metal in used catalyzers is again proved. (4) Lack of elec. cond. or absence of carbonyl-reaction are not proof of the absence of free Ni, while positive results with these tests always prove its presence. (5) The sp. gr. of catalyzers depends essentially upon org. impurities and proves nothing as regards presence of Ni suboxide. (6) The assertion that suboxide or "suboxide hydride" is formed, is not proved.

P. ESCHER.

A new oil-bearing seed plant. E. M. JASON. *Kew Bull.* 1914, 333; *Chem. Druggist* 1915, 46; *J. pharm. chim.* 13, 26(1916).—The seeds of the South American plant *Osteophloeum platyspermum* Warb. (*Myristica platyspermum* Spruce) yielded to petr. ether 55.2% of a solid white fat of very slight odor; m. 43° f. p. 39°, sapon. no. 240.2, free fatty acids 5.3%, I no. 6.3 n₄₀° (Zeissbutyro-refractometer) 36.9. S. WALDBOTT.

Tobacco-seed oil. N. H. COHEN. *Mededeelingen van het Proefstation voor Vorstenlandsche Tabak* 1915, No. 14, 57-65(1915); *Bull. Agr. Intelligence* 6, 1481.—Tobacco seed contains an oil which is as good as linseed oil for making varnishes. The seed should be collected as soon as the highest leaves have been gathered. About 3 cwt. of seed can be obtained per acre; this would give 1 1/4 cwt. of oil. The oil cake has some value, particularly on account of its N content (av. 4.2%). Some difficulties in collecting and drying the seeds will have to be overcome before their exploitation for oil can be profitable.

E. J. C.

Bean oil (oil from *Phaseolus vulgaris*). FRANZ WITKE. *Chem. Ztg.* 40, 147-8 (1916).—Oil extd. from the last crop with C₆H₆ amounted to about 2% of the dry material, and the acid, sapon., ester, I and Hehner nos. were 17.2, 179.2, 162.0, 97.9, 78.2, resp. The unsapon., P and lecithin were 5.6, 0.98 and 25.6%, resp.; n_D²⁵ = 1.4865. The fatty acids were sepd. and gave for the sapon., I, acetyl no., acetyl acid no., and acetyl sapon. no. 193.1, 124.6, 52.7, 175.4 and 228.1, resp.; n_D³⁸ = 1.4691. Cf. Kosutany, *Landw. Vers. Stat.*, 54, 463(1900); R. Meyer, *Chem. Ztg.* 27, 958(1903).

J. H. MOORE.

Tea-seed oil. J. J. B. DEUSS. *Mededeelingen van het Proefstation voor thee* 1914, No. 33; *Bull. Agr. Intelligence* 6, 1197-8(1915).—The paper deals especially with the oil of seeds of *Thea assamica* (J. W. Master), and *T. sinensis* L. Expts. carried out on a small scale have shown that tea seeds can be successfully exported to London when carefully packed. 43% of oil was obtained by extn. from the seeds dried at 100-105°; if pressure is used the amt. of oil obtained is not increased and there is risk of obtaining saponins in the oil. When absolutely clear the oil contains no saponin. If the seeds become dark brown on drying the oil may be darkened and difficult to purify; other-

wise it is of a golden yellow color. The oils from different species are very similar, are nondrying oils, and possess an agreeable taste. They are used by the Chinese for culinary, medicinal, and toilet purposes. They may also be used in the manuf. of soap and for lubricating purposes as they acidify with difficulty. Tea-seed oil resembles olive and peanut oils in its analytical characteristics. The oil cake after extrn. has no great value, containing only 1.92% N. F. W. SMITHER.

Seed analysis. N. E. KATZ. *J. Ind. Eng. Chem.* 8, 264(1916).—Formulas are given for detg. % of hulls to mix with kernels in order to dil. the cake to desired NH_4 content and also for detg. % of hulls in uncooked and unextrd. meats.

E. SCHERUBEL.

Determination of ricinic acid in oil preparations. F. ERBAN. *Seifenfabrikant* 36, 108-10(1916).—The distribution of the H_2SO_4 consumed during sulfonation and of the alkali used in neutralization is discussed. Less than $\frac{1}{4}$ of the amt. of acid used is combined in the oil. A table is given showing % neutral fat, ricinic acid, diricinic acid, lactide-combined H_2SO_4 and distribution of KOH used for neutralization. Cf. C. A. 9, 1255, 2820; 10, 285.

E. SCHERUBEL.

Note on the saponification value of oils. D. WOODROFFE. *Collegium, London* 1915, 336; *J. Am. Leather Chem. Assoc.* 11, 161(1916).—W. objects to Fahrion's statement (C. A. 9, 1851), that 10 min. boiling with alc. KOH is sufficient, and gives results showing that some oils require longer; he recommends $\frac{1}{2}$ hr. L. B.

Experiments on the catalytic hydrogenation of oil from the French colonies. First series of experiments, "Karité" of French W. Africa and "Aouara" of Guiana. H. HEIM AND A. HEBERT. *Ministère des Colonies, Bull. de l'Office Colonial* [59] 8, 238-44(1915); *Bull. Agr. Intelligence* 6, 1247-8(1915).—Karité (*Butyrospermum parkii*) butter and fat of Aouara nuts mixed with the catalyzer were placed in flasks and pure dry H was passed through at a pressure of 1 to 2 cm. of Hg above atm. pressure. The process was carried out at 50° and also at 180 – 200° for 12 hrs. with const. agitation. As catalyzers reduced Pt in the proportion of 1% and reduced Ni, 5%, were used. At the end of the process the mixt. was dissolved in benzene and the fat obtained by evapn. Results are given in the following table:

Treatment.	Karité butter.		Fat of Aouara nuts.	
	M. p.	I. value.	M. p.	I. value.
Initial.....	32°	65.6	30°	9.5
After hydrogenation with Pt at 50°	35°	57.6	30° – 31°	9.2
After hydrogenation with Pt at 180° – 200°	67° – 68°	16.0	32°	8.1
After hydrogenation with Ni at 50°	34° – 35°	48.0	30° – 31°	9.0
After hydrogenation with Ni at 180° – 200°	69° – 70°	9.6	32°	6.7

F. W. SMITHER.

Low grade fat soaps and remelted soaps. L. B. *Seifensieder-Zig.* 43, 2-3(1916).—Discussion of mfg. process.

E. SCHERUBEL.

Conservation of fats and oils by using fillers in soaps. G. HAUSER. *Seifenfabrikant* 36, 107-8(1916).—Discussion of the use of well-known fillers. E. SCHERUBEL.

Composition of the seeds of *Martynia Louisiana*. E. H. S. BAILEY AND W. S. LONG. *J. Ind. Eng. Chem.* 7, 867-8(1915); see C. A. 9, 2989. E. J. C.

Theoretical considerations on hydrogenation (KORÉVAAR) 2. Lubricating oil for Diesel engines and air compressors (MOORE) 22.

HYDE, F. S.: *Solvents, Oils, Gums, Waxes, and Allied Substances.* London: Constable & Co. 176 pp. 8s, 6d.

Soluble catalyst for hydrogenating oils or fats. N. SULZBERGER. U. S., 1,171,902, Feb. 15. Pd oleate free from protective admixts. which would prevent deposition of Pd at a temp. of 50° is used as a catalyst for hydrogenating oils. It is prepd. by reaction of Na oleate on PdNH₄ chloride and is a yellowish oil, insol. in H₂O, sol. in ether, fats and oils and decomposes on heating or spontaneously on standing, with deposition of Pd.

Catalyst for use in hydrogenating oils. A. SCHWARCMAN. U. S., 1,172,062, Feb. 15. Ni and Al₂O₃ in molecular association are prepd. by adding NaOH soln. to a soln. containing Ni and Al sulfates or other sol. Ni and Al salts, washing and drying the ppt. and reducing it in H. A protective colloid such as wool, hide, hair or glue is preferably dissolved in the NaOH soln. used.

Hydrogenating oils. GEO. CALVERT. Can., 166,053, Nov. 16, 1915. See U. S., 1,142,668 (C. A. 9, 2003).

Extracting oils with chlorinated hydrocarbons as solvents. E. O. BARSTOW. U. S., 1,171,408, Feb. 15. Solvents such as CCl₄, recovered by distn. after use in extg. oils or other substances, are passed upward through a layer of CaO, to neutralize any acid which has been formed in the solvent by decompn. The purified solvent is then used again in the extn.

Oil presses. J. W. PAYNE. Brit., 21,780, Oct. 30, 1914. An oil press is provided with means for alternately raising and lowering the pile of plates, means for charging the top plate in the lower position, and means for retaining the top plate in the upper position, so that the plates are charged one by one and assembled in the upper position, after which pressure is applied for the extn. of the oil.

Powdered soap mixture. S. McCOMB and J. B. McCOMB. U. S., 1,172,297, Feb. 22. A pulverulent detergent is formed of soap 20 lbs., borax 6 lbs., Na₂CO₃ 3.5 lbs., ultramarine blue 8 oz., glycerol 8 oz., and oil of cedar leaves 3 oz. 10 oz. of this mixt. in 4 gals. of hot H₂O is used for brushing carpet or rugs.

A wax-like product from wool fat. J. LIFSCHÜTZ. Ger., 286,245, Jan. 28, 1914. According to 76,613, a considerable part of the wax-like constituents can be extd. from wool fat by fusel oil. The yield, however, is very small (8-10%). Expts. have shown that satisfactory yields of a good wool-fat wax are obtainable by subjecting the crude material, before treatment with solvent, to a partial saponification. The liquid, readily fusible and fatty constituents are attacked first by the alkali, so that not until these are broken up are the higher melting solid substances saponified. If, then, wool fat is saponified, and samples are taken during the process, which are washed with alc. or benzine-alc. in the cold, there is obtained after removing the acid from the undissolved portion a more or less high melting wax product which approaches qualitatively the natural waxes. E. g., wool fat, 100 kg., is saponified with KOH 15 kg. During the saponification tests are taken from time to time and extd. with solvent. The undissolved residue is treated with acid and melted over H₂O. If a test has a wax-like substance of high m. p. and waxy plasticity, the saponification is discontinued, and the whole mass is extd. with alc. or MeOH.

Obtaining a wax mass from wool fat. J. LIFSCHÜTZ. Ger., 286,244, Nov. 26, 1913. The wax is obtained directly from the wool fat. The method depends upon the observation that the soly. of the fatty acids of the wool fat, as such or as alkali soaps, and the soly. of the alc. of the same in alcs. such as wood spirit or EtOH vary, almost uniformly, in inverse proportion to the m. p. of the corresponding fatty acids and the alc., so that lanoceric acid (m. p. 104°), or the alkali salt and solid cholesterol (m. p. 145° and 137°), are practically insol. in 60-70% alc., and oleic acid (m. p. 15°), or its alkali soaps and the soft "cholesterol fraction 2⁰⁰" are most readily sol. If, there-

fore, the saponification or hydrolysis product of wool fat is washed out sufficiently with alc. at the ordinary temp., the readily fusible and liquid constituents go into soln., while the difficultly fusible wax-like constituents remain as a solid cryst. slurry which yields, after removal of the alc. and liberation of the contained acid portion, a bright yellow, wax-like mass m. at 65–68°. This product consists for the most part of the difficultly fusible alcs. and fatty acids of the wool fat. *E. g.*, 1000 kg. crude acid or neutral com. wool fat are saponified, the reaction product is drawn off into a wash vessel, and washed out therein with 60–70% alc. at the ordinary temp. The solid white sludge is mixed with an equal vol. of H₂O which has been mixed with the necessary amt. of mineral acid, and heated to drive off the alc. After a short period of clarification the H₂O is drawn off, and the molten wax mass, after purification on account of color and odor, is collected in shaping vessels. After cooling a light yellow, odorless wax mass is obtained, which resembles carnauba wax in its fracture, but in section, m. p., and plasticity it is very much like beeswax. By employing stronger alc., the m. p. may be raised materially. The yield of wax is claimed to be 35–40% of the crude acid wool fat, and 45–50% of the crude neutral wool fat. The spirituous wash liquor can be worked up into wool fat acids.

28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

The constants of the quartz-wedge saccharimeter and the specific rotation of sucrose. I. The constants for the twenty-six gram normal weight. F. BATES AND R. F. JACKSON. *Bur. Standards. J. Wash. Acad. Sci.* 6, 25–31 (1916).—The purest commercial granulated sugar was purified by repeated recrystn. Two recrystns., removed the ash and reducing power became a minimum. A study of the reaction velocities of the reduction with sucrose and invert sugar showed that a great part, if not all, of this reduction was due to sucrose. By 32 fractional crystns. 5 fractions were obtained which yielded essentially identical rotations. This was considered evidence of the purity of the substance. The rate of decompn. into caramel was detd. at different temps. The sugar was finally dried by a few hrs. heating at 50–60° under 0.001 mm. Hg in the presence of CaO. The sugar was weighed in a volumetric flask. The vol. of soln. was detd. by filling to the mark, and by calcn. from the wt. and d., the latter being taken from tables giving % compn. Each soln. was measured on a polarimeter, and also on 2 of 3 saccharimeters. The calcd. rotation of normal sugar soln. was 40.763°, $\lambda = 5461 \text{ \AA.}$, and 99.89° S, Herzfeld-Schönrock standard. The conversion factor for quartz was calcd. to be 34.620° for $\lambda = 5892.5 \text{ \AA.}$, and 40.690° for $\lambda = 5461 \text{ \AA.}$ For quartz it was detd. that $\phi \lambda = 5892.5 \text{ \AA.} / \phi \lambda = 5461 \text{ \AA.} = 0.85085$; and for sugar, 0.84922. The rotation of the normal soln. was calcd. to be 34.617° at 20°, for $\lambda = 5892.5 \text{ \AA.}$ From 2 values for the rotation of quartz, the thickness of the normal plate was calcd. to be 1.5934 mm. and 1.5940 mm. The calcd. specific rotations for sugar were $[\alpha]_{\lambda=5892.5}^{20.0} = 66.529^\circ$ and $[\alpha]_{\lambda=5471}^{20.0} = 78.342^\circ$. P. M. GINSY.

Comparative action of sucrose and invert sugar on cupropotassic solution. I. MAQUENNE. *Compt. rend.* 162, 145–9 (1916); cf. *C. A.* 10, 980.—Data and curves are given for the reduction of sucrose and invert sugar at different temps. and for different times of heating. The temp. coefficient of the reduction of invert sugar is const. above 70°, and small enough that a variation of 2–3° makes a negligible difference in analytical results, while that of sucrose increases with the temp. This explains the fact that analyses made at the boiling temp. give results which vary with the atm. pressure. With the bath at 65°, the reduction of invert sugar is const. for a time exceeding 15 min.; at 100°, it is const. for above 10 min. The reduction of sucrose in-

creases with the time, and at 65° and 70°, with an amt. of sucrose not exceeding 15 g., it is proportional to the time. From this, M. deduces the following rule: Every sugar 10 g. of which gives in 10 min. at 65° a reduction, the double of which exceeds by one division or more (using the thiosulfate detn. of Cu) that which is obtained under the same conditions in 20 min. heating, contains invert sugar. This method shows the presence of 0.5 mg. of invert sugar with 10 g. sucrose. At 100°, the reduction due to sucrose decreases as the amt. of sucrose increases.

P. M. GIESY.

Determination of reducing sugar by the use of cupro-potassic solutions; different causes of error. H. PELLER. *Ann. chim. anal.* 20, 123-5 (1915); cf. *C. A.* 9, 2463; 10, 538.—By boiling 5 g. sucrose dissolved in 20 cc. H₂O with 40 cc. of Fehling soln., and calcining the Cu₂O, one gets, after 1 min. boiling, 0.020 g. CuO, after 2 min. 0.040 g., after 3 min. 0.060 g. By the new procedure of P. (*C. A.* 8, 1681) one gets 0.004 g. The new procedure is described.

P. M. GIESY.

Experiments on the use of sodium phosphate in white sugar manufacture. P. DE SORNAY. *Bull. soc. chim. de Maurice* 6, 41-4 (1915); *J. Soc. Chem. Ind.* 34, 916.—Laboratory experiments seem to show that using sodium phosphate as a clarifier increases the purity of the treated juice. CaO is reduced 23-34%, going into the scums, and Na displaces K. Practical trials in a Mauritius sugar factory resulted in improved color of the sugar, less incrustation in the evaporators, and more ready boiling than when the ordinary method was used. The sodium phosphate which was used contained 25% H₂PO₄ and 0.1 g. was added per l. of the defecated juice.

P. M. G.

Sugar beets attacked by *Cercospora beticola* sacc. E. SAILLARD. *Compt. rend.* 162, 47-9 (1916).—This year sugar beets were attacked by a mold, *Cercospora beticola* Sacc.; the yield of sugar was poor in quality and quantity, although the sucrose content was nearly the same as usual. The juices were less pure and contained more salts; the alk. juices and sirups lost a large part of their alkalinity during the heating. Analyses given show that the total, amino, ammoniacal, and harmful N was much higher than usual; also that there were present dextrorotatory substances, other than sucrose, which were not pptd. by Pb subacetate in the course of analysis. These substances, like the amino and ammoniacal N, disappear in the course of manuf., so that the molasses contains very little of them, and the rotation is consequently lower.

P. M. GIESY.

Japanese cane. JOHN M. SCOTT. Univ. Florida Agr. Expt. Sta., *Bull.* 129, 44 pp. (1916).—Fertilizer expts. are reported. In addition to the results as to yield of cane it has been shown that the fertilizer does not change the % of sucrose in the juice.

E. J. C.

Continuous sugar-making process. J. NAYLOR, JR. U. S., 1,172,303, Feb. 22. Masseccuite is continuously introduced into a centrifugal separator arranged to discharge continuously sugar and molasses separately. About half the molasses withdrawn is heated to 95° or above and returned immediately to the separator at the same point where the masseccuite is fed, to thin the latter.

Apparatus for bleaching cane juice with sulfur dioxide. L. C. GREVENBERG. U. S., 1,172,133, Feb. 15.

Desugaring molasses and boiling down last runnings. A. GRÄNTZDÖRFFER and A. LIST. Ger., 284,973, Apr. 17, 1910.

Preventing foaming in the scalding process of obtaining sugar sap. E. NEUFELDT. Ger., 285,100, Feb. 28, 1914.

Desugaring starch. DEXTIN AUTOMAT G. M. B. H. Ger., 286,362, June 22, 1914. Starch is treated until it swells, and then mixed with pulverulent starch

moistened with concd. acid. This mixt. is then heated slowly, by indirect heating, to a temp., 105–150°, suitable for the production of dextrin.

Treatment of gums. F. v. RAYMOND. Can., 163,835, Nov. 2, 1915. Process for treating of kauri and like gums by sand blasts, containing sands of different grades or qualities operated by compressed air.

29. LEATHER AND GLUE.

LLOYD BALDERSTON.

Proposed additions to methods. ANON. J. Am. Leather Chem. Assoc. 11, 89–91 (1916).—Standard methods for *dets. of Cr and acid in one-bath Cr liquors* are proposed for adoption as official methods of the Assoc.: for *Cr in leather*, the methods given by Levi and Orthmann (C. A. 8, 3870); for *lactic acid analysis* the methods suggested by 1915 committee (C. A. 9, 1702). A table is given for estg. volatile acid in lactic acid when a specified diln. is distd. in standard app. in a specified manner (p. 96).

L. B.

Guara and its extract analysis. FRED ASHWORTH. London Shoe Trade J.; J. Am. Leather Chem. Assoc. 10, 646–7 (1915); Shoe Leather Rep. 120, No. 6, 53, 57 (1915).—Eitner maintains that guara consists of the ground-up fruits of a variety of *divi minus* the outer husk. Microscopic examn. confirmed this. For other information contained in this article see T. Callan, C. A. 9, 2465.

J. S. ROGERS.

Mangrove cutch in the Federated Malay States. B. H. F. BARNARD. Agr. Bull. of Federated Malay States 3, 241–5 (1915).—The mangrove forests on the coasts of the states of Perak and Selangor embrace 250 sq. miles. The species found in a given region depend on the nature of the soil and the liability to tidal inundation. Nine species are mentioned, belonging to 6 genera. The most valuable of these as a source of tannin is *Ceriops candolleana*, but it is not very abundant. The bark contains 35–40% of tannin. *Rhisophora mucronata* is very abundant, its bark having 30–40% tannin. The other very abundant species is *R. conjugata*; it is poor in tannin. At present the forest is worked entirely for firewood. An acre yields from 4 to 8 tons of bark. No attempt to utilize the bark for the manuf. of ext. for export has been made in the F. M. States.

L. B.

Brazil's tanning materials. ANON. Bull. bur. de renseignements du Brésil à Paris; Hide and Leather 51, No. 7, 28–30 (1916).—Several vegetable tanning products are mentioned. *Barbatimao* (*Stryphnodendron barbatimao* Mart.) is especially good because of its high percentage of tannin; the bark contains from 25 to 48%. Mangrove (*Rhisophora mangle*, L.), known as mangue vermelho, contains no more than 30% tannin, but is very abundant and easy to exploit.

J. S. ROGERS.

The anatomy of *Acacia mollissima*, with special reference to the distribution of tannin. P. A. VAN DER BYL. Union S. Africa Dept. Agr. Sci., Bull. 3, 32 pp. (1914); Expt. Sta. Record 33, 523–4.—The author describes the anatomy of *A. mollissima*, or black wattle, with reference to the location of tannin. This is said to be present in every organ of the plant, but mostly in the phloem region of trees from 6 to 10 yrs. old, young branches and leaves having too low a tannin content to be profitably used.

E. J. C.

Melting point of greases other than paraffin wax (committee report). T. A. FAUST. J. Am. Leather Chem. Assoc. 11, 92–4 (1916).—The Ubbelohde method was not tested, because of inability to get the instruments. A thermometer bulb method, with carefully prescribed conditions, was tested by sending 2 samples to 8 collaborators. The results agree well, and the method is suggested for adoption.

L. B.

Petroleum leather oils. CHARLES R. OBERFELL. *Shoe Leather Reporter* 120, No. 13 (1915); *J. Am. Leather Chem. Assoc.* 11, 2, 74-81 (1916).—Hydrocarbon oils may come from many sources; hence those derived from crude petroleum should be referred to as petroleum hydrocarbon oils. These petroleum hydrocarbon oils do not absorb O nor change in compn. and therefore give best results when used blended with such drying oils as cod or menhaden oils. In this country the supply of petroleum hydrocarbon oils not produced at home comes from Mexico and is obtained from paraffin-base crude and asphaltic-base crude. In distg. crude petroleum at first the fire is applied directly to the still and naphtha, gasoline, kerosene, and another product (which it is hoped may be converted into gasoline) are distd. The distn. of lubricating stock is assisted by direct superheated steam. At this point, oils suitable for use on leather are produced. They are cleaned and bleached by treatment first with H_2SO_4 and then with caustic lye, after which they are washed with hot water until clean and neutral, and then sepd. from the water. The oil may be passed through a bone charcoal or fullers' earth filter to improve the color further if desired. The oil may be chilled and pressed. In some cases it is placed in shallow tanks and subjected to the bleaching and mellowing action of the sun's rays and atmosphere. 'Sp. gr., viscosity, emulsification, evapn., acidity or alkalinity, flash and fire point (to a less degree), and cold test are the characteristics which should be taken into account for the valuation of petroleum hydrocarbon oils. The gravity is measured with a Westphal balance or by a hydrometer. It is usually given in Baumé degrees. Oils suitable for leather weigh about 7.25 to 7.75 lbs. per gal. The viscosity may be measured by the Engler app. An oil of proper body flows well when worked, sticks to the whole leather surface, and eventually penetrates where it remains to lubricate. The emulsifying property is of great importance. After leather has been oiled off and hung to dry, the grain side is given a coat of oil to force the water to evap. from the flesh side. This protective coat of oil does its work better if emulsified. Filtering retards, while exposure to the sun facilitates, emulsification. Tanners often blend animal or vegetable oils with petroleum oils to make them emulsify. The ease of formation and not the duration of emulsification is important. A simple test is to emulsify oil and a few drops of water in the palm of the hand. Oils may be robbed of "greasiness" for leather at the filter presses by too much chilling, so the cold test may be of value. When heated 15 hrs. at 212° F., the loss with Northern oils should be less than 1%, with Southern oils less than 5%. Too high volatile content causes a harsh feel and cut both in grain and fibers. The oil should be neutral. Flash and fire tests are of value only in connection with the cold test and sp. gr.

J. S. ROGERS.

Leather dressing notes. "HEMATINE." *Shoe Leather Reporter* 121, No. 3, 27-31 (1916).—Flexibility and waterproofing qualities as well as gain in wt. are aimed at by *stuffing with degreas*. Two parallel series of expts. showed that leather tanned to just the proper limit gained 15% on the wt. of the dry leather by the grease absorbed, while overtanned leather gained only 5% and was darker. Empty leather absorbs more than a full one. Puered skins absorb more degreas than skins which have been tanned without, but the gain is more than balanced by the leather substance lost in the fermentation processes in the puer and in drying. A good *fat liquor* is made by mixing 2% degreas and 1% fish oil, then 1.5% best white soap in a strong soln. After the fat-liquoring, the grain side is degreased by brushing over with a soln. 3% borax, 2% good white soap and 95% water. The skins are then rinsed in warm soft water and dried, sometimes sponged with linseed mucilage and dried, in prepn. for dyeing. If dyeing precedes fat-liquoring, H_2SO_4 may be used in the dye bath. A lot of dye-stuff is removed, however, in the subsequent fat-liquoring. Soft water should be used on hides after unhairing and before fleshing to prevent lime blast. *Valonia* carries more than one tannin. When a fresh valonia liquor is allowed to stand, decompn.

takes place and one of the products is bloom. This imparts wt. and firmness if deposited on hide; consequently valonia is used as a dusting material for sole leathers. After all the bloom is deposited, the liquor is much less astringent and may be used for producing a mellow tannage for dressing leather.

J. S. ROGERS.

Waterproofing leather. M. SZAMATOLSKI. U. S., 1,173,988, Feb. 29. Chrome leather shoe soles are waterproofed and given a firmer texture by treatment with a mixt. of rosin 5, naphtha 5 and paraffin oil 1 part.

Tanning. G. DURIO. U. S., 1,173,182, Feb. 29. Hides are cleaned and washed and when free from washing liquor they are treated on both sides with commercial, undiluted liquid tanning ext. which is brushed on or allowed to flow over the hides. The excess is continuously drawn off. Tanning is completed in 2-20 days, according to the thickness of the skins or hides.

Preparing hides and skins for tanning. E. D'HUART. U. S., 1,170,426, Feb. 1. The hair is removed from the skins by treatment with $\text{Ca}(\text{OH})_2$ or a concd. $\text{Ba}(\text{OH})_2$ or $\text{Sr}(\text{OH})_2$ soln. and the skin is then treated with a soln. of Na, K or NH_4 glycerophosphate and free glycerophosphoric acid and afterward with the free acid alone to plump the hide. An alkali hydrogen carbonate, NH_4NO_3 or an NH_4 fatty acid salt may be added to keep the hide soft and pliable.

Permanent aqueous solutions of albumin and gluten substances. C. BEYER. Ger., 286,099, May 3, 1914. The object of the process is so to treat glue and albuminous substances, without affecting their adhesive properties, that they dissolve promptly in H_2O and that the resulting solns. neither gelatinize in the cold nor coagulate upon heating. This is accomplished by mixing glue, casein, or albumin with at least 10% of its wt. of resorcinol and heating the dry mixt. for some time under pressure in the autoclave. An extractive brown mass is thus obtained, which may be dild. readily with hot H_2O , and can be used as an adhesive and varnish. Upon cooling the aq. soln., small amts. of a resorcinol compd. sep., which upon the addition of some alc. redissolve promptly. The solns., clarified with alc., are neutral, possess strong adhesive properties, are quite permanent, do not gelatinize in the cold, and upon boiling do not deposit a sediment. Animal glue may in this manner be easily converted, with resorcinol, into permanent liquid glue. E. g., dry casein 50 kg. is mixed with resorcinol 10 kg., and this mixt. is heated in the autoclave, under 3-4 atms., for 3 hrs. After this time the mixt. has become a brown thick ext., and this is dissolved in 100 kg. of hot H_2O . After cooling, it is cleared by stirring in 5 liters of alc.

30. RUBBER AND ALLIED SUBSTANCES.

R. T. STOKES.

Vulcanization experiments on plantation Para rubber. The cause of variability. B. J. EATON AND J. GRANTHAM. *Agr. Bull. Fed. Malay States* 3, 175-203, 397-401, 442-5 (1915); abstracted in part under above title in *C. A.* 10, 400, which see.—Further expts. were made to det. the effect of each operation in the prepn. of thin crepe on the lengthening of the optimum time of cure in the finished rubber, and to det. how far uniformity is possible under ordinary estate conditions. It was found that the effect of each stage in the prepn. of a thin crepe is to retard the cure; but when this retardation reaches a limit, a very uniform rubber is obtained. The cure is slow, and the mechanical tests are slightly low. The results of tests on 10 samples from 1 estate, 1 sample being collected each day for 10 days, showed a high degree of uniformity in the case of eight of the samples. The other two differed slightly, no formalin having been added to the latex. To produce uniform results, however, the conditions must

be kept absolutely rigid; even the tapping conditions must invariably be the same. Furthermore, if the rubber is creped the same day that it is coagulated, as is necessary when uniformity is desired, the resulting rubber is slow in curing and slightly weaker. The effect of the various stages in the prepn. of the block form of plantation rubber was then detd. These stages are: Slabbing from coagulating pan, thick crepe, thin crepe, wormed rubber and rubber dried for 1 to 8 hrs. in hot-air driers. Rubber in the first stage cured most rapidly, and samples from each succeeding stage required more time for cure than the sample preceding it, the time necessary for cure varying from $1\frac{1}{2}$ hrs. in the case of the first sample to $3\frac{1}{4}$ hrs. for the last. All of the samples dried in hot air showed a diminution of the breaking load. Finally it was found that if the rubber was left in the form of a slab, and allowed to "mature" for a week before conversion into block form, a rapidly curing rubber with good mechanical properties was obtained.

R. T. STOKES.

Vulcanization experiments on plantation rubber. The extent of variability caused by lack of uniformity in factory methods. I. B. J. EATON AND J. GRANTHAM. *Agr. Bull. Fed. Malay States* 3, 218-25(1915).—Expts. were made to det. the following: (a) the effect of creping, (b) the effect of maceration, (c) the effect of creping on the load-stretch curves, not detd. in (a), (d) the effect of adding excessive acid in coagulating, (e) the effect of adding NaHSO_3 to the latex to prepare pale rubber. The following conclusions were drawn: The effect of creping on rubber is negligible, both as regards optimum mechanical properties and rate of cure, unless the creping is excessive. The slight effect of retarding the rate of cure in excessively worked rubbers is probably due to removal of traces of a catalytic substance or something necessary to its formation, i. e., to overwashing rather than overworking. The effect of adding an excess of acetic acid to coagulate the latex has a marked effect in retarding the rate of cure, but the mechanical properties are not affected. The acid probably reduces the amount of the catalytic substance finally present in the dry rubber. The effect of bisulfite on crepe rubbers is nil, although there is reason to believe that the use of this chemical in the prepn. of sheet and other forms of rubber is harmful, if it is not afterwards completely removed.

R. T. STOKES.

Vulcanization and testing of rubber. B. J. EATON. *Agr. Bull. Fed. Malay States* 3, 230-6(1915).—A loose series of notes and criticisms relating to work on vulcanization. The absence of a central organization for the coördination of rubber research, or rather the failure of the existing (or possibly defunct) International Rubber Testing Committee is deplored. E. thinks that the fault lies in the fact that until recently such work was in the hands of private consulting chemists, who could not be expected to give their results to the public; or that many valuable researches have been carried out by chemists in the employ of large corporations for the benefit of their employers alone. To emphasize his contention that vulcanization research must be carried out on satisfactory lines, E. criticizes the results obtained by Fol of the Netherlands Rubber Testing Station, published in a paper presented to the International Rubber Congress held in Batavia in 1914. Fol's tests on 137 samples of plantation Para are of no value because he neglected to take into account their variable vulcanizing capacity. Fol vulcanized all samples with the same percentage of S under the same conditions of heat and pressure. He particularly neglected to observe that the greater the proportion of some particular catalyst, derived from the latex and present in the raw rubber, the more rapid the combination of rubber and S. In E.'s work (see *above*) the proportion of S and the temperature have been kept const., but the period required by the nature of the rubber. Earlier conclusions on the proportions of combined S and E. have based their conclusions on the

mechanical test. There is obviously some relationship between combined S and the mechanical properties of a compound, but whether the amount of combined S at the correct cure is more or less a constant remains to be investigated. R. T. STOKES.

The nitrogen content of rubber and its relation to the rate of vulcanization. J. GRANTHAM. *Agr. Bull. Fed. Malay States* 4, 1-4(1915).—N detns. were made on a series of both smoked and unsmoked plantation rubbers in both slab and sheet form, before vulcanization. The % of N and the optimum time of vulcanization for the various grades were as follows: smoked sheet 0.445%, 3 hrs.; creped smoked sheet, 0.441%, 3 hrs.; smoked slab after creping, 0.451%, $1\frac{3}{4}$ hrs.; unsmoked sheet, 0.423%, $2\frac{3}{4}$ hrs.; unsmoked sheet after creping, 0.434%, $2\frac{3}{4}$ hrs.; unsmoked slab after creping, 0.321%, $1\frac{1}{4}$ hrs. No relation can be traced between the N content and rate of vulcanization in the smoked rubber. The unsmoked rubbers, on the other hand, show a regularly increasing % of N with a decreasing rapidity of vulcanization. The loss of N in the unsmoked rubber is probably due to decompn. of the protein, with which the rapidity of vulcanization appears to be associated. Smoking tends to fix the N, but does not prevent a slab rubber from curing at a rapid rate; hence it cannot be the actual loss of N which produces rapid vulcanization. The low % of N in rubber prep'd. from wet unsmoked slab is attributed partly to loss as gas during the superficial drying of the slab, and partly to the washing out of nitrogenous products when the slab is creped. R. T. STOKES.

Vulcanization experiments. B. J. EATON. *Agr. Bull. Fed. Malay States* 4, 4-6(1915).—From latex containing approx. $1\frac{1}{2}$ lbs. dry rubber per gallon, coagulated by the addition of 3 oz. of a 5% soln. of acetic acid per gal. of latex, 2 sets of samples were prep'd., one in the form of a slab and the other in the form of crepe. The slabs were allowed to stand after coagulation for the period necessary for the changes to take place to produce a rapidly curing rubber (6-9 days). The creped samples were machined a few hrs. after coagulation to produce a slowly curing rubber. Batches of varying proportions of these 2 samples were then made up with 10% S and vulcanized the optimum periods. Batch A (rapidly vulcanizing rubber) required $1\frac{1}{2}$ hrs.; Batch E (slowly vulcanizing rubber) $3\frac{1}{2}$ hrs.; B (2 of A plus 1 of E) $1\frac{3}{4}$ hrs.; C (1 of A plus 1 of E) $2\frac{1}{4}$ hrs.; D (1 of A plus 2 of E) $2\frac{3}{4}$ hrs. These results show a gradation in rate of cure according to the proportion of fast or slowly curing rubbers in the mixt. This expt. satisfies E. as to the cause of the variability of the cure of plantation rubber, which is so objectionable to the rubber manufacturer. Fine hard Para is a constant curing rubber because a biscuit consists of latex collected on different days for a period of several months, so that any variation in the latex or in the method of prep'n. is averaged, with the result that 1 biscuit is very similar to any other. The uniformity is due to averaging. The expt. indicates a method which could be used on rubber estates, if, as is often the case, the rubber prepared on different days varies considerably in rate of cure and behavior on vulcanization. The chief disadvantage would be in sampling and testing, for the reason that if a box of sheets made on different dates were sampled by testing 1 or 2 sheets only, the results would not represent the entire bulk. The only satisfactory test would be to mix the whole before sampling. Schidrowitz has suggested the testing of $\frac{1}{4}$ -ton lots, but it is the opinion of E. that even this quantity is not properly representative of the bulk of rubber from even 1 estate, especially in the case of sheet rubber. Much preliminary investigating is required of a large number of samples from the estate. Each estate should carry out a series of tests on samples from each shipment, to see what the actual variation is likely to be, before the inauguration of such a scheme. The preference of certain manufacturers for the rubber from certain estates is probably due to the knowledge that the rubber from these estates is always uniform. The method of bulking latex, and the greater control of dñl. of latex and

amt. of coagulant, and subsequent treatment in estate factories have tended to much greater uniformity than was the case a few years ago. On any particular estate the rubber prepd. at different times is probably very uniform, but the great differences existing between rubbers from various estates still justify the manufacturers' complaints on the lack of uniformity of plantation Para rubber. R. T. STOKES.

Coagulation of Hevea latex. B. J. EATON AND J. GRANTHAM. *Agr. Bull. Fed. Malay States* 4, 26-30(1915).—E. and G. oppose the theory brought forward by Whitby (Proceedings of the Congress of Applied Chemistry, 1912) (*C. A.* 7, 2318) that natural coagulation of Hevea latex is caused by a coagulating enzyme, and advance a bacterial theory of natural coagulation. It was found that the coagulation is due to certain bacteria which infect the latex after collection. Of these organisms there are 2 kinds, 1 favored by anaerobic conditions which effects the coagulation of the latex, and 1 favored by aerobic conditions which tends to inhibit coagulation and produces an alk. slime in the presence of air. The coagulation of latex under anaerobic conditions is not const., being much less complete on some days than on others, possibly because of a variation in the constituents of the latex. By the addition of various sugars, coagulation under both aerobic and anaerobic conditions always occurs, and is caused by the fact that a medium is formed more favorable for the organisms which produce coagulation and less favorable for the organisms producing putrefactive changes. R. T. S.

A new rapidly vulcanizing rubber. B. J. EATON. *Agr. Bull. Fed. Malay States* 4, 30-3 (1915).—An excess of acetic acid used in coagulation retards the rate of cure (see *supra*). It was thought that this excess of acid inhibited the action of microorganisms which are thought to produce the substance accelerating the rate of vulcanization. Expts. were therefore carried out in which the excess of acid was neutralized, and an alk. medium formed by immersing slab rubber in 1% solns. of NaOH and Na_2CO_3 . Lime water was tried and found unsatisfactory. The slabs were soaked in the alkali for 18-24 hrs., removed from the solns. and left on racks for about 10 days, after which they were converted to thin crepe and dried. The following results were obtained: Sample E (soaked in NaOH soln.) showed optimum time of cure of $\frac{1}{2}$ hr., breaking load 1.43 kg. per sq. mm., elongation at break 940%; sample F (soaked in Na_2CO_3 soln.) cure $\frac{3}{4}$ hr., breaking load 1.44, elongation at break 970%; sample H (control) cure $1\frac{1}{4}$ hrs., breaking load 1.51, elongation at break 966%. Further tests showed sample E to be absolutely overcured at 1 hr., and sample F at $1\frac{1}{2}$ hrs., while sample H did not become badly overcured under $1\frac{3}{4}$ hrs. Sheet and crepe ought to cure more rapidly under these conditions also, although not as rapidly as slab. Whether the effect produced by these alkalies is a direct chemical action or is due to the formation of an alk. medium more favorable to biological processes remains to be detd. R. T. STOKES.

Vulcanization experiments on plantation rubber. B. J. EATON AND J. GRANTHAM. *Agr. Bull. Fed. Malay States* 4, 58-62(1915).—In an earlier expt. it was found that a slowly curing plantation rubber could be converted into a rapidly curing rubber with superior physical qualities by allowing the coagulum to stand for about 10 days before it undergoes the usual procedure for conversion into block form. Further expts. show that the change causing this phenomenon takes place in the first 3 days, after which little or no further change takes place under ordinary circumstances. After the rubber has been slabbed, the amt. of substance causing the acceleration of the rate of cure does not apparently decrease with increasing age of the rubber. R. T. STOKES.

Preparation of rubber samples. J. H. LINK. *Chem. Analyst* 1915, No. 15, 7.—For rubber of high quality, cutting is preferable to grinding. An "Enterprise" food masticator is recommended for the purpose. H. M. LANCASTER.

Rapid electrolytic method for total lead and zinc in rubber compounds. E. D. DONALDSON. *Chem. Analyst*. 1915, No. 15, 11-12.—Digest the ash in HNO_3 , ppt. Pb

electrolytically as PbO_2 , evap. and ppt. Zn as metal. Both detns. are electrolytic, the circuit including a 110 v. d. c. generator, lamp rheostat and pole-reversing switch. Electrodes are of sand-blasted Pt gauze, a larger one, diam. 1.5 in., height 2 in., and a rotating gauze, diam. 0.5 in., height 2 in. Weigh 1 g. rubber, wrap in 7 cm. ashless paper, and ash in a 25-30 cc. porcelain crucible. Cool, brush the ash into a 200 cc. electrolytic beaker, add 25 cc. concd. HNO_3 , digest on the hot plate for 15 min., boil to expel oxides of N and dil. to about 125 cc. Electrolyze at 70-80° with rotating cathode, using 2-3 amp. for 30 min. Wash the anode first with H_2O to remove mechanical impurities, and then with alc. and Et_2O . Dry 30 min. at 170°, weigh as PbO_2 and calc. to PbO . Other metals do not interfere. Wash the soln. and insol. matter into a 1000 cc. beaker, add 5 cc. concd. H_2SO_4 , evap. to dryness and drive off the greater part of H_2SO_4 , to insure removal of HNO_3 . Cool, digest residue with 50-75 cc. H_2O , filter and wash. If Zn is known to be low in amt., use whole soln., but if 20% or more of Zn is present dil. to 200 cc. and use 50 cc. Wash this aliquot into a 200 cc. electrolytic beaker, add NaOH in satd. soln. until ppt. of $\text{Zn}(\text{OH})_2$ is redissolved, and then a considerable excess. Electrolyze at room temp., with 2-2.5 amp., using the rotating anode, for 20 min. Remove anode, wash with H_2O , alc. and Et_2O , dry at 100 for a few min., cool and weigh. Al does not interfere, even if $\text{Al}(\text{OH})_3$ is present. If Fe is present, filter off the $\text{Fe}(\text{OH})_3$ before the excess of NaOH is added, then add NaOH to the filtrate. To remove PbO_2 and Zn from the Pt gauze, use concd. HNO_3 satd. with $\text{H}_2\text{C}_4\text{H}_4\text{O}_6$.

H. M. LANCASTER.

The determination of sulfur in rubber. E. L. DAVIES. *Chem. Analyst* 15, 4 (1915).—Weigh 0.5 g. finely ground sample into a 300 cc. Erlenmeyer flask, add 15 cc. satd. soln. H_2AsO_4 , 10 cc. fuming HNO_3 and 3 cc. H_2O satd. with Br. Cover with a watch glass and boil until oxidation is complete and the soln. is clear. Use more HNO_3 if necessary. Evap. to sirupy consistency, add a few crystals KClO_3 and continue evapn. almost to dryness to expel completely the oxides of N. Cool, take up with 50 cc. 10% HCl , heating on the steam bath until soln. is complete. Filter off insol. matter, and dil. filtrate to about 300 cc. From this soln. sulfate may be pptd. and estd. as usual. Wash BaSO_4 thoroughly with hot H_2O to remove Pb salts. The function of H_2AsO_4 is to raise the b. p. of the soln. and promote oxidation. Prepare the soln. by adding As_2O_3 to boiling H_2O until the b. p. is 140°. Analyses of rubber mixes, both cured and uncured, contg. known amts. of S, with or without compounding ingredients or fillers, show the method "accurate to within less than 0.1%." H. M. L.

Hydrochloric acid-ether mixture as a reagent for rubber analysis. DOUGLAS F. TWISS. *India Rubber J.* 50, 199(1915).—Ordinary dil. HCl acts slowly and incompletely on rubber at 100°, but a HCl -ether mixt. acts readily even at ordinary temps., the penetration of the acid being facilitated by the swelling action of the ether. This mixt. is suggested in the proportion of 20 HCl to 30 ether for the estn. of mineral S, all of the sulfide S present being liberated as H_2S , while any SO_4 present is estimated in the residue. 1-2 g. of rubber are treated with the HCl -ether mixt. until it has penetrated the mass, the action usually being complete in 1 day. The Et_2O is then distd. and the mass washed with H_2O and dried; it is then ready for acetone extrn. The best procedure is to begin with 2 samples, extract the free S with acetone, and estimate the mineral and combined S in 1, and the mineral S in the other; the difference indicates the organic S, which in the absence of substitutes is S of vulcanization.

E. J. KELLEY.

Report of committee D-11 on standard specifications for rubber products. E. A. BARRIER, et al. *Proc. Am. Soc. Testing Materials* 15, 1, 408-10(1915).—Proposed specifications for cold-water hose, cotton rubber-lined hose and insulated wire.

E. W. BOUGHTON.

Proposed tentative specifications for insulated wire and cable: 30 per cent Hevea rubber. E. A. BARRIER, *et al.* *Proc. Am. Soc. Testing Materials* 15, I, 411-21 (1915).—A. Conductor. I. Manufacture. Specifications for strand, shape, etc. II. Physical properties and tests. Statement of requirements and methods of testing. III. Permissible variations. B. Insulation. IV. Chemical properties and tests. Limits are given for rubber, waxy hydrocarbons, free S, saponifiable acetone ext., CHCl_3 ext., alc. KOH ext., total S, and sp. gr. The limits for 30% and for 33% compounds differ. The color of the exts. must not be darker than a straw color, the acetone ext. must not fluoresce, and hydrocarbons must be waxy and not darker than a light brown. V. Physical properties and tests. Statement of requirements and methods of testing. VI. Electrical properties and tests. Statement of requirements and methods of testing. C. Inspection. Methods of analysis are given. Discussion follows (pp. 434-9).
E. W. BOUGHTON.

"Balata" from northern Nigeria. ANON. *Bol. inst. imperial* 10, 209; *Rev. industrial agric. Tucuman* 6, 74 (1915).—The sample of "balata" rubber examd. by the Imperial Inst. contained a considerable proportion of moisture and vegetable impurities and was quite dirty and covered with mold; it was white to red in color, and was rather tenacious, but only slightly elastic, and very sticky. The sample lost 26.0% in wt. by washing (due to impurities) and analysis of the residue showed 49.2% caoutchouc, 47.7% resin, 2.4% protein, 0.7% ash. The appearance and physical properties of the original material were greatly improved by converting it into crepe. The caoutchouc which was isolated was almost black and exhibited very inferior physical properties. The "balata" rubber of northern Nigeria is probably derived from *Ficus vogelii*, the preceding data being in accord with the analyses (made by the Imperial Inst.) of samples of the product obtained from this tree in Gambia and the Gold Coast.

H. S. PAINE.

Caoutchouc production from German plants. SCHERMESSER. *Pharm. Ztg.* 60, 591 (1915).—Several plants are mentioned as possible sources of the product, notably *Euphorbia cyparissias*, from which in addition to fat, considerable caoutchouc was obtained.

W. O. E.

Industrial poisons used in the rubber industry. A. HAMILTON. *U. S. Bur. of Labor Statistics*, Whole No. 179, *Industrial and Hygiene Series* No. 7 (1915).—The investigation covered 35 rubber factories and included practically every branch of the rubber industry. In general, and especially in the newer factories, light, ventilation and physical surroundings were excellent. The most dangerous processes are those which involve the use of Pb salts, Sb sulfides, $\text{C}_6\text{H}_5\text{NH}_2$, CS_2 and CCl_4 . Only a small % of the workers, including no women and few boys, are engaged in such operations. A considerable number of workers, including men and boys, are exposed to the lesser danger of fumes of C_6H_6 and naphtha. It is possible to eliminate all such dangers, but their presence is not always realized. Actual cases of poisoning from Pb salts, CS_2 , CCl_4 , $\text{C}_6\text{H}_5\text{NH}_2$ and naphtha were found. Pb compds. are used for molded and mechanical goods, druggists supplies, footwear, clothing, and tires. $\text{C}_6\text{H}_5\text{NH}_2$, CS_2 and C_6H_6 are used in cement. The cold cure of inner tubes requires but little CS_2 or CCl_4 . Bright red goods require Sb sulfide. If rubber clothing is vapor-cured, CS_2 and naphtha fumes may be abundant. Hard rubber contains little or no Pb. The danger of Pb poisoning in dusty compounding rooms could be eliminated by cleanliness and care. The danger from fumes of $\text{C}_6\text{H}_5\text{NH}_2$ in the compounding room could also be eliminated. The dust from mixing mills is harmful if it contains Pb and should be drawn off by means of hoods. After the Pb salts and Sb sulfide have been thoroughly incorporated with the rubber, there is probably no further danger from them in the ordinary handling which takes place in the factory, except in buffing and in grinding

up old rubber for shoddy. Dust-tight covers will eliminate the dangers here. That the Pb in rubber dust is a source of danger was shown by the Thorpe test, *vis.*, digestion with 0.25% HCl for 10 hrs.; appreciable amts. of sol. Pb were found in samples. In the prepn. of cement protection from fumes is necessary, as fumes of CS_2 , C_6H_6 , etc., are evolved. Women and boys are frequently engaged on such work. Much more trouble from naphtha fumes is experienced in dipping and spreading than in cementing. The so-called "dust room," where soapstone dust is used, should be kept clean, but precautions are not often taken. Kettles of melted Pb are a source of danger unless hooded. No matter how carelessly heat-curing is done, the risk to health is slight, but in cold-curing the danger is great enough to cause Europeans to class the rubber industry as a dangerous trade. German regulations forbid more than 4 hrs. work a day at cold-curing. Pb and fume poisoning should be guarded against in the reclaiming process. This process was found responsible for a case of Pb poisoning. The rubber industry is not considered a dangerous one in this country, since relatively few workers are exposed to poisonous dusts or vapors. $\text{C}_6\text{H}_5\text{NH}_2$ poisoning is far less frequent than formerly, but still occurs. Acute, severe naphtha poisoning is rare; but chronic, mild naphtha poisoning is probably very common. Among the workers on dipped goods, CS_2 poisoning is fairly common; it is less frequent, but still occurs, among those who use CS_2 in paint or in vapor curing. CCl_4 is less dangerous than CS_2 . Rubber factories in the U. S. are, almost without exception, lacking in proper protection for workmen, and in consequence the industry is much more unhealthful than it need be. The bulletin contains descriptions of all the processes used and illustrations of arrangements in different factories. Appendices on $\text{C}_6\text{H}_5\text{NH}_2$ poisoning at Akron, Ohio, and on the soly. of Sb sulfide in human gastric juice are given, and also 4 state reports on the hygiene of the rubber industry. E. W. BOUGHTON.

PEARSON, H. C.: **Rubber Machinery.** New York: India Rubber World. 419 pp. \$6.00.

Restoring old rubber. F. MOENCH. U. S., 1,172,158, Feb. 15. Old rubber is covered with a plastic mixt. of linseed oil, turpentine and clay, and heated for 45-60 min. to 160° in a closed retort out of contact with air to soften and restore it.

Vulcanizing rubber. W. E. MUNTZ. Can., 165,820, Nov. 2, 1915. The process of introducing by means of a single treatment (with one solution) on to or into (or both) the fibers of the foundation fabric used in the manuf. of vulcanized rubber goods, a substance which will neutralize H_2SO_3 and H_2SO_4 without the substance, by itself or its products in combination with these acids, having any injurious or deleterious effect on the fabric or the rubber at any time of the process of vulcanization.

Utilizing waste rubber. G. W. BELDAM and A. U. B. RYALL. Brit., 21,445. Oct. 23, 1914. Soles and heels of boots and shoes or sheets, slabs, or pieces for the manuf. thereof are made by disintegrating the clippings or residue, consisting of unvulcanized rubber and canvas, resulting from the making of pneumatic or like wheel tires, and subjecting the homogeneous mass to pressure and vulcanization. The product may be united with a fabric backing.

India-rubber substitutes. V. OTTOREPRETZ. Brit., 21,524, Oct. 26, 1914. An India-rubber substitute is obtained by dissolving S in a vegetable oil, such as linseed oil, and heating the soln. with dil. HNO_3 or other oxidizing agent. A tough elastic substance, which may be vulcanized, is obtained. The substance is formed into a dough-like mass by treatment with CS_2 , benzene, etc. Solns. of resin, India rubber, gutta percha, etc., and filling substances such as chalk, kaolin, pigments, etc., may be added. The mixt. is heated with S to vulcanize it.

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The Directors of the American Chemical Society have authorized publication of the collective index to the first ten volumes of Chemical Abstracts. It has become evident that the cost of the index will be more than \$10 per copy. In view of this fact the price will be \$10 per copy to all who have subscribed up to the time of this notice (May 10, 1916) and to all members of the American Chemical Society who will have subscribed up to January 1, 1917. The price will be \$12 per copy to all members who will not have subscribed up to January 1, 1917, and \$15 per copy to all non-members who have not subscribed up to May 10, 1916.

The collective author index will be prepared from the annual author indexes after checking these to eliminate errors and to detect omissions. The collective subject index will be compiled directly from the abstracts, both because the annual indexes lack uniformity and because it will be of a form quite different from that of the annual subject indexes, the change being planned in the interest of convenience in use.

Although publication is assured, subscription in advance is still urged on those who will want an index. The size of the edition will have to be gaged on the basis of advance subscriptions. It is the only way to insure obtaining a copy.

PATENTS

Abstracts of patents are included under the appropriate divisions of the journal; those on organic compounds, unless they pertain especially to some other division, are under Pharmaceutical Chemistry. The abstracts of U. S. patents are prepared by Earl T. Ragan, those of Canadian patents by Russell S. Smart, of Fetherstonhaugh & Smart, Ottawa (50 Queen St.), and all others by O. D. Swett. Most German patents are prepared, with permission, from the abstracts in *Chemiker-Zeitung* and Italian patents from those in *Annali di chimica applicata*. All other patents are obtained direct from the specifications.

Copies of any patent may be obtained for: United States, 5 cents, sent to the Patent Office, Washington, D. C.; French, one franc, sent to L'Imprimerie Nationale, 87 rue de Vieille du Temple, Paris; German, one mark, sent to the Patent Office, Berlin; British, eight pence, sent to Patent Office, London (extra postage outside United Kingdom); Austrian, write to the Patent Office, Vienna; Danish, write to the Patent Office, Copenhagen; Norwegian, 1 crown, Patent Office, Christiania; Swedish, 1 crown, Patent Office, Stockholm. Of Canadian patents, manuscript copies only are obtainable. They may be secured from Fetherstonhaugh & Smart, or the Commissioner of

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In ordering a copy of a patent, the number of the patent, name of the patentee, and subject of the invention should be stated.

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CHEMICAL ABSTRACTS

Vol. 10.

MAY 10, 1916.

No. 9

1. APPARATUS.

L. C. JONES.

Suggestions for the manufacture of apparatus for the chemical industries. M. SCHLÖTTER. *Z. Ver. deut. Ing.* 59, 711-2(1915).—A general discussion of structural materials. Galvanic action, action of acids, salt solns., etc., are briefly discussed and suggestions are given as to the selection of materials for the construction of app. for various manufg. operations. F. W. SMITHER.

A new form of absorption bottle for use with either calcium chloride or soda lime in the elemental analysis of carbon and hydrogen in organic substances. H. L. FISHER. *J. Ind. Eng. Chem.* 8, 368-9(1916).—F. describes, with sketches, a new style of absorption bottle with an inner tube fused to the bottom of the bottle and a single hollow ground-in stopper which makes a gas-tight joint in the neck of the bottle and the top of the inner tube. Two kinds of stoppers have been designed. Numerous advantages are claimed. F. W. SMITHER.

Description of a portable gas detector. G. A. BURRELL. *J. Ind. Eng. Chem.* 8, 365-6(1916).—A description, with photograph and diagrams, is given of a portable device for detecting combustible gases in air. Its most important use is for the detection of CH_4 in mine air (fire-damp), but it can also be used for natural gas, coal gas, gasoline vapor, water gas, C_2H_4 , and other combustible gases in air. The app. is 10 to 20 times more accurate than the safety lamp, is lighter in wt., is more rugged and is simple of operation. Percentages of CH_4 in air as low as 0.10% can be detd. The parts are of Al and brass, with a stout gage glass. The instrument carries 4 graduated columns (one for CH_4 and natural gas, one for H, one for gasoline vapor, and one for coal gas) on which the amt. of gas is read off from the height of a H_2O column after the combustion. The elec. energy for heating the Pt wire in the combustion chamber is derived from a miner's elec. cap lamp storage battery (in one form 2 dry cells are used). F. W. SMITHER.

A gas pressure regulator. J. R. POWELL. *J. Ind. Eng. Chem.* 8, 367-8(1916).—P. describes with a sketch a simple pressure regulator that may be easily constructed from material readily obtainable in any lab. F. W. SMITHER.

An apparatus for digesting crude fiber. J. M. PICKEL. *J. Ind. Eng. Chem.* 8, 366-7(1916); cf. *C. A.* 4, 2013.—The distinctive feature of the app. (described in detail) is the round-bottom reflux condenser (Zn or Cu, or an ordinary glass flask with a side-tube on neck). These condensers, through which cold H_2O passes, rest on the beakers in which crude fiber is digesting preventing evapn. and holding frothing in check. F. W. SMITHER.

A furnace for crude fiber incineration. J. M. PICKEL. *J. Ind. Eng. Chem.* 8, 367(1916).—A furnace for igniting 12 detns. in 15 to 20 mins. is made as follows: A piec
9 cr
or
board 0.7 X 19 X 19 cm., in whose center is cut a circular opening
laid on an ordinary lab. tripod. On this board is set a disc of cast
t 2.5 mm. thick and 14.5 cm. in diam. The disc is supported on
screwed into it; on the disc are placed the alundum crucibles (RA
has been filtered, washed, dried, and weighed. The cylinder is

covered with a piece of asbestos board of the same dimensions as the one previously described, but having in its center a hole only 3.5 cm. in diam. A small Bunsen burner, whose gas tip has been widened somewhat, furnishes the heat. F. W. SMYTH.

Simple cell for the determination of hydrogen ion concentration. J. H. LONG. *J. Am. Chem. Soc.* 38, 936-8(1916).—A cell is described which gives results sufficiently accurate for many lines of work and can be easily constructed from material at hand, no complicated glass blowing or expensive stopcocks being required. Comparison with Hasselbalch cells and the use of liquids of known H ion concn. show that measurements can be made with an accuracy of about 0.5 millivolt. Const. readings are secured about 10 min. after filling with liquid and H₂ and shaking. C. A. ROUILLER.

A large fat-extractor. CARL L. A. SCHMIDT. *J. Ind. Eng. Chem.* 8, 165(1916).—An apparatus similar in principle to that used by Benson and Thompson (*C. A.* 10, 398) for extg. tannin from sawdust, suitable for extg. several pounds of material at a charge. H. L. OLIN.

A modification of the Barnard Bishop still. J. J. HINMAN, JR. *J. Ind. Eng. Chem.* 8, 164(1916); cf. *C. A.* 8, 2469.—The gas main in the old type which also served as a support for the burners and flasks is replaced by one made of short sections of 1 in. pipe and 1 in. $\times$ 1 in. $\times$ 1/2 in. tees. H. L. OLIN.

The testing of hydrometers. Bur. Standards, *Circ.* No. 16, 16 pp.(1914).—A detailed account, with illustrations of the methods used in the Bur. of Stds., under the captions: (a) Introduction. (b) Specifications for hydrometers; (1) classes: density, sp. gr., percentage, arbitrary scale; (2) general specifications: standard temp., material, construction, etc., inscriptions, tolerances. (3) Special requirements: alcoholometers, saccharometers, hydrometers for H₂SO₄, Baumé hydrometers, density and sp. gr. hydrometers. (c) Manipulation of hydrometers: observing, influence of temp., influence of surface tension, cleanliness. (d) Tests performed by the Bureau: instruments admitted for test, character of test, control marks. (e) Directions for submitting app. for tests. (f) Fees for testing hydrometers. F. W. SMYTH.

Thermometer with vacuum mantle. E. F. BRUIJNING. *Z. Feinmech.* 23, 52 (1915); *Beiblätter Ann. Physik* 39, 682.—The Hg capillary and scale of the thermometer are inclosed in a high vacuum so that the height of the column is but slightly affected by its surroundings. This arrangement dispenses with the usual uncertain corrections for exposed column. L. W. RIGGS.

Studies of instruments for measuring radiant energy in absolute value: An absolute thermopile. W. W. COBLENTZ AND W. B. EMERSON. Bur. Standards. *Sci. Paper* No. 261, 504-51(1916).—A strip of metal receives the radiation and re-radiates to a thermopile. The strip can also be heated electrically. This gives the absolute calibration; the constants of the thermopile, etc., fall out. The concordance obtained under varied conditions appears to indicate that systematic errors, so very prominent in this field, have here been reduced to 1% or less. The contrivance is thought to be simple enough to be used almost anywhere. Still further simplified, it yields a total radiation pyrometer. W. P. WHITE.

Evaporating apparatus. A. ERNST. *Chem. App.* 3, 37-9(1916).—Descriptions, with 7 cuts, of the Kaufmann, Witkowitz, and Dinkel's app. The W. app. is especially suitable for treating high-boiling liquids as it is built to stand as high as 20 atms. pressure; it requires little floor space and is easily cleaned and repaired. Cf. *C. A.* 10, 297, 708. J. H. MOORE.

Flasks with perforated rim. A. KRIEGER. *Chem. Ztg.* 40, 210(1916).—Two or more small holes are bored in opposite sides of the rim through which a string is drawn over the top of the stopper, tied and sealed with wax. J. H. MOORE.

Respirator. E. J. BEVAN and R. H. DAVIS. Brit., 22,719, Nov. 18, 1914. In a respirator for mine rescue work and the like, the absorbent for CO_2 in the regenerator is made by grinding wood pulp or other form of cellulose with a strong soln. of caustic alkali, such as NaOH .

Filter. BRINJES & GOODWIN and F. TITTERTON. Brit., 22,481, Nov. 13, 1914. A vacuum or natural-subsidence filter comprizes an open-topped casing containing hollow filtering diaphragms and fitted with a hinged bottom for the discharge of the cakes or residue. The filtrate flows through pipes to a receiver which may be evacuated. The cakes may be removed by a reverse flow of air or steam or by mechanical means.

Blast furnace for burning magnesite. AUSTRO-AMERICAN MAGNESITE CO. Aust., 70,686, Dec. 10, 1915. In the burning of magnesite and like substances which form lumpy masses, two rolls, provided with teeth or cutting edges, are arranged before the lower furnace opening, partially closing it.

2. GENERAL AND PHYSICAL CHEMISTRY.

W. D. HARKINS and E. B. MILLARD.

The work of J. H. van't Hoff. G. BRUNI. Smithsonian Inst. *Ann. Rept.* 1914, 767-89.—A biographical sketch. E. J. C.

Arthur Williams Wright. CHAS. S. HASTINGS. *Am. J. Sci.* 41, 361-6(1916). —An obituary with a bibliography of Prof. Wright's most important papers. E. J. C.

Fritz Burmeister. R. *Chem. Ztg.* 40, 181(1916).—Died Jan. 23.

J. H. MOORE.

The atom and the molecule. G. N. LEWIS. *J. Am. Chem. Soc.* 38, 762-85 (1916); cf. *C. A.* 7, 3865 and Bray and Branch, *C. A.* 7, 3865.—Compds. should be classed as polar and nonpolar rather than inorg. and org. These classes are roughly the same. A nonpolar mol. is one in which the electrons belonging to the individual atom are held by such restraints that they do not move far from their normal positions, while in the polar mols. the electrons, being more mobile, so move as to sep. the mol. into positive and negative parts. In an extremely polar mol. such as NaCl it is probable that in the great majority of the mols. the Cl atom has acquired a unit negative charge and therefore the Na atom a unit positive charge, and the process of ionization probably consists only in a further sepn. of these charged parts. If a weakly polar mol. comes into the neighborhood of a more polar one it becomes itself more polar. In this process the weaker bipole stretches and its moment increases. A "cubical atom" is proposed as a basis of a new theory of atomic structure. Thus Li is a cube with a single electron on one corner, Be has 2 electrons, B 3, C 4, N 5, O 6, and F 7. This view is in harmony with the theory developed by Parson, *C. A.* 10, 406. An atom is considered as having an unalterable kernel which possesses an excess of positive charges corresponding in number to the ordinal number of the group in the periodic table to which the element belongs (cf. Thomson, *C. A.* 8, 824). There is a shell of electrons around the kernel which, in the case of a neutral atom, contains negative electrons equal in number to the excess of positive charges of the kernel, but the number of electrons in the shell may vary during chem. changes between zero and 8. The atom tends to hold an even number of electrons in the shell (especially 8 at the corners of the cube) but the electrons may ordinarily pass from one position to another in this shell. Two atomic shells are mutually interpenetrable. The paper is a discussion of these ideas applied to the structure of atoms and compds. E. B. MILLARD.

Molecules as realities. A. PERRIER. *Arch. sci. phys. nat.* 41, 38-47(1916).—Popular lecture on molecular phenomena and the study of mol. motion. E. B. M.

Additivity of the internal atomic heat of ideal gases. M. TRAUTZ. *Elster-Geitel Festschrift* 1915, 333-60; *Beiblätter Ann. Physik* 39, 772-3(1915).—The at. heat is considered as the sum of the translatory and inner at. heats. The former is $\frac{3}{2}R$, and the latter $C_v - \frac{3}{2}R$. The question is raised whether $(C_v - \frac{3}{2}R)$ is identical for both sides of a chem. reaction, if all of the substances taking part in the reaction are ideal gases. For a case in which 2 single atoms form a double atom (e. g., $I + I = I_2$, where the substances on the left have no inner at. heat but that on the right has considerable) it appears that the question must be answered in the negative. T. takes the stand that a free atom is different from one bound in any way, and that the additivity should hold only for the latter. Except for monatomic gases, the additivity principle leads to values of $K = c_p/c_v$ which lie between those calcd. from the Maxwell and Boltzmann theories, and which for polyatomic gases more closely approach the Maxwell values. In a survey of the sp. heat data of gases many tables are given (which show considerable errors in the existing data) for 49 gases containing from 2 to 26 atoms. For about a third of the substances the additivity holds rigidly (in some cases the agreement is excellent), for another third the agreement is rough, and for the rest the values are too large but they are so inexact that the meaning is not clear. The question of whether the additivity of inner at. heat holds for gases in the ideal state or whether it is approximated for gases which deviate from the ideal state to about the same extent is discussed at length without arriving at any definite conclusion. E. B. MILLARD.

Logical basis of the theory of relativity. A. HARNACK. *Ann. Nat. Kulturphil.* 13, 46-51(1915); *Beiblätter Ann. Physik* 39, 569(1915).—H. distinguishes between the equivalence principle (essentially identical with the Einstein relativity principle) and a "relativity" which is valid only when the same motion exists in both system. A further difference is drawn between "true" and "apparent" relativity (which is established only through "accidental" changes in the app.). H. is of the opinion that the theory of relativity furnishes support for the existence of an ether, and not for the Fitzgerald-Lorentz contraction hypothesis. E. B. MILLARD.

Revision of the atomic weight of cadmium. IV. Electrolytic determination of cadmium in cadmium bromide. G. P. BAXTER, M. R. GROSE AND M. L. HARTMANN. *J. Am. Chem. Soc.* 38, 857-67(1916); cf. *C. A.* 9, 735.— $CdBr_2$ was prepd. from Cd and purified Br under dil. HBr, and recrystd., fused in Pt, and again crystallized until the black residue (chiefly C and SiO_2) was eliminated. Samples of this salt were weighed into a cell shaped like a Florence flask with a long wide neck, and were electrolyzed. The Pt anode was fused through the neck of the app.; the cathode was a charge of pure Hg in the bottom of the flask, connected by means of a Pt wire fused through the bottom of the vessel. In general, the method was that employed in the work on $CdCl_2$. A small stream of electrolytic H was passed through the app. during the electrolysis to aid in removing the Br. The ratio $Cd:Br_2$ calcd. from the mean of 12 detns. on samples of 6 to 20 g. each was 0.703282 after applying corrections for air displacement, giving an at. wt. of Cd of 112.407, if $Br = 79.916$. The % Cd in $CdBr_2$ found in this investigation was 41.290, the % Br in the same compd. found by Baxter, Hines and Frevert was 58.708, total 99.998% (*J. Am. Chem. Soc.* 27, 222(1905); 28, 770(1906)). The % Cd in $CdBr_2$ found by Quinn and Hulett (*C. A.* 9, 2613) was 41.257, giving 112.3 as the at. wt. of Cd. E. B. MILLARD.

Revision of the atomic weight of zinc. Electrolytic determination of zinc in zinc bromide. G. P. BAXTER AND M. R. GROSE. *J. Am. Chem. Soc.* 38, 868-73(1916).—The method of expt. and the app. were the same as those described in the preceding

abstract. Zn was purified by electrolysis and recrystn. of the bromide prep'd. from pure Br and Zn. In some expts. the ZnBr_2 was converted to sulfate before electrolysis to save time. After applying the usual corrections to vacuum weights, the ratio $\text{Zn}:\text{Br}_2$ was calcd. from the mean of 10 analyses on samples of 6 to 8 g. each as 0.409103. If $\text{Br} = 79.916$, $\text{Zn} = 65.388$. Richards and Rogers (*Proc. Am. Acad.* 31, 158(1895)) found 70.971% Br in ZnBr_2 ; the present research gave 29.903% Zn, total 100.004%.

E. B. MILLARD.

Method of determining the molecular weight with very small quantities of gases. M. KNUDSEN. *Verh. K. danisch. Wissensch. Ges.* 20, 217-29(1915); *Beiblätter Ann. Physik* 39, 763(1915).—The principle of the method depends on the coeff. of viscous resistance to an object rotating about its axis in the gas under expt. If P is the frictional force with which a gas acts on a surface moving with a tangential velocity of 1 cm. per sec., p the pressure on the gas in dynes per sq. cm., and T its abs. temp., it can be shown from the kinetic theory that the mol. wt. of the gas is given by the equation $M = 522.25 \times 10^8 T(P/p)^2$. A symmetrically blown glass sphere was suspended by a quartz thread in a larger spherical vessel and the damping of the vibrations of the inner sphere was detd. The gas pressure was detd. with a manometer which could detect a change of 0.0002 dyne per sq. cm. The validity of the equation was tested with expts. on O. Values of the mol. wt. were obtained from the logarithmic decrement which varied with the pressure of the gas, but which if extrapolated to zero pressure, gave values in satisfactory agreement with the theoretical. Detns. of the mol. wt. of satd. H_2O vapor down to -75° gave values which were too high, on account of some exptl. error which is being further investigated.

E. B. MILLARD.

Free energy of hydrochloric acid in aqueous solution. JAMES H. ELLIS. *J. Am. Chem. Soc.* 38, 737-62(1916); *Proc. Nat. Acad. Sci.* 2, 83-7(1916); cf. *C. A.* 10, 992.—The prepn. of calomel electrodes, reproducible to 0.05 millivolt, which do not change their value on shaking when in contact with HCl of 0.1 molar or higher concn. is described; and measurements of the e. m. f. of cells of the type H_2 (1 atm.) | HCl soln. | $\text{Hg}_2\text{Cl}_2 + \text{Hg}$ at 18° , 25° and 35° , and with HCl concns. from 0.033 to 4.5 molal are presented. From these e. m. f. values are computed (1) the change in free energy content and in heat content attending the reaction H_2 (1 atm.) + Hg_2Cl_2 (solid) = 2Hg (liquid) + 2HCl at various concns., (2) the change in free energy content and in heat content attending the change HCl (at c_1) = HCl (at c_2), (3) the ratio of the activities of the H ion or Cl ion in solns. of various concns. By combining these results with those derived from Jahn's measurements (*Z. physik. Chem.* 35, 545-76(1900)) of the e. m. f. at 18° of cells $\text{Ag} + \text{AgCl} | \text{HCl} (c_1) | \text{HCl} (c_2) | \text{AgCl} + \text{Ag}$, the series of free energy values is extended from 0.033 to 0.00167 molal and the abs. free energy of HCl (referred to the free energies of the elements as zero) at 18, 25 and 35° in solns. from 0.00167 to 4.5 molal is calcd. and tabulated. From these data and the assumption that at the lowest concn. the ion activity is equal to the ion concn., a series of abs. activity coeffs. for HCl covering this concn. range is computed and these values are compared with the activity coeffs. of KCl derived from the e. m. f. measurements of MacInnes and Parker (*C. A.* 9, 1709) and the osmotic pressure calcns. of Bates (*C. A.* 9, 1710, 2342). The activity coeffs. both from HCl and KCl decrease up to 0.1 molal far more rapidly than do the cond. ratios. The difference at this concn. amounts to 9% for HCl and 15% for KCl, so that in using the conductance ratio as a measure of ion activity in mass action expressions a corresponding error is involved. At about 0.5 molal the activity coeff. of HCl reaches a minimum and then increases very rapidly with increasing concn., becoming 2.23 times as great at 4.48 molal as at zero concn. There is evidence that the conductance ratio is a true measure of ion concn. (but not of ion activity) for KCl.

E. B. MILLARD.

The metastability of the elements and chemical compounds in consequence of enantiotropy or monotropy and its bearing on chemistry, physics and technics. E. COHEN. Utrecht. *Proc. Akad. Wetenschappen* 18, 961-5(1916).—It is pointed out that the non-metals, as well as the metals, are metastable systems because of the existence of several allotropic modifications, and the failure of the substance to become completely transformed to the stable state; S is cited as an example. The same is true of numbers of compounds; expts. with Tl picrate and KNO_3 show that the stable form often persists into regions in which it is unstable, when care is taken to exclude traces of solvent. Hence the pure compd. is in a metastable state, and physical and chem. const. must be redetd. with the pure modifications. GEORGE W. MOREY.

New thermoelectric method for the study of allotropy of iron and other metals. C. BENEDICKS. *Compt. rend.* 162, 297-9(1916).—If a wire is heated locally and this place of heating is gradually moved along the wire (for example by slowly passing the wire through a small elec. furnace) there will be a difference of potential between the ends of the wire if there are 2 phases in it. This method could be applied to the study of allotropy of Fe. In one expt. there was a sharp break in the curve showing temp. plotted against deflections of a galvanometer attached to the ends of the Fe wire at about 875° , in another expt. there was no break. Cu showed no p. d. when passed slowly through the furnace. E. B. MILLARD.

Scientific survey of gas equilibria. H. VON WARTENBERG. *Z. Elektrochem.* 21, 464-9(1915).—A review, with references to the literature, covering the period from the middle of 1913 to the middle of 1915. E. J. C.

Determination of temperature changes in rising and falling gases, and the values of their specific heats calculated from these changes. R. ORHME. *Diss. Marburg*, 106 pp.(1915); *Beiblätter Ann. Physik* 39, 774-5(1915).—In the meteorological part the adiabatic changes of condition of air have been studied. The cooling of an ascending quantity of gas is inversely proportional to its sp. heat at const. pressure, and is given by the equation $dT = -g/Jc_p$, where J is the mechanical equiv. of heat and g the acceleration due to gravity. The presence of H_2O vapor changes the sp. heat only slightly, but is of great importance on account of the changes of state (condensation and freezing) which it undergoes with wide changes in temp. In the physical part, changes of temp. in rising and falling quantities of gas have been measured with a sensitive bolometer, and values of c_p calcd. from them. The value for air agrees within 0.2% with the accepted value, that of H_2O vapor is 6% from the accepted value, and the calcd. values for CO_2 are subject to such wide error as to be of only qual. significance. E. B. MILLARD.

The viscosity of liquefied gases. III. The periodic rotational motion of a sphere in a viscous liquid. J. E. VERSCHAFFELT. Leiden. *Proc. Akad. Wetenschappen* 18, 1038-45(1916); cf. *C. A.* 10, 994.—A math. discussion of the conditions determining the periodicity of motion of a sphere in a viscous liquid. G. W. MOREY.

Cryoscopic measurements at low temperatures. H. S. REID AND D. MCINTOSH. *J. Am. Chem. Soc.* 38, 615-25(1916).—Toluene, CHCl_3 , CCl_4 , MeOH, EtOH, EtOAc, acetone, HOAc, paraldehyde, and CH_3CHO in liquid HBr were studied. The f. p. app. consisted of a double-walled freezing tube immersed in a Dewar tube of ether and CO_2 , in which there was a Pt resistance thermometer and a stirrer. F. p. detns. with the first 3 solutes mentioned above were made to establish the value of K , since these alone showed no evidence of forming compds. with HBr. The latent heat of fusion of HBr was calcd. to be 6.79 cal. per g. from the value $K = 102.3$. Alc. is associated 2.3 to 2.4 times, MeOH 3.4 times, $(\text{CH}_3)_2\text{CO}$ from 2.26 to 3.13, depending on the concn., and HOAc from 2.00 at a diln. of 5.00 to 5.0 at a diln. of 1.25. HOAc

has also an abnormally high cond., which may be due to the presence of H^+ ions as well as complex ions. Oxonium compds. are formed with the solutes contg. O, as is the case when these substances are dissolved in liquid Cl, and a study of the slopes of the f. p. curves shows that these compds. are largely broken up into their constituents in soln. Detns. of mol. wts. in liquid Cl by Waentig and McIntosh (*Trans. Roy. Soc. Canada* 1916 (not yet published)) show normal mol. wts. for ether over a considerable range of concn., but MeOH and EtOH are greatly polymerized. It seems impossible to assign formulas to the oxonium compds. The increase in complexity in soln. as shown by increasing mol. wt. and rapid increase in mol. cond. points to the correctness of the view that the ions are much more complex than would be expected from the oxonium theory.

E. B. MILLARD.

Isomorphism between sodium nitrate and potassium nitrate. M. AMADORI. *Atti r. ist. Veneto* 72, II, 451-60(1912).—A. has carried out expts. to det. the thermal properties of mixts. of $NaNO_3$ and KNO_3 . The ordinary procedure of thermal analysis was followed, the mixt. being heated in glass tubes and the temp. detd. by means of a thermoelement. The point of solidification of $NaNO_3$ was found to be 310° and that of KNO_3 to be 336° . A study of the mixt. shows that the $NaNO_3$ and KNO_3 separate from the fused mass in the form of solid solns. in all proportions. The two forms of crystal are therefore completely isomorphous at that zone of temp (200°). The transition point of KNO_3 from the rhombohedral form to the rhombic is lowered in the mixt. The mol. solubility of the Na salt in the rhombohedral form of KNO_3 is about 10%.

L. T. FAIRHALL.

Dilatometric experiments on the polymorphic alkaline nitrates and on thallous nitrate. M. BELLATI AND L. FINAZZI. *Atti r. ist. Veneto* 69, II, 1151-68(1910).—The method employed in detg. the transformation temps. was an hydrostatic compensation method described by B. and F. (cf. *Atti r. ist. Veneto* 68, 917). The measurements were made in a vaseline bath. The substances studied were freed from adhering air by heating several times *in vacuo*. In the case of KNO_3 , the transformation which occurs at 127.8° is accompanied by a vol. change of 0.0100 of unit vol. at 0° . The $d_{10.6}$ of the salt is 2.1062. $CsNO_3$ has a vol. change of 0.0130 of unit vol. at 0° ; $d_{16.16}$ 3.6415. The transformation of $RbNO_3$ at 161.4° is accompanied by a vol. increase of 0.0185 of unit vol. at 0° ; $d_{17.4}$ 3.0955. The variation in vol. of NH_4NO_3 at its transformation temp. of 86° is -0.0148 and at its second transformation temp. (125°) is 0.0220; $d_{31.9}$ 1.7072. The increases in vol. of $TlNO_3$ at the 2 transformation points 73° and 142.5° are, resp., 0.0034 and 0.0156; $d_{21.4}$ 5.5556.

L. T. FAIRHALL.

Dissociation pressures of mercurous chloride. ALEXANDER SMITH AND R. P. CALVERT. *J. Am. Chem. Soc.* 38, 801-7(1916); cf. *C. A.* 8, 3139; 10, 840.—Dissociation pressures of $HgCl$ between 309 and 384° have been measured with the same app. as before, using either a mixt. of fused KNO_3 and $NaNO_3$ as confining fluid or a mixt. of $LiCl$ and KCl . The results with the latter mixt. are more reliable, since the nitrates slowly react with the vapor. The exptl. values were well represented by an equation of the type $\log p = -7792.10/T - 12.2309 \log T + 49.2048$. The entropy of vaporization to a fixed concn. ($p = 100$ mm. Hg) was calcd. as 17.7 for calomel and was of about this order for the 8 substances recently investigated in this series of papers. NH_4Br had the lowest value, 17.2, and Ph_4I the highest, 20.7. An av. value for normal liquids was 13.5, and for associated liquids 16.3. Cf Hildebrand, *C. A.* 9, 1423.

E. B. MILLARD.

An experiment on the diffusion of carbon dioxide. EDV. BJÖRNSSON. *Borås. Z. physik. chem. Unterricht* 29, 32(1916).—Over 1 end of a glass tube 20-30 cm. long and about 4 mm. inside diam. slip a piece of rubber tubing about twice as long, pass

CO₂ through to displace the air, dip the free end in Hg and close the end of the rubber tubing with a clamp. In about 1 hr. the Hg will rise about 5 cm. in the tube; in 24 hrs. the tube will be full. J. H. MOORE.

The laws of dissolution. HENRY LE CHATELIER. *Compt. rend.* 162, 29-32 (1916).—Le C. replies to Colson's criticism of the application of the Le Chatelier principle to solns. as expressed by the equation $i dC/C = (-500 dT/T^2) p$ (*Compt. rend.* 100, 50(1885)) because of the apparently anomalous behavior of anhydrous Na₂CO₃ and NaCl in liberating heat on soln. but increasing in soly. as the temp. rises. He points out (1) that a contrary view would lead to an absurdity, *vis.*, perpetual motion; (2) that the assertion that the soly. of Na₂CO₃ rises with temperature cannot be proved since the salt hydrates immediately on contact with H₂O; and (3) that the heat of equil. of NaCl at 0° is probably -70 cal. rather than +30 cal. See following abstr.

H. L. OLIN.

Irrational character of the formulas for solubility and the heat of solution. A. COLSON. *Compt. rend.* 162, 222-4(1916); cf. *C. A.* 10, 304, 415, 711.—Largely a polemic with Le Chatelier (preceding abstr.). C. defines soly. as concerned only with the quantity of salt dissolved by a given quantity of H₂O at a given temp., and not at all concerned with whether the salt becomes hydrated or not. The claim of Le C. that the soly. of anhydrous Na₂CO₃ cannot be realized is based on a misunderstanding of the terms used; the results do not support a possibility of perpetual motion as claimed by Le C.

E. B. MILLARD.

The heats of solution of sulfur and of iodine. M. BELLATI AND L. FINAZZI. *Atti r. ist. Veneto* 72, II, 1303-14(1913).—The heats of soln. of S in CS₂ and of I in CS₂, MeOH and EtOH, resp., were measured in a Bunsen calorimeter at 0°. The heat of soln. of S in CS₂ was found to vary from -11.89 cal. (for dil. soln.) to -11.55 cal. (satd. soln.). The values for I in CS₂ varied from -17.65 to -16.65 cal. (satd. soln.). The values for I in MeOH varied from -7.92 cal. to -7.42 cal. (satd.); in EtOH from -4.88 to -5.22 cal. (satd.). The expts. show that the heat absorbed in the soln. of a gram of S and of I in CS₂ decreases with the concn. and that this diminution follows a linear law. The phenomena of soln. of I in MeOH and in EtOH are more complex.

L. T. FAIRHALL.

Viscosity of certain alcoholic solutions. O. F. TOWER. *J. Am. Chem. Soc.* 38, 833-44(1916).—Solns. of LiCl, KI, benzil and urea in MeOH and EtOH at 15, 25, 40 and 50° have been measured in a modified Bingham viscosimeter (*C. A.* 8, 1525) having 2 vertical capillaries about 5 cm. long, one in each arm of the instrument. The app. was calibrated from expiration expts. with H₂O, using the values of Thorpe and Roger, and of Bingham and White. New detns. of the viscosity of samples of MeOH and EtOH contg. very small amounts of H₂O have been made, and detns. on the solns. mentioned above. These results are shown in tables and curves. The "viscosity const." $(\eta' - \eta)/\eta c$ increases with the solvation of the solute, and for the solns. here investigated seems almost independent of the temp.

E. B. MILLARD.

Properties of mixed liquids. II. Phenol-water and triethylamine-water mixtures. J. L. R. MORGAN AND GUSTAV EGLOFF. *J. Am. Chem. Soc.* 38, 844-57(1916); cf. *C. A.* 10, 838.—Surface tensions have been found by the drop-weight method for several concns. of the typical mutually sol. liquids mentioned above at temps. both above and below the critical soln. point. The property-compn. curves are typical and are characterized by the fact that the constituent of lower surface tension depresses that of the other until the max. amt. sol. in H₂O reduces the surface tension of this to a value differing but slightly from that of the other constituent. The effect of the liquid of larger surface tension on that of the other is exceedingly slight. In

the phenol-H₂O curve there is a max. indicating a compd. C₆H₅OH.55H₂O, and in the other system a max. indicating Et₃N.50H₂O. The H₂O layer of such systems must be considered as transformed completely into a compd. and the other layer as the second pure liquid having the compd. in soln. The critical soln. point is that point at which the compd. is miscible in the second liquid. An alternative for the usual adsorption theory of the change of surface tension of H₂O by the addition of other liquids is given.

E. B. MILLARD.

The velocity of esterification of organic anhydrides. R. GUARISCHI. *Atti r. ist. Veneto* 73, II, 449-55 (1913).—G. has measured the velocity of esterification of various org. anhydrides, namely, succinic, maleic and phthalic with different alcs. The alcs. used were methyl, ethyl, propyl and isopropyl. The procedure consisted in heating an equimol. mixt. of anhydride and alc. in sealed tubes at 100° in a glycerol bath. At various times the tubes were withdrawn, broken under water and the acid soln. titrated with 0.1 N soln. of Ba(OH)₂. Acetone was used as solvent for the reacting substances. It was found that the reaction progressed relatively slowly even at 100°. The reaction is probably rather complicated as irregularities were observed in the value of the velocity constant. The reaction between the anhydrides and MeOH is the most rapid. Measurements made at 115° show a great increase in the velocity of the reaction and in this case also irregularity was apparent in the value of the velocity constant.

L. T. FAIRHALL.

Invariant, monovariant and divariant equilibria. IV. F. A. H. SCHREINEMAKERS. Leiden. *Proc. Akad. Wetenschappen* 18, 1018-26 (1916).—A new method is described for representing the sequence of *P-T* curves around an invariant point, and the discussion of the preceding papers (*C. A.* 9, 2728; 10, 991) is continued. In this paper systems with an arbitrary number of components are discussed, and a method given for detg. the sequence of *P-T* curves around an invariant point in such systems, illustrated by application to a system of 5 components. V. *Ibid* 1026-37.—In this paper certain generalizations in regard to *P-T* curves are made. When the *P-T* curves surrounding an invariant point are considered, a "bundle of curves" may be defined as a number of curves which follow one another without being sepd. by metastable prolongations of other curves; e. g., a "3-curvical bundle" is one in which 3 curves follow in sequence, with no metastable prolongations of other curves in between. A similar convention holds in defining "metastable bundles of curves." It is shown that in a *P-T* diagram the same number of bundles (stable and metastable) are situated at the right as at the left of each bundle of curves, and that in every *P-T* diagram the number of bundles of curves is always odd, and at least 3. On this basis the various types of *P-T* diagrams which may exist in a system of a given number of components is readily ascertained. A method of deducing the type of concn. diagram belonging to a given *P-T* diagram is also deduced, and illustrated in a system of *n* components.

GEORGE W. MOREY.

Comparison of the van der Waals' equation with the purely thermodynamic equation of state, and a new method of determining the critical data, limiting density and inversion curves. L. SCHAMES. *Elster-Geitel Festschrift* 1915, 287-306; *Beiblätter Ann. Physik* 40, 7-9 (1916).—Integration of the thermodynamic equation $c_p - c_v = T(\partial p / \partial T)_v (\partial v / \partial T)_p$ gives a "purely thermodynamic" equation of state $p v = RT/m - \int_{\infty}^v [T(\partial p / \partial T)_v - p] dv - \int_0^p [T(\partial v / \partial T)_p - v] dp$. The first integral represents the internal energy on expansion to infinite vol., $-U_{\infty}$; the 2nd the Joule-Kelvin heat on expansion to zero pressure, Q_0 . This equation has been compared with the van der Waals' reduced equation of state. The following characteristic curves are given: (I) Boyle curve $\delta(Q_0 - U_{\infty})/\delta\delta = 0$, (II) the ideal curve $Q_0 - U_{\infty} = 0$, and there-

fore $p = 0$, (III) the differential inversion curve of the Joule-Kelvine effect $(\partial p/\partial T)_H = 0$, (IV) an integral inversion of the Joule-Kelvin effect $\int (\partial p/\partial T)_H dT = 0$, which are shown both analytically and by plotting to be straight lines on the $p-v$ diagram. Exptly. detd. plots for CO_2 , C_2H_4 , O, H and air gave nearly straight lines for curves I and II which intersected at a Boyle point agreeing with the van der Waals value at $p = 9$. This is made the basis for a new method of detg. the critical data and the limiting density. If the minimum points are known for 2 isotherms, the Boyle curve, and hence the Boyle point, is detd., and $p_{\infty} = (p_0)B/9$. If the crit. temp. is known, the "reduced gas const." B may be defined from the expression RT_c/mp_{∞} . Its value for CO_2 is 3.60; for C_2H_4 , O, N and air it has the const. value 3.42, as was shown also from expt., and for H (He) 2.67, in agreement with van der Waals' value. Further, not only the product p_{∞} , but also its factors, may be calcd., since the extrapolated Boyle curve ends at $v = 1.5$. The values of p_c and T_c so obtained agree well with those exptly. detd. The extrapolated ideal curve ends at $\lim_{p \rightarrow 0} v = 0$, $\lim_{T \rightarrow 0} v = 0$, so this may also be calcd., and it leads to exact values of the reduced gas const. B . If this equation holds, T_c may also be calcd., and finally the upper limit of $d_p = \infty$ may be obtained by extrapolation. The inversion curve of the Joule-Kelvin effect may also be obtained from the isotherms, but the value obtained, $(p_{\infty})_I = 16.2$, deviates somewhat from the van der Waals' value 18. The differential inversion curve is almost a straight line ending at $\lim_{p \rightarrow 0} v = 0$, $\lim_{T \rightarrow 0} v = 0$, the integral inversion curve is quite different from the van der Waals' curve, and tends toward $p = \infty$ as T approaches zero. A math. possibility of other characteristic curves in which the attraction coeff. is negative also exists. Amagat's negative attraction value for H_2 appears to be due to the neglect of the term $\partial^2 p/\partial T^2$, so that the physical possibility of a negative attraction seems doubtful. If the solid state is considered, an equation of the 5th degree is obtained, and with n further modifications, one of the $(5 + 2n)$ degree. This may be the physical explanation of the Kammerlingh Onnes equation of state. The conditions which correspond to the virial coeffs. in the Boyle point and in the inversion point have been outlined. The "average empirical reduced" equation of state of K. Onnes satisfies these conditions only for certain values of B . By a combination of these conditions and empirical factors a new equation of state has been derived for very dil. gases, which may be extended to higher pressures by the addition of more terms. E. B. MILLARD.

Simple relation for the heat of vaporization for substances with a reduced gas constant $B = 3.375$. L. SCHAMES. *Verh. deut. physik. Ges.* 18, 35-8(1916); cf. preceding abstr.—If it is assumed that B , and hence also the crit. d., is 1% low, the relation of van der Waals (*Arch. Neerl.* (3a) 1, 90(1911)) $\lim_{p \rightarrow 0} v = 0$, $\lim_{T \rightarrow 0} v = 0$ is exactly satisfied, and B has the value $27/8$, which may be of theoretical significance. Slight variations in the values of B obtained for different gases may be due to the fact that the Boyle curve for these substances is not quite a straight line. By the use of reduced coefficients in the Clausius-Clapeyron equation a function is obtained called f_3 which is defined by the equation $f_3 = 27/8(dv/dT)$, or by $f_3 = B/(v_1 - v_2)$. The value of f_3 , which is a pure number, is 7.00 for C_2H_4 and N, 6.75 for O and 6.375 for A. The relation is suitable for the prepn. of vapor tables from the abs. zero to the crit. temp. for substances whose "reduced" gas const. has the value $3^2/8$. In a future paper these tables, and the heat of vaporization, will be given. The calcs. are a confirmation of the Nernst theory of the heat of vaporization. E. B. MILLARD.

The thermal constants of hydrated sodium acetate. T. GNESSOTTO AND C. FARRIS. *Atti r. ist. Veneto* 70, II, 471-81(1911).—In this investigation, G. and F. have measured the sp. heat of solid and fused $\text{NaC}_2\text{H}_3\text{O}_2 + 2\text{H}_2\text{O}$ and its heat of fusion at 0° . The measurements were made in a Bunsen calorimeter. The fusion of the salt was carried

out in thin-walled glass bulbs heated in baths of fused salts ($\text{Mn}(\text{NO}_3)_2$, $\text{Na}_2\text{S}_2\text{O}_8$, and $\text{NaC}_2\text{H}_3\text{O}_2$). The mean of several detns. of the heat of fusion of hydrated sodium acetate was found to be 38.9 ± 0.1 cal. The sp. heat of the salt between 0° and the temp. of fusion was found to be 0.769. Detns. carried out over the interval 0° – 46.54° show a decided increase in the value of the sp. heat of the solid salt as it approaches the fusion temp.

L. T. FAIRHALL.

Thermal behavior of some compressed and condensed gases at low temperatures.

A. EUCKEN. *Verh. deut. physik. Ges.* 18, 4–17 (1916).—Detns. of the sp. heat at const. vol. have been made for H (gas at several pressures, and liquid), He, solid and liquid A, liquid and 2 solid forms of N, liquid and 3 solid forms of O, liquid and 2 solid forms of CO, and solid CO_2 at various low temps., using essentially the same method as in C. A. 8, 3141. Measurements have also been made of the heat of fusion and of transformation of the various phases of A, N_2 , O_2 , CO, and of the heat of evapn. of H, N, A, O, and CO. No discussion of the results is given.

E. B. MILLARD.

The thermal expansion of salol. A. LEVI. *Atti r. ist. Veneto* 73, II, 185–94 (1913).—Using a dilatometer with Hg as the contact liquid, L. has measured the thermal expansion of salol in the interval 0 – 100° . The sp. vol. of salol at the fusion temp. (40.6°) was found to be 0.774 for the solid phase and 0.846 for the liquid phase. Values are given for the sp. vol. of the solid, fused and superfused substance over the interval 0 – 100° .

L. T. FAIRHALL.

Electron theory of thermoelectric phenomena and electrothermal phenomena.

E. RIECKE. *Elster-Geitel Festschrift* 1915, 71–104; *Beiblätter Ann. Physik* 39, 639–40 (1915).—The Riecke electron theory of 1898 has been briefly and exhaustively treated. The form of the development is the same as in the earlier derivation, except for the Lorentz hypothesis that only the electrons are concerned in metallic conduction, and the Drude addition that the kinetic energy of the electrons is $\frac{1}{2} kT$ if the velocity distribution of the electrons is given by Maxwell's equation. The formulas derived are identical with those of H. A. Lorentz (C. A. 8, 609; 9, 1264, 2029). Under "conduction of heat and electricity," formulas have been derived for the electricity transported with a given quantity of heat and the heat accompanying a given quantity of electricity and for the elec. and thermal cond. during impeded heat flow and elec. flow. A linear temp. coeff. of electron density was found. Equations are derived for contact e. m. f. and thermal force, and for the heating action of galvanic currents in heating circuits. The second law of thermodynamics holds for the reversible heat flow in the direction of the current. The calcd. difference between the Thomson heat for Ag and Cu agreed with the value exptly. detd. With the aid of assumptions as to the mean free path of the electrons, the absolute density of the free electrons in various metals and the abs. value of the contact difference were calcd. from thermal data. The calcd. values of these quantities were too large, which R. explains by stating that the actual diameter of the sphere of influence of the atoms is much smaller than is shown by the value calcd. from the m. p. or in some other way.

E. B. MILLARD.

Study of the lead electrode. F. H. GRIMAN. *J. Am. Chem. Soc.* 38, 792–801 (1916).—The exptl. details were the same as in previous papers (C. A. 9, 267, 1582). Five types of Pb electrode have been studied in a cell: $\text{Pb} \mid \text{satd. soln. Pb}(\text{NO}_3)_2 \parallel 0.10 \text{ N KCl, HgCl} \mid \text{Hg}$, but the only one const. to 0.0003 v. was that in which the Pb was deposited electrolytically on Pt. Freshly cast sticks of Pb, after immersion in acidified solns. of $\text{Pb}(\text{NO}_3)_2$, for varying periods, lost their ductility and other properties commonly associated with Pb, which confirms the work of Heller (C. A. 9, 2339). The gray mass thus obtained is an allotropic modification of the metal. Measurements of the e. m. f. of cells at 0° and 25° in which freshly cast and gray modifications of Pb

formed the electrodes in 0.2 *N* Pb(NO₃)₂ failed to give any indication of the transition temp. The normal electrode potential of Pb at 25° is 0.1318 v. Photomicrographs of the specimens were made showing the rapidity with which freshly cast Pb undergoes transformation to the gray modification in acid solns. of Pb(NO₃)₂.

E. B. MILLARD.

Study of the action of alkali on certain zinc salts by means of the hydrogen electrode. J. H. HILDEBRAND AND W. G. BOWERS. *J. Am. Chem. Soc.* 38, 785-8 (1916).—The exptl. method employed was essentially that of *C. A.* 7, 3070. It is incorrect to write the reaction between Zn(OH)₂ and excess alkali as $H_2ZnO_2 + 2OH^- = 2H_2O + ZnO_2^{--}$; e. m. f. detns. during a titration with alkali showed the reaction to be $H_2ZnO_2 + OH^- = H_2O + HZnO_2^-$. This is to be expected since the 2nd H ionizes much less readily than the first in all dibasic acids, and it would be strange if the first main product of neutralization of Zn hydroxide were a soln. of Na₂ZnO₂. Another break in the e. m. f. curve indicated the existence in soln. of acids of the type HZnBr₂, HZnI₂, and HZnCl₂, as well as possibly HZn₂Cl₄. From the shape of the curve the ionization const. of HZnX₂ was estd. as about 4×10^{-4} . No indication of the neutralization of the second H was found. Part of the alkali is adsorbed, changing the coagulum of Zn(OH)₂ to a suspension, and part neutralizes the hydroxide, giving the acid zincate.

E. B. MILLARD.

Extrapolation of conductance values. MERLE RANDALL. *J. Am. Chem. Soc.* 38, 788-92 (1916).—It is proposed to plot $\Delta T/Cl/\alpha KCl$ (e. g.) against the square root of the ion concn., and extrapolate to zero concn., as a much quicker method of getting a Λ_0 value. In this method degree of dissociation (α) of the reference salt is detd. by any of the older and more laborious (but reliable) methods. Examples are given to show that this method gives values of Λ_0 which agree with those by other methods. H. C. Jones is criticized, first for reporting cond. values in the obsolete Siemen's units, and second, for assuming that the highest diln. measured represents complete dissociation.

E. B. MILLARD.

Recent developments in electromagnetism. EUGENE BLOCH. *Smithsonian Inst. Ann. Rept.* 1914, 223-41.—The following subjects are discussed: (1) the dynamics of the electron and electromagnetic mass; (2) the principle of relativity; (3) electromagnetism and radiation; (4) the magneton; (5) the production and nature of gaseous ions; (6) photoelec. effect.

E. J. C.

Absorption spectra of liquefied gases in the ultraviolet. L. CIECHOMSKI. *Inaug. Diss. Freiburg (Schweiz)* 1910, 83 pp.; *Beiblätter Ann. Physik* 39, 240-1 (1915).—ZrO₂ and ThO₂ were ignited in a Pt flask with any oxy-acetylene flame and the light radiated from them was used as a source of light in the expts. This allowed an extension of the O₂-H₂ flame range somewhat, but the light was very weak at 235 μ . Condensed Al sparks under H₂O, generated by a simple app. described by C., gave a continuous spectrum to $\lambda = 214 \mu$, but it was very weak at $\lambda = 220 \mu$. The absorption expts. were carried out in a vessel having parallel quartz sides which were optically plane. With liquid O 13 bands were found, of which 5 could be placed in band groups. Equiv. quantities of liquid and gaseous O do not show the same end absorption; the liquid O causes a shift of the absorption limit in the direction of the little-refracted wave lengths. N is very permeable in the ultraviolet. Liquid air gives the absorption spectrum of O. There are no bands in the visible range for Cl; there is strong absorption in the ultraviolet, which, for thin films, resembles that of gaseous Cl. The high absorptive power of the halogens is lost in their H compds.; absorption is first observed in the ultraviolet, and the limit is shifted toward the visible spectrum as the at. wt. of the halogen increases. H₂S shows a partial absorption in the ultraviolet which is

much stronger than that of H_2O . In spite of the fact that N is so transparent to ultraviolet, NH_3 absorbs strongly in this region. SO_2 shows a selective absorption in the beginning of the ultraviolet and becomes completely absorbing for the shorter wave lengths.

E. B. MILLARD.

Primary high frequency spectrum of iodine and tellurium. MANNE SIEGBAHN. *Verh. deut. physik. Ges.* 18, 39-40(1916).—To throw light on the contradictory results with secondary X-ray spectra obtained by Malmer (*C. A.* 9, 1144) and deBroglie (*C. A.* 8, 2650, 3150; 9, 2350), S. has detd. the primary spectrum by means of a chilled anticathode of Ag on whose surface some of the element was placed. The photographs obtained with a rotating salt crystal showed sharp lines for Ag and the α_1 and β_1 lines for the other element. If values of $(1/\lambda)^{0.8}$ are plotted against atomic numbers a straight line is obtained for both α_1 and β_1 if the order is Cd, In, Sn, Sb, Te, I, . . . , Ba, thus adding evidence to the belief that the anomaly of I and Te is one of at. wt. and not of at. number.

E. B. MILLARD.

Zeeman effect and spectral lines. T. VAN LOHUIZEN. *Arch. Mus. Teyl.* [3] 2, 165-97(1914); *Beiblätter Ann. Physik* 39, 155-6(1915).—Mathematical optics. The paper embraces an application of the Preston rule to spectrum lines.

E. B. MILLARD.

Adsorption of gases (vapors) by a solid non-volatile adsorbent. M. POLANYI. *Verh. deut. physik. Ges.* 18, 55-80(1916).—Mathematical. If the adsorption isotherm of an adsorbed substance is known for any one temp. below the crit. temp., the adsorption equil. between the substance and the adsorbent at all temps. and pressures can be calcd. if the equation of state of the adsorbing substance is known.

E. B. MILLARD.

Adsorption by charcoal in alcoholic solution. BROR GUSTAFSON. *Z. Elektrochem.* 21, 459-61(1915).—Distribution expts. have been made with alc. solns. of benzoic acid and phenol on the adsorbing power of charcoal. (The temp. of the expts. is not given.) The results do not lend support to the satn. theory. An expt. on the adsorption of picric acid by charcoal gave results which could be represented by the Freundlich theory if the amount of solvent adsorbed was taken into account in the calcs. Further work is being done.

E. B. MILLARD.

Oil films on water and on mercury. HENRI DEVAUX. Smithsonian Inst. *Ann. Rept.* 1914, 261-73.—A summary of D.'s work during the past 10 years.

E. J. C.

An interpolation formula for resistance thermometry at low temperatures. F. ZERNIKE. *Proc. Akad. Wetenschappen* 18, 914-26(1916).—Z. makes the assumption, based on theoretical considerations, that the resistance of a pure metal and its 1st, 2nd and 3rd differential coeff. with respect to T vanish at abs. zero, and that impurities may be corrected for by dropping the 1st of these conditions. One of the possible expressions for the above condition is $R = T^4/(aT^3 + bT^2 + cT + d) + r$, or $R = Cr/(1 + \alpha r^{-1} + \beta r^{-2} + \gamma r^{-3}) + r$, in which $\gamma = 0.01T$. The formula was tested by applying to the results of Onnes and Holst on the resistance of Pt down to the liquid He temp., and found to represent the results within exptl. error (0.02°). For the Pt wire in question, $\alpha = 0.1536$, $\beta = 0.1255$, $\gamma = 0.0958$. The formula was also applied to Au and Hg, with satisfactory agreement with expt. A single formula to fit both above and below 230° abs. could not be obtained; introduction of a T^2 term, as in the Callender formula, causes large deviation at low temp.

GEO. W. MOREY.

The atomic weights of isotopic thorium and ionium (HÖNIGSCHEID) 3. Production of constant high potential with moderate power capacity (HULL) 4.

3. RADIOACTIVITY.

WILLIAM H. ROSS.

The chemistry of the radioelements. ALEXANDER FLECK. *J. Röntgen Soc.* 11, 53-69(1915).—A discourse with bibliography. W. H. ROSS.

Some remarks on fluorescent and intensifying screens. LEONARD A. LEVY. *J. Röntgen Soc.* 12, 13-22(1916).—An address. W. H. ROSS.

The constants of radioactivity. GERALD L. WENDT. Harvard Univ. *Phys. Rev.* [2] 7, 389-93(1916).—A review of the data published in 1914 and 1915, including a retabulation of the fundamental constants and their general relations.

G. L. WENDT.

The isotopes. HARRY SCHMIDT. *Umschau* 19, 385-8(1915); *Chem. Zentr.* 1915, II, 169.—A review of the work of Soddy, Fleck, Fajans, etc., on the theory of isotopes.

G. L. WENDT.

A new alpha-ray effect. F. H. GLEW. *J. Röntgen Soc.* 11, 77-80(1915).—It has been observed that when a very thin sheet of mica is exposed to bombardment by α -rays, the sheet soon becomes curved with the convex surface towards the source of the rays. If the mica sheet is too thick to bend a strain is produced. These mechanical effects are cumulative and do not appear to be reversible, persisting through a great range of temp. If the radiated piece of mica is split into successive layers, it is found that the curvature resides in the layer which has been nearest to the source of the rays. It is suggested that by refined methods, using a suitable piece of mica as one plate of an interferometer, it may be possible to register and permanently to record a few α -particles, perhaps a single one.

W. H. ROSS.

Asymmetrical diffraction and rediffraction of X-radiation from Coolidge and ordinary tubes. I. G. RANKIN AND W. F. D. CHAMBERS. *J. Röntgen Soc.* 11, 41, 81-5(1915); cf. *C. A.* 9, 752.—The asymmetry is shown to be distributed around a point at about 15° from that at which light, substituted for cathode rays, would be reflected. With ordinary bulbs having platinized Ni or W anticathodes, there is, at this point only, sensible symmetry shown by an annular black band within the rim of the image having an inner white border. In the case of Coolidge tubes, it has been ascertained that although the principle of the distribution still holds, there are significant changes in the effects. Thus (1) the black and white bands are everywhere asymmetric, i. e., there is no symmetric "optimum;" (2) the point around which the asymmetry is distributed lies in the axis of the cathode rays themselves, where, if such observations could be taken, there would be minimal diffraction; (3) the diffraction appears as crescent arcs in place of more or less concentric rings; (4) with ordinary bulbs the breadth of the bands in different positions of the bulb varies imperceptibly when the distance is const., but with the Coolidge tube the breadth of both bands varies in a marked degree directly as the distance from the axis of the cathode stream. Negatives of the second diffraction of the already diffracted radiation show that its image-forming power is still further altered or transformed, e. g., images of circular apertures when the obstacle is placed in an asymmetric position appear as the 2 adjacent sides of squares. With the Coolidge tube there is on one side of the aperture a faint concentric band and on the other a prolongation, or "tail," of double structure which could only have been produced by radiation deviated up to 45° from its path between plate and obstacle (4 cm.). Thus the expts. would seem to show that the origin of the asymmetry, if not of the primary rays themselves, lies in the cathode stream. Cf. Rutherford and Andrade, *C. A.* 8, 3754; Laub, *C. A.* 8, 3529, 3754.

W. H. ROSS.

X-Ray sensitometry. ORIN TUGMAN. Eastman Kodak Co., Rochester. *J. Röntgen Soc.* 11, 121-4(1915).—In the Hurter and Driffield method for detg. the

sensitiveness of photographic materials to light, curves are plotted with densities, *i. e.*, degree of blackening of the photographic negative, on one axis, and the log of the exposure along the other axis. If the straight line part of any particular curve be extended to cut the latter axis, then the portion of this axis thus intercepted will represent the inertia of the photographic plate, and will give a measure of its speed. Expts. are described which show that the curve obtained from action of X-rays on an emulsion is similar to that obtained by the action of light except that the X-rays act throughout the thickness of the film, but this difference is to some extent masked, especially in thick coatings, by the slow penetration of the developer. The sensitiveness of photographic materials to X-rays, however, cannot be found in the same way as to light, but must be considered as the density which can be obtained for a given exposure with development continued to the limit. W. H. ROSS.

The spectrum of X-rays. B. CABRERA. Madrid. *Nature* 96, 144(1915).—Kossel (*C. A.* 10, 552, 1715) discussing the previous measurements of the frequencies of the corresponding lines of the spectrum *K* and *L* characteristic for different elements established certain numerical relations which were confirmed in a more general way by Wagner (*C. A.* 9, 2033) and by Bragg and Pierce (*C. A.* 10, 21). From among these relations attention is now specially directed to the one obtained by generalizing the second law of Kossel: $M_{\alpha} = L_{\gamma} - L_{\alpha}$. In this equation each term expresses the frequency of the lines and with its help the frequencies of the principal lines of the spectrum of the *M* characteristic may be detd. if L_{γ} and L_{α} are known. Using Bohr's model for the atom as modified by Kossel, *i. e.*, supposing that in the transit of an electron from one ring to another a quantum is emitted, the frequency of which is detd. by Bohr's formula, the radiation *M* will correspond to the transit of an electron from the fourth to the third ring, and the corresponding frequency, $\nu = 1.59 \times 10^{14}(N - a)^2$ will be emitted. The exactness of the prediction has been demonstrated by the good agreement in the values found for ν when calcd. for several of the elements by means of the first formula starting from the values of L_{γ} and L_{α} given by Mosely, Rutherford and Andrade, and when calcd. for the same elements by application of the second formula. W. H. ROSS.

The charge of radioactive recoil. L. WERTENSTEIN. *Compt. rend.* 161, 696-9 (1915); cf. *C. A.* 8, 2525.—An exptl. study was made of the question of the charge of recoil atoms in the case of Ra D projected during the transformation of Ra C. Owing to the extreme absorbability of recoil atoms in matter, it is possible to sep. the effect which they produce from that of the α -rays. Measurements were accordingly made of the charge received by a cylinder receptor (1) when the rays had no obstacle to traverse; (2) when they were filtered through a screen of Al foil 0.7μ thick; (3) when they had to traverse a sheet of Al 0.5 mm. thick which arrested all the α -rays. The difference between (1) and (2) gave the value of the charge of the recoil atoms, and the difference between (2) and (3) gave the charge of the α -rays. In carrying out this expt. the whole app. was inclosed in a vessel which was evacuated to as high a degree as possible, and by operating an electromagnetic control from the outside the screens could be moved without opening the vessel. It was found that when the pressure was reduced to 0.6 dynes per sq. cm. the atoms of Ra D when projected do not carry an elec. charge, but when the pressure is increased they gradually acquire a positive charge which becomes equal to and may even surpass that of the α -rays. The results obtained are explained on the grounds that at the moment of their production the atoms of Ra D are not charged. Their positive charge is only a consequence of their collision with the mols. of the surrounding gas which brings about a sepn. of one or more electrons from the radioactive atom. The pressure under which the radiation of recoil attains a charge equal to $1/2$ that of the α -rays corresponds with a free path of the atoms

projected equal to the distance of the source from the receptor. On the assumption that each collision gives rise to the production of a pair of ions the exptl. results show that the mean free path at a pressure of 1 dyne per sq. cm. is 100 mm., while the value calcd. from the ionization produced is 90 mm. Since the free path of a particle of Ra C calcd. in the same way for the initial portion of the path is 440 mm., the recoil atoms at their commencement therefore ionize 5 times better than the α -rays.

W. H. ROSS.

The atomic weights of isotopic thorium and ionium. O. HÖNIGSCHMID. Radium Inst., Vienna. *Z. Elektrochem.* 22, 18-22(1916).—The at. wt. of Th was found to be 232.150 from the ratio $\text{ThBr}_4/4\text{AgBr}$ and 232.152 from $\text{ThBr}_4/4\text{Ag}$. The bromide analysis is accurate because ThBr_4 does not absorb an excess of Br when melted and sublimed in a stream of Br, and at temps. below 800° it does not attack quartz app. This Th was spectroscopically free from all impurities including the rare earths. The same method was then applied to a Th-Io mixt. obtained from the residues after extrn. of U from Joachimsthal pitchblende. The sample was spectroscopically identical with the pure Th but was rich in Io and sufficiently radioactive to give a luminescence. Its at. wt. from the ratio $(\text{Th-Io})\text{Br}_4/4\text{AgBr}$ was 231.503, and from $(\text{Th-Io})\text{Br}_4/4\text{Ag}$ was 231.507. Theoretically the at. wt. of Io is near 230.0, so that the difference of 0.65 unit in the at. wt. of Th is due to an admixture of 30% Io. G. L. WENDT.

The relation between the radioactivity of Swedish springs and the chemical composition of the rocks through which they flow. NAIMA SAHLBOM. *Arkiv Kemi. Min. Geol.* 6, No. 3, 1-52(1915).—An examn. of the radioactivity of 394 deep-bored wells and open drinking springs from different geological areas in Sweden showed a variation in activity of from 0.3 to 172.2 Mache units per l. of water. A marked contrast in radioactivity was noted between spring waters from sedimentary deposits and from the primary rocks. The former gave an av. of 4 and the latter of 23 Mache units. Of the springs from the sedimentary rocks, those from limestone showed the weakest activity, averaging 1.9 units; those from schist showed an activity of 27 units while those from sandstone which were most active averaged 7.1 units. In the case of deep-bored wells a close relationship was also noted between the radioactivity of the water and the chem. compn. of the rock through which they flowed. Thus the highest activity was found in wells bored in the acid rocks, granite and syenite; those in the ordinary gray gneiss and the strongly-pressed granite took an intermediate position; while a few springs in diabase showed a weak activity which did not exceed the value found for sedimentary rocks.

W. J. O'BRIEN.

4. ELECTROCHEMISTRY.

COLIN G. FINK.

Utilization of electric power in electrochemical and electrometallurgical industries (of Switzerland). C. BAUR. *Elektrotechn. Z.* 36, 694-5(1915). C. G. F.

Single-electrode electric furnaces for making and refining steel. ANON. *Elec. World* 67, 670(1916).—The Snyder furnace is made as nearly spherical as possible, as this form has the largest ratio of vol. to surface. Furnaces are designed to make 10 heats per 24 hrs. and a 200 ton per day furnace occupies a floor area of 40 sq. ft. A thorough circulation of the bath is claimed. Three installations are briefly described of 200, 350 and 750 kw. capacity, respectively, and these show an energy consumption of 500-525 kw. hrs. per ton of steel.

W. E. RUDER.

Materials adapted for lining electric furnaces. O. PETERSON. *Mining Eng. World* 43, 695(1915).—The walls of a basic furnace above the slag line may be SiO_2 .

MgO, or chrome brick. MgO brick has the longest life, but is much more expensive. Chrome brick is not cut by molten SiO_2 , and is neutral to acids and bases. The roof of the furnace must consist of SiO_2 brick as no basic lining has been discovered which will retain the shape of an arch of appreciable span without spalling. SiO_2 brick is used throughout in lining an acid furnace.

W. H. BOYNTON.

Electrolytic refining of tin. A new American industry. ANON. *Elec. Rev. West. Elec.* 68, 507(1916).—About 45,000 tons of Sn are imported annually of which 90% comes from Straits Settlements. Bolivian metal does not lend itself to Sn plate production, because of impurities, particularly Pb, Sb and Cu. A new electrolytic refining plant of the Am. Smelt. & Ref. Co. will utilize about 14,000 tons of Bolivian ore. A syndicate in Seattle, Wash., is also contemplating building a smelting and refining plant to handle Alaskan and also Bolivian ores.

W. E. RUDER.

Electrolytic precipitation of bronze. W. D. TREADWELL AND E. BECKH. Charlottenburg. *Z. Elektrochem.* 21, 374-80(1915).—Expts. have been carried out for the purpose of detg. the capacity of Sn and Cu to form alloys. A number of bronze baths have been studied. For red bronze, a caustic alkali oxalate-cyanide bath, containing 25 g. CuSO_4 , 35 g. KOH, 52 g. KCN, 18.5 g. $\text{K}_2\text{C}_2\text{O}_4$ and 26.1 g. of SnCl_4 per l., is recommended and for gilt bronze, a caustic alkali cyanide-sulfide bath, containing 25 g. CuSO_4 , 35 g. KOH, 52 g. KCN, 26.1 g. SnCl_4 and 78.1 g. Na_2S per l.

H. JERMAIN CREIGHTON.

New electrolytic plant at Boston. ANON. *Elec. Rev. West. Elec.* 68, 540(1916).—Brief announcement of the new Boston Electrolytic Oxygen Co. plant. The O is guaranteed 99.3% and the H 99.9% pure. The O is compressed into metal cylinders.

C. G. F.

Anode and Wehnelt effects. G. OESTERHELD AND E. BRUNNER. *Z. Elektrochem.* 22, 38-48(1916); 8 illus.—In the electrolysis of molten salts, the current increases gradually as external resistance is cut out until a critical value is reached at which the voltage rises and the current falls off rapidly. The change is accompanied by sparking at the anode and by singeing of the resistance. The influence of varying conditions on this anode effect were studied with molten NaBe_2F_6 as electrolyte, and a number of oscillographs taken to aid in detg. its nature. The critical max. c. d. varies within wide limits with the physico-chem. properties of the molten salt. The effect is due to the gradual but never complete covering of the anode with a layer of gas resulting in arc discharges through the gas film which shift from place to place. The Wehnelt effect as utilized in the Wehnelt interrupter depends on the presence of self-induction in the circuit. The discharge is caused by the ignition of an explosive gas mixture surrounding the anode. Due to the low b. p. of aq. electrolytes, there is no possibility of a sufficient rise in temp. to permit of a true arc; such an arc in the anode effect is possible with high b. p., highly viscous and poorly adhering molten salts.

E. SCHRAMM.

The hot cathode argon gas-filled rectifier. G. S. MEIKLE. *Gen. Elec. Rev.* 19, 297-304(1916).—A new low-voltage rectifier for rectifying currents within a wide range is described. A simple type of this rectifier is shown in the accompanying fig. G is a hermetically sealed bulb, 7.6 cm. in diam., made of heat-resisting glass. The cathode C is a fine W wire supported between 2 W leads; A is a solid W anode of relatively large cross section and a smooth surface. The bulb is filled with 3 to 8 cc. of argon free from all such impurities as would readily attack the W electrodes. It is absolutely essential that these impurities be absent, as even traces will produce a very



rapid disintegration of the cathode and eventually render the rectifier ineffective. To ensure against the accumulation of impurities that might distil out of the glass or the electrodes, solid substances are introduced into the bulb which, when vaporized, will react readily with these impurities. In the fig. the purifying agent *P* is fastened to one of the cathode leads. As soon as impurities are liberated by the glass or electrodes the voltage across the gap increases and the increased energy consumption causes the cathode leads to heat up and the purifying agent to begin to vaporize. The vapor combines with the impurities and the high state of purity of the argon gas is reestablished. Expts. show that rectification is possible with all pressures of A. With an increase in the gas pressure the potential at which the arc is established increases. In starting the rectifier a. c. passes through the cathode filament: electrons are liberated from the filament and through the mechanism of ionization + ions are produced which, with the electrons, carry the unidirectional current of the arc. The rectifier is self-starting and self-maintaining. The life of the rectifier is 900 to 3000 hrs. The arc drop is 4 to 8 v. In one test the rectifier was connected into a 236 v. 60 cycle a. c. line and furnished 6.2 amp. to 89 storage battery cells connected in series. total d. c. voltage was 224. No auxiliary starting load is required when beginning a battery charge. Other details are given. C. G. F.

The production of constant high potential with moderate power capacity. A. W. HULL. *Gen. Elec. Rev.* 19, 173-80(1916).—Heretofore all attempts to produce high voltage d. c. of more than very small power capacity have met with little success. H. describes a new and comparatively simple method, based upon the kenotron (*C. A.* 9, 1008), for producing 1 to 50 kw. at voltages between 10,000 and 200,000 v. Details and diagrams are given. C. G. F.

The conductivity and electric excitability of liquid insulators. D. HOLDE. *Z. Elektrochem.* 22, 1-5(1916).—The purpose of the expts. described was to det. the danger of fire due to possible accumulation of charges when filling vessels with such liquids as benzine, petroleum ether, benzene. It was found that any charges produced were quickly transferred to the walls of a conducting vessel and at once dissipated if this was grounded. The addition of small amounts of EtOH or HAc, by greatly increasing the cond. of the liquid, acts as a further safeguard. E. SCHRAMM.

Earth resistance and its relation to electrolysis of underground structures. B. MCCOLLUM AND K. H. LOGAN. *Bur. Standards, Tech. Paper* 26, 48 pp.(1915).—The resistivity of the soil in which metallic structures are buried is of much importance with respect to electrolysis. Three methods of measurement, Wenner's method, the guard ring method and the compression method, are described. The first two do not require removal of the soil from its original position. All three are satisfactory for practical purposes, though each has advantages over the others under certain conditions. Soils from different localities showed great variation in resistivity, the majority showing 1000-5000 ohms per cu. cm. Increasing the pressure on a sample of soil tends to increase the conductance slightly, especially if the original pressure is low. Unless a soil is satd. with H₂O, increase in H₂O increases the conductance. The amt. and kind of sol. matter in the soil affect the resistivity. Resistivity increases as the temp. falls, especially when the f. p. of H₂O is reached. Flow of current through soil temporarily increases resistivity in the neighborhood of the electrodes. Considering the relation of soil resistivity to electrolysis, the importance of good rail bonding and well drained roadbed is pointed out. The relations of the various factors affecting leakage resistance, namely, character of soil, pressure, moisture, freezing, and polarization, and surface films to the electrolysis problem are described. A knowledge of the resistivity of the soil is important in estg. the danger indicated by the potential difference and the potential gradient measurements. Temp. and H₂O content of a

soil affect the amt. of current escaping from a grounded track used as a return circuit, and these factors must be considered in the interpretation of data from an electrolysis survey.

E. W. BOUGHTON.

The influence of frequency of alternating or infrequently reversed current on electrolytic corrosion. BURTON MCCOLLUM AND G. H. AHLBORN. *Bur. Standards. Proc. Am. Inst. Elec. Eng.* 1916 (advance copy); *Met. Chem. Eng.* 14, 389(1916).—The frequency of the currents used varied from 60 cycles per sec. to a 2-week period. Pb and Fe electrodes were buried in soil, part of the tests being run outdoors and part in earthenware jars in the lab. The c. d. was 0.5 milliamp. per sq. cm. for Fe. A run lasted 15 to 20 days, and the test pieces were weighed before and after. The results show, (1) that a decrease of corrosion occurs with an increase in frequency; (2) that the corrosion is practically negligible below a 5-min. period; (3) that with Fe electrodes a limiting frequency is reached between 15 and 60 cycles per sec., beyond which no appreciable corrosion occurs; no such limit was reached in the Pb tests, although it may exist at a higher frequency than 60 cycles; (4) that with periodically reversed currents, the addition of Na_2CO_3 to the soil reduces the loss in the case of Fe, and increases it in the case of Pb; (5) that the loss of Pb in soil on d. c. is about 25% of the theoretical loss; and (6) that alternating or reversed current with as long periods as a day or a week would in the case of Fe materially reduce the damage to underground structures. In the so-called neutral zone of street railway networks where the pipes continually reverse in polarity, the damage is much less than would be expected from a consideration of the arithmetical average of the current discharged from the pipes into the earth. Where the pipes are alternately + and — with periods not exceeding 10 or 15 min., the algebraic sum of the current discharged is more nearly a correct index of the damage that will result than any other figure that can readily be obtained. The reduction in corrosion due to periodically reversed currents appears to be due to the fact that the corrosive process is in a large degree reversible, so that the metal removed during the half cycle when current is being discharged is in large measure redeposited during the succeeding half cycle, when the current flows toward the metal. This redeposited metal may not be of much value mechanically, but it serves as an anode surface during the next half cycle, and so protects the uncorroded metal beneath. The extent to which the corrosion is reversible depends upon the freedom with which the electrolyte circulates, and particularly, on the freedom of access such substances as O or CO_2 which may result in secondary reactions giving rise to insol. ppts. of the corroded metal. It is largely for this reason that the corrosion becomes greater with a longer period of the cycle, since the longer the period the greater will be the effect of these secondary reactions. The paper was discussed by Cushman, *et al.*

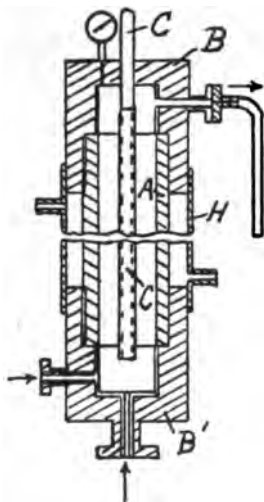
SHERMAN EASTMAN.

Tungsten resources of the U. S. (HESS) 9. Magnetic properties of some iron alloys melted *in vacuo* (YENSEN) 9. The alloy Fe_2Co and its magnetic properties (YENSEN) 9. Corrosion and the engineer (WALKER) 9. High-temperature insulation (BOECK) 18.

Fixing nitrogen. SOC. GÉNÉRALE DES NITRURES. *Brit.*, 22,586, Nov. 16, 1914. A mass containing AlN is obtained by moistening and exposing to the air the product prepd. by heating, at the temp. of the elec. furnace, a mixt. of C and bauxite or other aluminous bodies, with or without a quantity of Fe depending on the proportion of Fe in the aluminous product. The mass is pulverized before treatment, and sawdust or other porous materials may be added to assist the distribution of the H_2O . The reaction is accompanied by the production of combustible gases and by the raising of the mass to a high temp., and after this rise in temp. has taken place, the reaction may

be continued in an atm. of more or less pure N. The speed of the reaction is increased by employing air or N under pressure, or by blowing these gases over or through the mass. The surplus heat produced in the process may be utilized to effect the combination of N with other materials added to the mass, such as bauxite and C. It is preferred that there should be 30-60% of Fe in the mass to be treated; in an example the product is prepd. from a bauxite containing Si and Ti, by heating with coke or wood charcoal in an elec. furnace, molten Fe, or Fe_2O_3 and C, being added during the operation to increase the proportion of Fe in the product.

Electrolytic production of hydrogen peroxide. HENKEL ET CIE. Brit., 22,714. Nov. 18, 1914. App. for mfg. H_2O_2 by the use of O under pressure comprizes a strong



metal tube A fitted with screw caps B, B' and lined with material such as Ag amalgam or Cu amalgam forming the cathode. The caps are lined with protective material. A jacket H may be provided so that the tube A can be cooled by brine. Axially within the tube A is an anode rod C enclosed in a tubular diaphragm of asbestos fabric or other material. O is forced into the lower cap B' through a nozzle producing fine bubbles. Excess of O may be supplied in order to agitate the electrolyte, which enters at the lower cap and escapes through the upper one. Strong peroxide solns. may be obtained by successive passage through several app., which may be elec. connected in series, or by repeated passage through one app. O sepg. from the product is returned to the compressors. Cf. C. A. 9, 1013.

Lixiviating copper and silver ores. H. B. SLATER. Can., 165,980, Nov. 9, 1915. Process for producing a lixiviant for ores of Cu and Ag, by subjecting a soln. of NaCl together with FeCl_2 to electrolysis, thereby oxidizing the FeCl_2 to FeCl_3 , adding a metallic hydroxide to the soln. at the anode and continuing the electrolysis to produce free HClO and ferric chloride.

Separating and cleaning grain. J. KRAUS. Aust., 70,601, Dec. 10, 1915. The treatment is electrolytic.

Drawing wire. R. JAHODA and ELEK. GLÜHLAMPENFABRIK "WATT" SCHARF, LÖTTI & LATZKO. Aust., 70,611, Dec. 10, 1915. The wire is coated with lubricant before passing through the die.

Tungsten wire. WESTINGHOUSE METALLFADEN-GLÜHLAMPENFABRIK GES. M. B. H. Aust., 70,613, Dec. 10, 1915. Before the mechanical operations of hammering, rolling, and drawing the heated rod, or between these operations, the metal is exposed to the action of vapors of S, Se, Te, or their compds. (e. g., H_2S , H_2Se , H_2Te), or similar substances which leave deposits removable later without injuriously affecting the material, preventing oxidation of the heated metal and facilitating rolling and drawing.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

Henry Roscoe. C. THESING. *Chem. Ztg.* 40, 189-92(1916).—Biographical.

J. H. MOORE.

Reaction mechanism of the azoimide synthesis from hydrazine and nitrous acid. FRITZ SOMMER AND HEINRICH PINCAS. Berlin. *Ber.* 49, 259-77(1916).—The reaction between N_2H_4 and HNO_2 is in reality much simpler than might be assumed from the

contradictory observations reported in the literature. Strict distinction must be made between the reaction in acid and in neutral soln. In the latter case (C. A. 8, 306), from 1 mol. each of N_2H_4 and HNO_2 is formed the salt $N_2H_4NO_2$ which on heating, both in the solid form and in aq. soln., decomps. quant. into NH_3 , N_2O and H_2O . Free HNO_2 enormously accelerates this decompn. so that the dinitrite cannot be prepd., as it dissociates into $N_2H_4NO_2$ and free HNO_2 , the latter catalyzing the above decompn., but as it is neutralized by the NH_3 formed, it loses its catalytic activity and in a side reaction the NH_4NO_2 decomps. in the usual way into N_2 and H_2O to an extent depending on the time, temp., concn. and catalytic influences. From the earlier work it seemed probable that the above decompn. was to be referred to the undissociated $N_2H_4NO_2$, so that it should decrease with increasing H-ion concn. To det. whether or not such was the case, solns. of $N_2H_4NO_2$ were treated at 10° with 1-6 N HCl, HNO_3 and AcOH and, after the reaction was ended, analyzed for N_2H_4 , HNO_2 and NH_3 , and it was found that, whereas in aq. solns. equiv. amts. of N_2H_4 and HNO_2 disappear, in acids there is always an excess of N_2H_4 left and never any HNO_2 . The amt. of N_2H_4 left does not vary very much with varying concns. of any 1 acid, but varies considerably with different acids. The same is true of the amt. of NH_3 formed, much less being formed in HCl and HNO_3 than in AcOH. The disappearance of the HNO_2 may be explained on the assumption that it reacts with another product, *vis.*, HN_3 , thus: $HNO_2 + HN_3 = N_2 + N_2O + H_2O$ (cf. C. A. 10, 578). To det. whether this decompn. plays a role in the Curtius HN_3 synthesis, equiv. amts. of $2N_2H_4.H_2SO_4$ and NaN_3 in HCl and HNO_3 (in AcOH $N_2H_4.H_2SO_4$ was used) were treated with an equiv. amt. of $NaNO_2$ drop by drop with const. shaking and the resulting solns. analyzed for remaining N_2H_4 and HN_3 , and for NH_3 formed. The results showed that the reaction between HNO_2 and HN_3 is faster than that between HNO_2 and N_2H_4 , even though it would at first sight seem that in the stronger acids (HCl and HNO_3) more N_2H_4 than HN_3 disappears (N_2H_4 remaining in 5.7 and 1.3 N HCl, 67.9 and 63.4%; HN_3 remaining, 72.8 and 76.0%; NH_3 formed, 2.3 and 2.4%); in 3.5 and 0.90 N AcOH, however, the N_2H_4 remaining is 77.4 and 85.4%; HN_3 remaining, 35.0 and 32.7%; NH_3 formed, 10.6 and 11.3%. Rightly to interpret these figures, however, it must be remembered that HN_3 is formed from N_2H_4 and HNO_2 in acid soln. and in strong acids the HN_3 formation is about 95%. Therefore, in the expt. in 15.7 N HCl, of the 32.1% N_2H_4 which has disappeared, about $\frac{95}{100}$, or 30%, has been converted into HN_3 ; so of the original HN_3 , $27.2 + 30 = 57.2\%$ has disappeared instead of 27.2%. In aq. acid soln., then, the reaction between HNO_2 and N_2H_4 takes place according to the 3 following equations: (1) $HNO_2 + N_2H_4 = NH_3 + N_2O + H_2O$; (2) $HNO_2 + N_2H_4 = HN_3 + 2H_2O$; (3) $HNO_2 + HN_3 = N_2 + N_2O + H_2O$. Strong acids favor (2) but the velocity of (3) also increases with increasing H ion concn. To obtain the max. yield of HN_3 , a strongly dissociated acid must be used but its concn. must not be too great. As it is the undissociated $N_2H_4NO_2$ which decomps. according to (1), the concn. of the N_2H_4 salt must not be too great, but an excess of N_2H_4 is desirable to keep down (3) by mass action. Although S. and P. have not attempted to det. the greatest possible yield of HN_3 , they report a series of expts. in which the max. yield (59.6%) was obtained from 27.6 g. N_2H_4Cl (97.6% pure, with 1.52% NH_4Cl) in 400 cc. of 25% H_3PO_4 treated drop by drop with 1.35 g. $NaNO_2$ in 400 cc. H_2O .

CHAS. A. ROUILLER.

Hydrazine and its inorganic derivatives. III. The sulfates of hydrazine, with especial consideration of their double salts. FRITZ SOMMER AND KURT WEISE. Berlin. *Z. anorg. allgem. Chem.* 94, 51-91(1916).—In general, the salt deriv. in which N_2H_4 functions as a mono-acid base are the ones ordinarily obtained, but the reverse is true of the sulfates, $N_2H_4SO_4$ being the ordinary sulfate, and $(N_2H_4)_2SO_4$ being but little known. The monohydrate of the latter compd. is readily obtained in quantity by treat-

ing the former with excess BaCO_3 , removing the excess Ba with H_2SO_4 , evapg. the filtered soln., and cooling, when it seps. as large, flat, birefractive, hexagonal tablets, stable in the air, insol. in EtOH. It is far more sol. in H_2O than either $(\text{NH}_4)_2\text{SO}_4$ or $(\text{N}_2\text{H}_5)_2\text{SO}_4$; following are the soly. detns., expressed as g. $(\text{N}_2\text{H}_5)_2\text{SO}_4$ in 100 g. soln.: 25°, 66.91; 35°, 71.28; 45°, 78.54; 50°, 82.35; 55°, 83.40; 60°, 84.72; a break in the curve corresponds to the transition of the monohydrate to the anhydrous salt, which takes place at 47.30°, as detd. by thermometric and dilatometric measurements. Anhydrous $(\text{N}_2\text{H}_5)_2\text{SO}_4$ forms long, colorless prisms, m. 118.9°. The following double salts were easily obtained by double decompn. and concn. over H_2SO_4 : $\text{Li}_2\text{SO}_4 \cdot (\text{N}_2\text{H}_5)_2\text{SO}_4$, large colorless prisms; $\text{MgSO}_4 \cdot (\text{N}_2\text{H}_5)_2\text{SO}_4 \cdot 4\text{H}_2\text{O}$, clear prisms; $\text{CaSO}_4 \cdot (\text{N}_2\text{H}_5)_2\text{SO}_4$, colorless 4-sided tablets; $(\text{N}_2\text{H}_5)_2\text{Al}(\text{SO}_4)_3 \cdot 12\text{H}_2\text{O}$, large, colorless octahedra, 100 g. satd. soln. at 25° contains 24.266 g.; $(\text{N}_2\text{H}_5)_2\text{Cr}(\text{SO}_4)_3 \cdot 12\text{H}_2\text{O}$, well formed violet octahedra. *Hydrasinealotriquo nickel sulfate*, $\text{Ni}(\text{N}_2\text{H}_4)(\text{H}_2\text{O})_2\text{SO}_4$, was obtained from NiSO_4 and $\text{NiSO}_4 \cdot (\text{N}_2\text{H}_4)_2$ as flat, deep blue, 6-sided tablets, stable in air, insol. in EtOH, loses H_2O above 100°, decompd. by boiling H_2O . The above salts are in general analogous to the ammonium double salts. Double salts of the type $\text{M}^{++}\text{SO}_4 \cdot (\text{N}_2\text{H}_5)_2\text{SO}_4$ have been described in the literature; several of these were prepd. and the conclusion is drawn that they are internal complex

salts of the compn. $\begin{array}{c} \text{NH}_2\text{NH}_2 \\ \diagup \\ \text{M}^{++} \\ \diagdown \\ \text{NH}_2\text{NH}_2 \end{array} \begin{array}{c} \text{SO}_4 \\ \diagdown \\ \text{SO}_4 \end{array}$. $\text{N}_2\text{H}_5\text{SO}_4$ was also prepd. and in general the ob-

servations of Curtius and Jay confirmed. Detns. of the freezing-point lowering showed that, contrary to the observations of previous investigators, $\text{N}_2\text{H}_5\text{SO}_4$ dissociates in soln. into 3 ions, N_2H_5^+ , H^+ and SO_4^- ; this conclusion is confirmed by potential measurements. The soly. of $\text{N}_2\text{H}_5\text{SO}_4$ is greatly decreased by addition of acids; with H_2SO_4 the magnitude of the effect falls off but slightly with increasing concn.; with HCl the soly. is rapidly diminished with small additions, but the effect rapidly falls off; with AcOH the effect is less than with either of the above with small concn., but the slope of the curve remains const. By dissolving $\text{N}_2\text{H}_5\text{SO}_4$ in hot strong H_2SO_4 and cooling, is obtained an acid salt, $\text{N}_2\text{H}_5\text{SO}_4 \cdot \text{H}_2\text{SO}_4$, long, colorless, hygroscopic prisms; and from strong $(\text{NH}_4)_2\text{SO}_4$ solns., $\text{N}_2\text{H}_5\text{SO}_4 \cdot (\text{NH}_4)_2\text{SO}_4$, transparent, colorless crystals.

GEORGE W. MORREY.

Studies on sulfites, thiosulfates and polythionates. III. A. SANDER. *Z. angew. Chem.* 29, I, 11-2, 16(1916); cf. *C. A.* 9, 2042, 2357.—S. has shown that in the reactions between HgCl_2 and the Na and K thiosulfates and polythionates, the HgCl_2 does not act as an oxidizing agent. The reaction that occurs takes place in steps, there being successively formed (1) mercuric thiosulfate or polythionate and (2) HgS . The HgS combines with the excess HgCl_2 to form the complex $\text{Hg}_2\text{S}_2\text{Cl}_2$. These observations support those made by Kessler 67 yrs. ago and controvert those recently advanced by Feld. In detg. the amts. of trithionate and tetrathionate present in a mixt., S. uses an oxidation method by means of which the polythionate in the presence of excess NaOH may be oxidized quant. to sulfate with 0.1 $\text{N H}_2\text{O}_2$ soln. The excess NaOH is then detd. with 0.1 N acid. The number of mols. of NaOH used up depends upon the character of the polythionate. By means of this simple titration method the relative quantities of polythionate present in a mixt. may readily be detd. L. T. FAIRBALL.

Oxides of iron. I. Solid solution in the system $\text{Fe}_3\text{O}_4\text{-Fe}_2\text{O}_3$. R. B. SOSMAN AND J. C. HOSTETTER. *J. Am. Chem. Soc.* 38, 807-33(1916).—The expts. were undertaken as a basis for the study of Fe-bearing silicates at high temps. Measurements of the dissociation pressure of Fe_3O_4 and Fe_2O_3 were made in a special vacuum furnace with a heating tube of Pt-Rh connected to 2 McLeod gages and a Hg manometer

reading to 0.01 mm. Oxides of Fe from various sources were used, and gave practically the same results. Reproducible O pressures can be obtained at a given temp.; equil. is established in a few minutes in the absence of disturbing factors. One of these factors was the reduction of the oxide by Pt, yielding O an alloy of Fe and Pt. Equil. was certainly established in the expts., for the same pressures were attained with rising and falling temps. The oxidation of magnetite gives pressures which are identical with those produced by the dissociation of Fe_2O_3 . The pressure-compn. isotherm for this oxide system at 1200° indicates a continuous solid soln. from Fe_2O_3 to (or very near to) Fe_3O_4 . On account of the opacity of the products it was not possible to show the existence of this solid soln. optically beyond 18% FeO. These results are confirmed by the 1100° isotherm. Over most of the range the pressure of O is between 4 mm. and 1 mm., but it drops rapidly near Fe_3O_4 and rises rapidly near Fe_2O_3 . Since the dissociation results in the formation of a solid soln., the pressure of O and the compn. of the solid phase depend upon the relation of the wt. of the charge to the vol. of the space into which the O dissociates. This accounts for the variety and uncertainty of results heretofore obtained in expts. on the dissociation pressure of Fe_2O_3 .

E. B. MILLARD.

The nomenclature of silicon and boron compounds. A. STOCK. *Ber.* 49, 108-111 (1916).—S. proposes a more flexible nomenclature for the compds. of Si and B than that in present use. It is proposed to designate the hydrides of Si as *silanes*, thus, SiH_4 *monosilane*, Si_2H_6 *disilane*, Si_3H_8 *trisilane*, etc. Further than this it is a natural step to adopt the rules of organic nomenclature, as Si_2H_4 *disilene*, $\text{H}_2\text{Si}:\text{SiH}:\text{SiH}:\text{SiH}_2$ *tetrasiladiene*, etc. Org. compds. in which one or more C atoms are replaced by Si may be designated as "silico" compds.; in case all the C atoms are replaced by Si as "persilico" compds. As, for example, *monosilicopropane* $\text{SiH}_3\text{CH}_2\text{CH}_3$, *persilicopropane* Si_3H_8 . In the case of B compds. similar rules may be applied. "Boro" corresponds to "silico" in compds. similar to the "silico" compds. above.

L. T. FAIRHALL.

Silicon hydrides. I. Hydrides as products of the reaction between magnesium silicide and acids. A. STOCK AND K. SOMIERSKI. *Ber.* 49, 111-57 (1916).—Magnesium silicide was prepd. as a blue cryst. mass dissolving readily in HCl with evolution of gas which was inflammable in contact with air. In this reaction a brownish gray residue is formed which reacts only slowly with the acid, but decomposes quickly on heating, becoming white. From the carefully purified gas several of the silicon hydrides can be sepd. by condensation in liquid air. SiH_4 (b. -112°) can be prepd. in very pure form from the condensation mixt. Si_2H_6 (b. -15°) may be obtained by distn. from the condensed mixt. Careful fractionation failed to reveal the presence of any other hydride between SiH_4 and Si_2H_6 . By fractionally distg. at room temp. the liquid remaining after boiling off the 2 hydrides, SiH_4 and Si_2H_6 , the following hydrides were obtained: *silicon octahydride* Si_8H_8 , *silicon decahydride* Si_4H_{10} , *silicon duodecahydride* Si_3H_{12} and *silicon quatordecahydride* Si_2H_{14} . The authors call these compds. *trisilane*, *tetrasilane*, *pentasilane* and *hexasilane*, resp. (cf. preceding abstract). SiH_4 (m. -185° , d. = 0.68 at this temp.) is a gas having a characteristic odor. It decomposes H_2O , forming SiO_2 and H_2 , but does not visibly react with most reagents. It is somewhat sol. in org. solvents. Si_2H_6 (m. -132.5° , d. as liquid at -25° = 0.686) is a colorless gas having an odor similar to that of SiH_4 . It decomposes H_2O at room temp. and is easily sol. in EtOH , C_6H_6 and CS_2 . Si_3H_8 (m. -117° , d. 0.725) is a colorless liquid inflammable in air. It reacts slowly with H_2O . Si_4H_{10} (m. -93.5° , d. 0.79) is a colorless liquid similar in all its properties to Si_3H_8 . It decomposes at room temp. somewhat quickly. Heat breaks it up into Si and H_2 . Si_4H_{12} and Si_2H_{14} could be obtained in very small quantity only. No other liquid silicon hydrides could be found by the above method of prepn.

L. T. FAIRHALL.

The combinations of selenium with silver. GIOVANNI PELLINI. Univ. Palermo. *Gass. chim. ital.* 45, I, 533-9(1915).—The compds. of Se and Ag have been frequently studied. Naumannite, Ag_2Se occurs in nature and is found as an isomorphous mixt. with Ag_2S as agularite. Berzelius and Margottet obtained Ag_2Se synthetically by passing Se vapors over red hot Ag in a N_2 atm. Berzelius and Fabre obtained it by the action of H_2Se on AgNO_3 and Senderson thus: $4\text{AgNO}_3 + 3\text{Se} + 3\text{H}_2\text{O} \longrightarrow 2\text{Ag}_2\text{Se} + \text{H}_2\text{SeO}_3 + 4\text{HNO}_3$; in the sealed tube, $6\text{AgNO}_3 + 3\text{Se} \longrightarrow 2\text{Ag}_2\text{Se} + \text{Ag}_2\text{SeO}_3 + 3\text{N}_2\text{O}_5$. Rossler (*Z. anorg. chem.* 9, 50(1895)) crystd. Ag_2Se from fused Bi. Berzelius obtained Ag_2Se but Fonzes-Diacon threw doubt on its existence. Puschin (*Compt. rend.* 1907, I, 1726) confirmed the existence of Ag_2Se by e. m. f. detns. in the cell $\text{Ag} \mid \frac{1}{2}\text{N AgNO}_3 \mid \text{AgSe}_2$. By thermal analysis, Rossler (*l. c.*) found that Ag_2Se is formed and that 2 liquid layers are formed, 1 of which contains 8 at. % Se. Friedrich and Leroux (*C. A.* 2, 3329) confirmed this. R. found that the selenide m. $834-50^\circ$ and the other alloys show a liquid miscibility break between 5 and 33.2 atom % Se. Pelabon (*Compt. rend.* 43, 294(1906); *C. A.* 4, 10) found the compd. Ag_2Se (m. 880°) and a complete miscibility of Ag with Ag_2Se with eutectic at 25 atom % at 830° . Pelabon found that for alloys with the compn. Ag_2Se with increasing Se concn. the m. p. drops from 880° to 620° and shows a miscibility break; the upper liquid is pure Se and the lower has the compn. AgSe which Guertler (*Metallographie* 1, 954-6) considers not to be a compd. since it decomp. into Se + Ag_2Se on crystn. Since Quercigh and P. (*C. A.* 5, 1884) found the unstable compd. AgTe in the system Ag-Te it seemed desirable to repeat the complete study of this system. 28 alloys were studied in the usual way. From the m. p. of Se (217°) the m. p. curve rises rapidly to 616° at 4-5 atom % Ag and remains const. up to 52 atom % Ag and then rises rapidly again to 897° at 66.6 atom % Ag. With increasing Ag the m. p. drops to 845° at 67-8 atom % Ag to rise to 890° at 68-9% Ag and then rises gradually to the m. p. of pure Ag. Only one compd., Ag_2Se , is formed without decompn. in a way analogous to the compds. Ag_2S and Ag_2Te . The m. p. of the 3 compds. increases from S to Te (Ag_2S m. 842° ; Ag_2Se m. 897° ; Ag_2Te m. 959°). Se does not form a compd. AgSe with Ag similar to that found for Te. The 3 compds. Ag_2S , Ag_2Se and Ag_2Te are polymorphic enantiotropes; the points of transformation are, respectively, 90° and 179° for Ag_2S and 122° and 138° , resp., for the other 2. Ag_2Se shows a miscibility break in the liquid state with Ag and with Se, similarly with other binary systems S-Sb and perhaps Se-Sn. Ag shows a miscibility break with Ag_2S but it was not possible to study the behavior of mixts. richer in S. Ag_2Te does not show any miscibility breaks with its components. E. J. WITZEMANN.

The electrolysis of an aqueous solution of potassium orthothioantimonite and the constitution of this compound. J. H. MULLER. *Bull. soc. chim.* 19, 3-8(1916).—By means of electrolyses, with and without diaphragms, of aq. solns. of K_2SbS_3 , it is shown that only SbS_3 migrates to the anode, thus making clear the mode of ionization of the salt. H. I. S.

Thermal analysis of the system cuprous chloride-cupric chloride. C. SANDONNI. *Atti r. ist. Veneto* 71, II, 553-9(1911).—S. has applied the method of thermal analysis to a study of the system CuCl - CuCl_2 to det., if possible, the presence of complexes between the 2 salts, such as are known to exist in soln. The mixts. of the 2 salts were fused in Jena glass and maintained in an atm. of dry N. The temp. changes were followed by means of a Pt-(Pt + Rh) thermoelement. It was found that mixts. containing less than 40% CuCl_2 remained entirely unaltered (fusion developed no trace of Cl). On the contrary, mixts. containing more than 40% CuCl_2 lost Cl rapidly. The results of thermal analyses indicate the presence of a complex salt of the compn. $2\text{CuCl} \cdot \text{CuCl}_2$, corresponding to 79.5% CuCl .

L. T. FAIRHALL.

The temperature of decomposition of cupric nitrate. LUIGI ROLLA. Univ. Genoa. *Gass. chim. ital.* 45, I, 444-50(1915).—In the study of the catalytic action of various metallic oxides in the oxidation of gaseous NH_3 it is necessary to establish the mechanism of formation and decompn. of the corresponding nitrates. R. has detd. experimentally and calcd. thermodynamically the temp. at which at atm. pressure the reaction $2\text{CuO} + 4\text{NO}_2 + \text{O}_2 \rightarrow 2\text{Cu}(\text{NO}_3)_2$ takes place. The mixt. of $\text{NO}_2 + \text{O}$ obtained by the decompn. of $\text{Pb}(\text{NO}_3)_2$ was allowed to act at various temps. on CuO . The temp. above which CuO does not increase in wt. under these conditions is the pt. of decompn. of anhydrous $\text{Cu}(\text{NO}_3)_2$. Abs. dry $\text{Pb}(\text{NO}_3)_2$ was heated in a horizontal electric furnace in a Jena tube connected with a large test tube, in an upright electric furnace, by way of a manometer. At 240° a number of duplicate expts. showed a slight retention of N_2O_4 but at 250° the wt. of CuO remained const. at atm. pressure. The temp. of decompn. of nitrates may be calcd. by Nernst's theorem: $\log(P_{\text{NO}_2} \cdot P_{\text{O}_2}) = -(2Q/4.571 T) + \Sigma \nu \cdot 1.75 \log T + \Sigma \nu C$ in which P_{NO_2} and P_{O_2} are the partial pressures of NO_2 and O_2 in atms., Q the heat of reaction in small cal., $\Sigma \nu$ the sum of gaseous mols. that are formed in the reaction and C the chem. const. of this gaseous mol. By substituting the values $\Sigma \nu = 5$ and $\Sigma \nu C = 16$ and reducing $Q/4.571 T = 4.41 \log T + 8.5$ (I) is obtained. The value of Q for $\text{Cu}(\text{NO}_3)_2$ is not known. Thomsen detd. the heat evolved in the reaction: $\text{Cu} + \text{O}_2 + \text{N}_2\text{O}_4 + 6\text{H}_2\text{O}$ as 95590 cal. When to this is added 12900 cal. for the heat of dissociation of N_2O_4 into 2NO_2 and 39700 cal. is subtracted for the reaction the heat of formation of $\text{Cu}(\text{NO}_3)_2 \cdot \text{H}_2\text{O}$ is obtained, which, by subtracting the heat of hydration, will give Q . The heat of hydration was detd. Since $\text{Cu}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ loses HNO_3 easily on dehydrating, R. placed it in a H_2SO_4 desiccator containing fuming HNO_3 for a week, then *in vacuo* over CaO and H_2SO_4 and on analysis found it to be $\text{Cu}(\text{NO}_3)_2 \cdot 0.52\text{H}_2\text{O}$ and another specimen as $\text{Cu}(\text{NO}_3)_2 \cdot 0.36\text{H}_2\text{O}$. From these the heat of soln. of anhydrous $\text{Cu}(\text{NO}_3)_2$ was found to be 9488. The heat of soln. of $\text{Cu}(\text{NO}_3)_2 \cdot 6\text{H}_2\text{O}$ is -10710 cal. So that the heat of hydration of $\text{Cu}(\text{NO}_3)_2$ is $10710 + 9488 = 20198$ cal. And thus $Q = 95590 + 12900 - (39700 + 20198)$ or 47592 cal. Substituting 523 ($= 250^\circ$) for T in (I) Q is found to be 48917. The error between the calcd. and experimental value for Q is 2.6%. E. J. WITZEMANN.

Amphoteric metallic hydroxides. III. Chromium hydroxide. J. K. WOOD AND VERA K. BLACK. Univ. Coll., Dundee. *J. Chem. Soc.* 109, 164-71(1916); cf. C. A. 2, 1650; 4, 2242.—Freshly pptd. and well washed $\text{Cr}(\text{OH})_3$ in solns. of NaOH of varying concns. was maintained at 25° . After 3 wks. only a very small amt. of Cr was found in the most concd. soln., but after 3 months a yellow color began to develop in this soln. and later in all the others, the intensity being roughly proportional to the concn. of alkali. This was proved to be due to oxidation to chromate by air. The authors regard this as evidence for acid properties in $\text{Cr}(\text{OH})_3$. As the curve showing $[\text{NaOH}]$ -[salt] is not a straight line, it must be concluded that $\text{Cr}(\text{OH})_3$ behaves as a polybasic acid. Attempts to det. the hydrolysis of violet solns. of CrCl_3 by catalysis of hydrolysis of MeOAc were unsuccessful. Complex AcOH derivs. of Cr appeared to be formed. Attempts to det. the soly. of the base in HCl of varying concn. were equally without result. A. R. M.

Stannous and lead alkali double halides. F. RIMBACH AND F. FLECK. Bonn. *Z. anorg. allgem. Chem.* 94, 139-56(1916).—Double salts were prepd. at temps. inside their transition interval by crystn. from the incongruently satd. soln. obtained by adding the components in the desired proportions to insufficient H_2O for complete soln. and sepg. the liquid phase in equil. with double salt and 1 component. The transition temp. was detd. by means of soly. detns.; in all cases studied the double salt becomes stable on increase in temp. The transition temp. for $\text{NH}_4\text{SnCl}_4 \cdot \text{H}_2\text{O}$ is about 20° ; from 16° expressed in g. anhydrous salt per 100 g. soln., is represented

by the formula $P = 57.534 + 0.3598t$. The transition temp. of $\text{KSnCl}_4 \cdot \text{H}_2\text{O}$ is below 3.2° ; from 3.2 to 71° , $P = 23.186 + 0.83063t$; the transition temp. of $\text{NH}_4\text{SnBr}_4 \cdot \text{H}_2\text{O}$ is 50° , of $\text{KSnBr}_4 \cdot \text{H}_2\text{O}$, 45° . $(\text{NH}_4)_2\text{SnCl}_4 \cdot \text{H}_2\text{O}$ is stable in contact with H_2O over a large range of temp.; from 1.6 to 79° , $P = 27.479 + 0.5816t$. The transition temp. of $\text{K}_2\text{SnCl}_4 \cdot 2\text{H}_2\text{O}$ is about 35° ; from 35.6 to 77.3 , $P = 26.705 + 0.4829t$. The transition temp. of $(\text{NH}_4)_2\text{SnBr}_4 \cdot \text{H}_2\text{O}$ is 80° . Contrary to statements in the literature, compds. of the type M_2SnCl_6 exist; the following were prepd. by the above method: *Stannous tetraammonium chloride*, $(\text{NH}_4)_4\text{SnCl}_6 \cdot \text{H}_2\text{O}$, transition temp. slightly above 70° ; *stannous tetrapotassium chloride*, transition temp. about 70° ; *stannous tetraammonium bromide*, transition temp. about 92° ; *stannous tetrapotassium bromide*, transition temp. about 70° . *Lead tetraammonium chloride*, $(\text{NH}_4)_4\text{PbCl}_6 \cdot \text{H}_2\text{O}$ was obtained with difficulty; its transition temp. could not be detd. Attempts to prep. similar compds. with KCl and RbCl failed.

GEORGE W. MORRY.

New series of platinum compounds analogous to Cossa's salts. L. CHUGAEV AND V. LEBEDINSKII. Petrograd. *Compt. rend.* 162, 43-5 (1916).—The mother liquors from the action of CH_3CN on K_2PtCl_4 yielded another compd. as sol. as K_2PtCl_4 and like it pptd. by the chloride of Reiset's first base. This compd. was sepd. from the co-pptd. salt of Magnus by extg. with hot water acidulated with HCl . The filtrate on cooling yielded square plates, orange, strikingly resembling the double salt of Cossa, $[\text{Pt}(\text{NH}_3)_4][\text{Pt}(\text{NH}_4\text{Cl})_2]$. Analysis and reactions established that the salt was $[\text{Pt}(\text{NH}_3)_4][\text{PtCl}_4\text{CH}_3\text{CN}]_2$, corresponding to the acid $\text{H}[\text{PtCl}_4\text{CH}_3\text{CN}]$. When heated with HCl the orange salt gives an abundant rose ppt. gradually becoming green; the latter gives all the reactions of the green salt of Magnus; the rose ppt. is the isomeric form described by Jørgensen. Other sol. double salts of the acid $\text{H}[\text{PtCl}_4\text{CH}_3\text{CN}]$ are obtained by treating the double salt with the appropriate chloroplatinite in water slightly acidulated with HCl to avoid hydrolysis. The K salt, $\text{K}[\text{PtCl}_4\text{CH}_3\text{CN}]$, was prepd. It reformed the double salt on addition of the chloride of Reiset's first base; heated with HCl it gives K_2PtCl_4 ; with CH_3CN in neutral soln. it gives the salt of Hofmann and Bugge. The foregoing shows that CH_3CN reacts with sol. chloroplatinites like NH_3 and org. amines.

A. R. MIDDLETON.

Solution of cerium group oxides by certain acids. W. S. CHASE. Cleveland. *J. Ind. Eng. Chem.* 8, 239-40 (1916).—Soln. of these oxides in residues from extrn. of Th from monazite is shown to be much facilitated by addition of small amts. of H_2O_2 . The accelerating effect is equally shown with H_2SO_4 , HNO_3 , or HCl and whether the acids be concd. or quite dilute. AcOH was found unsatisfactory as a solvent and H_2O_2 had no accelerating effect in presence of this acid.

A. R. MIDDLETON.

Gadolinium sodium sulfate. D. W. BISSSELL AND C. JAMES. *J. Am. Chem. Soc.* 38, 873-5 (1916).— Gd material was purified first by crystg. the double Mg nitrates, then the bromates, until the least sol. portion gave a pure white oxide. The bromate was then converted into oxalate, then to sulfate, and recrystd. The soly. in dil. solns. of Na_2SO_4 of this $\text{Gd}_2(\text{SO}_4)_3$ at 25° was then detd. by rotating the solid with the soln. in a thermostat for several months. 100 g. H_2O dissolve 2.15 parts of $\text{Cd}_2(\text{SO}_4)_3$ in the absence of Na_2SO_4 , but the soly. falls off rapidly in the presence of Na_2SO_4 . When the latter salt is present 1.26 g. per 100 g. H_2O the soly. of the Gd compd. is only 0.17; it falls to 0.05 when there are 7.46 g. Na_2SO_4 per 100 g. H_2O and then remains const. as the Na_2SO_4 is further increased. There is probably only one compd. formed between these 2 salts, namely $\text{Gd}_2(\text{SO}_4)_3 \cdot \text{Na}_2\text{SO}_4 \cdot 2\text{H}_2\text{O}$, similar to the K compd. of Benedict (1899).

E. B. MILLARD.

Extraction of beryllium from gadolinite. C. JAMES AND G. A. PERLEY. *J. Am. Chem. Soc.* 38, 875-7 (1916).—Finely powdered gadolinite was treated with hot H_2SO_4

until dense white fumes were evolved. The soln. was allowed to settle until silica, etc., had sepd., then siphoned off and treated with hot $\text{H}_2\text{C}_2\text{O}_4$ and allowed to stand 12 hrs. After filtering, KBrO_3 was added to oxidize the $\text{H}_2\text{C}_2\text{O}_4$ and the Fe and Be were pptd. together by adding first a small quantity of NH_4OH , then NaOH until the odor of NH_3 was quite strong. Enough H_2SO_4 or HCl was added to the ppt. to dissolve about $\frac{2}{3}$ of it, and then NaOH was slowly added until a small portion of the filtered liquid gave a light colored ppt. with NH_3 , showing that most of the Fe was pptd. After removing the small amt. of Fe remaining, the Be was pptd. as basic carbonate with Na_2CO_3 . If the material is very rich in Be, the first complete pptn. with NaOH may be omitted and a partial pptn. carried out after removing the rare earths and oxidizing the Fe. The sepn. of Be and Al will be described in a future paper. E. B. M.

Beryllium nitride. FR. FICHTER AND EMIL BRUNNER. Basel. *Z. anorg. allgem. Chem.* 93, 84-94(1915).—Impure Be was prepd. by electrolysis of a molten mixt. of BeF_2 and NaF ; it was purified by pressing into cylinders and heating to 1450° in an atm. of H, when the pure metal oozed out of the cylinder in drops. The cylinder was supported on a MgO or an Al_2O_3 support; if the temp. was raised to 1900° the Be reacted with the MgO , and the Mg condensed in a cooler portion of the tube. At 153° in a H atm. at 5 mm. pressure, Be loses weight by volatilization to the extent of $\frac{1}{2}$, its weight in 30 min. Heated in N, or better, in NH_3 to 1000° , Be takes up N with formation of Be_3N_2 ; no compd. containing both N and H appears to be formed. Be_3N_2 sublimes readily; heated rapidly in N it melts at 2200° , and dissociates at a slightly higher temp. Be_2C reacts rapidly at 1000° with NH_3 or at 1250° with N with formation of Be_3N_2 and sepn. of C; a mixt. of BeO and C does not react until about 1900° .

GEORGE W. MORREY.

Isomorphism between sodium nitrate and potassium nitrate (AMADORI) 2. Properties of silicates of the system $2\text{FeO} \cdot \text{SiO}_2 + 2\text{CaO} \cdot \text{SiO}_2$ (SÉLIVANOV) 9.

7. ANALYTICAL CHEMISTRY.

E. G. R. ARDAGH.

Simplified quantitative micro-elementary analysis of organic substances. J. V. DUBSKY. Zürich. *Chem. Ztg.* 40, 201-3(1916).—D. claims to have so simplified and improved Pregl's methods (*C. A.* 9, 1730) that micro-analyses may be made by anyone experienced in macro-analysis. The app. for the detn. of N, C and H is described, with cuts, and detailed directions for operating are given. The app. and manipulation are substantially the same as P.'s.

J. H. MOORE.

Succinic acid as a standard. C. A. PETERS AND V. SAUCHELLI. *Am. J. Sci.* 41, 244-8(1916).—The authors were unable to duplicate the work of Phelps and Hubbard (*C. A.* 1, 1832) who found that succinic acid might be used as a standard for volumetric work against NH_4OH with cochineal as an indicator. In parallel detns. using (1) the electro-titrametric method of Suchtelen and Stano (cf. *C. A.* 8, 3400), (2) the HCl titration with Me orange as indicator, and (3) the method of Phelps and Hubbard, they obtained for the normality of a soln. of NH_4OH the values 0.1240, 0.1224 and 0.1313, resp.

H. L. OLIN.

Reagents for use in gas analysis. IV. Phosphorus in solution. R. P. ANDERSON AND W. BIEDERMAN. *J. Ind. Eng. Chem.* 8, 135-6(1916).—In the abstract of this paper appearing in *C. A.* 10, 728 the second author's name was omitted through an error.

E. J. C.

Color standards and colorimetric assays. H. V. ARNY AND C. H. RING. *J. Ind. Eng. Chem.* 8, 309-17(1916).—Practically every tint desired in colorimetric work can be obtained from either the "Co-Fe-Cu," the "Co-Cro-Cu," or the "Cro-manganate" blends. (Cf. *C. A.* 8, 2540; 9, 2492; 10, 804.) The following detns. are dealt with in detail: NH_3 (Nessler), nitrates, nitrites, vanillin, uric acid, salicylic acid and phosphates. H. M. LANCASTER.

A simple and rapid assay of lead. G. TOROSSIAN. *J. Ind. Eng. Chem.* 8, 331 (1916).—By the action of Al and HCl, the Pb in many compds. is reduced to metallic Pb, which may be dried and weighed. Results obtained in 9 detns. of Pb in $\text{Pb}(\text{OAc})_2$ varying from 54.19 to 55.26% (theoretical, 54.61%), show the method to be suited to those requiring rapid and approx. detns. H. M. LANCASTER.

The reduction of pentavalent to trivalent arsenic by cuprous chloride and the determination of arsenic by distillation as arsenic trichloride. R. C. ROARK AND C. C. McDONNELL. *J. Ind. Eng. Chem.* 8, 327-31(1916).—Ferrous salts effect only incomplete reduction of As^{V} to As^{III} in HCl solns. Apparent contradictions of this statement have arisen from (a) Cu or Cu salts present as impurities, CuCl being formed. (b) As present in small amts., (c) As present as the free metal, or as arsenite and not as arsenate. In HCl solns. CuCl effectively reduces As^{V} to As^{III} , and the AsCl_3 is completely sepd. from Sb, Pb, Cu, Zn, Fe and Ca by distn. H. M. LANCASTER.

The general applicability of the paper pulp filter to quantitative analysis. S. J. JODIDI AND E. H. KELLOGG. *J. Ind. Eng. Chem.* 8, 317-9(1916); cf. *C. A.* 10, 730.—In the quant. manipulation of BaSO_4 , AgCl , K_2PtCl_6 and $(\text{NH}_4)_2\text{PtCl}_6$ considerable time and labor can be saved by the use of paper pulp. The results are as accurate as those obtained with standard filter paper. H. M. LANCASTER.

An accurate end point in the volumetric determination of sulfur in steel. H. ZSCHIEGNER. *J. Ind. Eng. Chem.* 8, 324(1916).—In titrating H_2S with I and starch, the end point is sharp, and results do not vary more than 0.001%, if use is made of a special titrating vessel consisting of a white porcelain beaker 7 cm. in diam. $\times$ 16 cm. deep with a thin disk of hard black rubber or celluloid, 2 cm. diam. cemented to the inside of the bottom. An ordinary beaker, covered on the outside with black and white enamels, is a satisfactory substitute. H. M. LANCASTER.

Determination of sulfur in zinc blende. H. KOELSCH. *Chem. Ztg.* 40, 174 (1916).—Fuse 0.625 g. blende or 1.25 g. roasted blende with 15 g. Na_2O_2 in a 25 cc. Fe crucible over a strong flame, swirling carefully in the flame after fusion begins till it ends, put the slightly warm crucible in 150 cc. H_2O in a 300 cc. beaker, cover, let the contents dissolve, wash the crucible, transfer the soln. and the insol. residue to a 250 cc. flask, add 10 cc. concd. HCl, cool, fill, filter through a dry filter, acidify 200 cc. with HCl and ppt. S with BaCl_2 . It is not necessary to remove Fe from the soln. before pptg. for control work. The results check with those by fusing with $\text{Na}_2\text{CO}_3\text{-KClO}_3$ mixt. J. H. MOORE.

The reduction test for tungsten. M. L. HARTMANN. *Pahasapa Quart. (S. Dak. School of Mines)* 5, 23-6(1916).—W minerals fused with Na_2CO_3 give sol. Na_2WO_4 which when acidified with HCl or H_2SO_4 in the cold yields a white flocculent ppt. varying in compn. from $\text{WO}(\text{OH})_4$ to $\text{WO}_2(\text{OH})_2$. On ignition this yields the yellow oxide WO_3 , which on the addition of strong reducing agents becomes bright blue by the formation of a suspension of lower oxides—a qualitative test for W. As a result of his study of the method H. recommends the following procedure: Boil 0.2 g. of the ore with HCl (d. 1.20) until one-half the acid is evaporated. Dil. with an equal vol. of H_2O , add a piece of metallic Sn and heat. If this test fails to produce the blue color, fuse a 0.5 g. sample with 4 g. Na_2CO_3 , take up the mass with boiling H_2O in the crucible, add

an equal vol. of HCl and proceed as before. The method is applicable to material with 2% W or less.

H. L. OLIN.

Determination of carbon in steels and irons by direct combustion in oxygen at high temperatures. J. R. CAIN AND H. E. CLEAVES. Bur. Standards, *Tech. Paper* 69, 10 pp.(1916).—An amplification of a preliminary paper by the same authors (cf. C. A. 8, 3403). A method has been devised for the detn. of C in steels and irons by direct combustion in O at 950 to 1100°, finishing above 1450°, so that the Fe oxides are kept fused for several mins., in order to give the best possible chance for liberating all the C. This method was tested by analyzing various types of plain C and alloy steel standards of the Bureau and some of the pig-Fe standards, the C results obtained averaging about 0.01% above the certificate analysis.

F. W. SMITHER.

Rapid method for the estimation of copper and iron. GRAHAM EDGAR. *J. Am. Chem. Soc.* 38, 884-7(1916).—The method is a modification of the Volhard method (*Z. anal. Chem.* 18, 285(1879)), and is based on the following steps: (1) Cu is pptd. as CuSCN and Fe reduced to the ferrous state by the action of SO₂ and standard NH₄SCN soln., (2) excess SO₂ is removed by boiling in a current of CO₂. The soln. is cooled and filtered, (3) the filtrate is treated with an excess of standard AgNO₃ soln. and is then titrated for Fe with KMnO₄ soln., (4) Cu is detd. by titrating the excess Ag in the soln. with NH₄SCN. Details are given for the process.

E. B. MILLARD.

Some qualitative tests for gum arabic and its quantitative determination. C. E. WATERS AND J. B. TUTTLE. Bur. Standards, *Tech. Paper* No. 67, 15 pp.(1916).—The object of this paper is to bring together the most important methods that have been published, with more or less discussion of each, and to present a new procedure for the detn. of gum arabic. It was found that Pb(OAc)₂.PbO gives the most characteristic reaction. Mixts. of neutral FeCl₃ and alc., and of CuSO₄ and NaOH are of value as confirmatory tests. Dextrin and gum ghatti, which is in many respects similar to gum arabic, behave toward these reagents quite differently from the latter gum and from one another. Heating with KOH, color reactions with phenols and a number of other reagents were found to give indications of no value. After numerous trials of CuSO₄ and alkali, as well as of modifications of Fehling soln., W. and T. propose the following as a satisfactory quant. method: Dissolve 50 g. of Cu(OAc)₂ in H₂O, add an excess of NH₄OH and dil. to 1 l. using H₂O and alc. in such proportions that the final soln. contains 50% of alc. For each detn. pipet 50 cc. of the gum arabic soln. (=0.25 g. gum) into a 250-cc. beaker, add 50 cc. of alc., and then 25 cc. of the Cu reagent, with const. stirring. Let the ppt. settle, filter on a tared paper, wash with 50% alc. containing NH₄OH, then with 75%, and finally 95% alc.; dry to const. wt. at 105°, ignite in a porcelain crucible, and weigh the ash. The amt. of ash deducted from the wt. of the original ppt. gives the "net gum arabic." The amt. of moisture in the gum originally taken for analysis must be allowed for, and is detd. by drying in a current of H at 105°. The percentages of gum found in a series of 18 detns. averaged 99.5%, the extreme values being 96.6 and 103.3%.

F. W. SMITHER.

Investigation of the antimony spot. Its behavior towards hypochlorite. W. VAUBEL AND A. KNOCKE. Darmstadt. *Chem. Ztg.* 40, 209-10(1916).—In the hypochlorite test to distinguish between As and Sb in spots from the Marsh app. the Sb spot is sometimes dissolved. To det. the cause of this, tests were made on spots from tartar emetic; it was found that while fresh solns. of NaOCl, KOCl and Ca(OCl)₂ did not dissolve the spots they were quickly dissolved by an old hypochlorite soln. Expts. showed that this was due to the presence of NaClO₂ in the old soln., formed by the reaction $2\text{NaOCl} + \text{H}_2\text{O} \rightarrow \text{NaClO}_2 + \text{NaCl}$, but that when the old soln. of sp. gr. 1.052 was diluted with water the reaction was very slight. Old Sb spots were not dissolved even

by the old soln. An examn. of the Sb deposit made by heating the exit tube of the Marsh app. showed it to consist of (1) steel gray metallic Sb, insol. in old hypochlorite soln.; (2) velvet black Sb mirror, probably SbH_3 or Sb in monomolecular form, sol. in old soln. Spots on the porcelain dish consist of (3) a light gray deposit, apparently Sb_2O_3 , perhaps also Sb_2O_3 , sol. in HCl ; (4) a deposit identical with (2); (5) a brownish black portion resembling the As spot, sol. in HCl but insol., or only very slightly sol. in the old soln., probably an allotropic modification of Sb; (6) gray streaks, apparently metallic Sb. Spots on the dish disappear more or less completely on standing a few days, the constituent (5) being most persistent, thus explaining the insolubility of old Sb spots even in the old soln. Hence only fresh hypochlorite solns. should be used in making this test. J. H. MOORE.

Reappearance of the blue color in iodine titrations. H. DUBOVIČ. *Kv. Magyar Természettudományi társulat, Budapest*, Mar. 13, 1915; *Chem. Ztg.* 39, 585(1915).—An address in which the causes of the reappearance of the blue color in I titrations are discussed. The most frequent cause is the presence of NO_2 either in the air or in the water. Another cause is the presence of free or combined Br, which reacts more slowly on $\text{Na}_2\text{S}_2\text{O}_3$ than I and in a different manner. Finally, very small amts. of I react on starch not instantaneously, but after some time. E. H.

8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

Bibliography of North American geology for 1911. JOHN M. NICKLES. U. S. Geol. Survey, *Bull.* 524, 162 pp.(1912); for 1912, *Bull.* 545, 192 pp.(1913); for 1913, *Bull.* 584, 183 pp.(1914); for 1914, *Bull.* 617, 167 pp.(1915); cf. *C. A.* 6, 53.—This series of bulletins contains author and subject indexes, with brief abstracts, of publications on geology and related subjects, including mineralogical and geological chem. Lists of analyses of minerals and rocks appearing in these publications are given. E. T. W.

Diffusion between crystals in the solid state at ordinary temperatures and its importance in mineral formation. F. QUERCIGH. *Rend. accad. sci. fis. nat. Napoli* [5] 21, 18-9(1915).—It was shown that even at ordinary temps. there is a marked diffusion between crystals in the solid state with the formation of a simple [isomorphous] solid soln. The diffusion of iodyrite in miersite and in marshite, and of HgBr_2 into HgCl_2 were studied. In this way an example of a new method of mineral synthesis was demonstrated: i. e., synthesis by simple diffusion in the solid state. The photomicrographs show this effect clearly. E. J. WITZEMANN.

A peculiar intergrowth of phosphate and silicate minerals. EDGAR T. WHERRY. U. S. Nat. Museum. *J. Wash. Acad. Sci.* 6, 105-8(1916).—A green and white substance associated with variscite in fissure veins in metamorphosed slate near Manhattan, Nevada, consists of a green glassy mass, traversed by numerous sub-parallel wavy white lamellas, varying from 1 to less than 0.05 mm. in thickness. Both minerals are amorphous, showing only traces of doubly refracting material. Analysis by J. E. Whitfield of as pure a specimen of the green material as could be obtained by hand picking, but containing sub-microscopic white lamellas, gave: CaO 6.30, CuO 1.25, MgO 0.80, Al_2O_3 25.90, Fe_2O_3 2.14, P_2O_5 24.76, SiO_2 7.32, H_2O below 100° 21.90, above 100° 9.20, sum 99.57. A small sample of the white lamellas containing perhaps $1/3$ of its wt. of green material was analyzed by E. T. W. with the following results: $\text{CaO} + \text{CuO}$ 9.0, $\text{Al}_2\text{O}_3 + \text{Fe}_2\text{O}_3$ 23.3, MgO 0.5, P_2O_5 12.1, SiO_2 30.0, H_2O below 100° 10.4, above 100° 14.8, sum 100.1. On comparison with the known Al phosphate minerals the former

was found to resemble vashegyite most closely, and is probably an impure form of that species. The white mineral is a zeolite related to laubanite, but amorphous. "The material studied is regarded as a colloidal vashegyite traversed by rhythmically pptd. laminae of a Ca-Al silicate of probably zeolitic nature." L. W. RIGGS.

Some mining districts in northeastern California and northwestern Nevada. JAMES M. HELL. U. S. Geol. Survey, *Bull.* 594, 200 pp.(1915).—Includes discussions of the origins of deposits of Au, Ag-Pb, Cu and Sb ores. E. T. W.

Geology and mineral resources of the Kenai Peninsula, Alaska. G. C. MARTIN, B. L. JOHNSON AND U. S. GRANT. U. S. Geol. Survey, *Bull.* 587, 243 pp.(1915).—This bulletin includes descriptions of beds of coal, with analyses, and of deposits of Au, Ag, Cu and minor metals. The origin of some of these deposits is discussed. E. T. W.

Gold quartz replacements in intrusive rock. J. F. McLENNAN. *Mining Eng. World* 44, 389-92(1916).—M. describes the geology and topography of the northern Sierra Nevada and Klamath Mountains. As a typical example is chosen the region of the Feather River. It is pointed out how the dikes and sheets which course the Paleozoic slate undergo variable changes commensurable with the scope of rock subdivision and mineralogical make-up. Thus the more fractured and permeable (Leucophyre vs. Diorite) rock is more readily affected by the "twofold results of circulating solns.; rock alteration, and later, after the descending waters becoming chemically effective through properties collected in their descent, complete reduction of the invaded rock and through substitution, laying down mineral substances collected in their travels." These replacements are not uniform in compn., varying from Au-bearing quartz, to worthless quartz, to sulfides or sulf-arsenides. C. BRAMSON.

Cambrian manganese deposits of Conception and Trinity Bays, Newfoundland. N. C. DALE. Princeton Univ. *Proc. Am. Phil. Soc.* 54, 371-456(1915).—The general geographic and geologic relations of the Mn deposits of S. E. Newfoundland are described, and detailed descriptions of these localities are given, as well as of other Mn deposits of somewhat similar character in Wales, Saxony and Arkansas. Recalcd. analyses are shown in the following table, in which A to K represent Newfoundland specimens, and L to N samples from Elbingerode, Saxony. (G and H, not being Mn ores, are omitted.)

	MnCO ₃	MnSiO ₃	MnO ₂	CaCO ₃	MgCO ₃	Ca-(PO ₄) ₂	SiO ₂	Fe ₂ O ₃	BaSO ₄	H ₂ O	Clay	Total
A.....	44.39	.....	8.08	20.11	4.21	.....	.....	3.36	.....	0.86	18.24	99.2
B.....	29.32	.....	2.34	58.05	29.32	.....	3.78	1.40	.....	1.06	4.07	100.02
C.....	39.56	.....	7.30	18.61	3.79	.....	5.94	7.35	6.29	1.51	9.17	99.52
D.....	32.89	.....	28.93	14.01	5.90	.....	5.40	1.27	.....	0.72	11.08	100.20
E.....	10.23	.....	19.71	7.50	7.25	10.31	19.44	4.25	.....	1.87	19.01	99.57
F.....	19.22	.....	9.36	18.61	10.54	7.50	9.18	6.22	.....	.....	19.61	100.24
I.....	11.27	.....	34.25	4.00	4.97	.....	10.32	4.82	5.40	5.41	16.30	96.74
J.....	16.79	.....	.....	20.91	10.37	3.75	1.20	10.01	.....	.....	36.38	99.41
K.....	26.91	.....	9.00	15.21	7.75	2.50	0.84	9.22	.....	.....	30.06	101.49
L.....	15.05	33.98	.....	1.70	12.64	.....	10.97	1.75	.....	.....	23.76	99.85
M.....	10.00	8.00	.....	2.80	3.79	.....	69.84	.....	.....	.....	6.11	100.54
N.....	76.13	8.92	.....	4.00	2.44	.....	2.16	0.37	.....	.....	5.98	100.00

These analyses are discussed at length and the genesis of the Mn ores summarized as follows: The ultimate source of the Mn was the Mn-bearing silicates of pre-Cambrian igneous and metamorphic rocks east and west of the Cambrian sea. The Mn-bearing silicates went into soln. as sol. bicarbonates, which under favorable conditions were oxidized to oxides. The Mn was transported chiefly as bicarbonate, and to a less ex-

tent as suspended particles of oxides, by pre-Cambrian drainage systems to Cambrian basins. A concn. of the salts of Mn in the sea water immediately overlying the deposited muds, and the liberation of CO_2 , caused a pptn. of MnCO_3 or Mn oxides. "While the main contribution of the Mn came from the pre-Cambrian drainage area in soln., undoubtedly the deposited muds supplied a minor portion." L. W. RIGGS.

High grade manganese ores of Brazil. J. T. SINGEWALD, JR. AND B. L. MILLER. *Iron Age* 97, 417-20(1916).—The geology and history of the manganese deposits in Brazil are given and their importance in the industries pointed out. Detailed descriptions of a few districts are given, and mention is made of the cost of mining, av. analysis, output, and shipment facilities. C. BRAMSON.

Pebble phosphates of Florida. E. H. SELLARDS. *Flo. State Geol. Surv., Ann. rept.* 7, 29-116(1915); *Am. J. Sci.* 41, 299(1916).—A geologic study of the origins of the pebble phosphates. The variation of the thickness and continuity of the deposits is attributed to the irregularity of the erosion surface upon which the pebbles were deposited, and to the constantly changing depth of water and force of wave action of the advancing sea. The variation in phosphate content appears to result from the irregular sorting action of the water, from varying phosphate content of the supply and from secondary enrichment being more complete in some places than in others. L. W. RIGGS.

Geology and coal resources of North Park, Colorado. A. L. BEEKLY. U. S. Geol. Survey, *Bull.* 596, 121 pp.(1915).—Analyses of samples of the coals of this region from 7 different mines are tabulated. The coal is to be classed as subbituminous E. T. W.

Summation of chemical analyses of igneous rocks. H. H. ROBINSON. Peabody Museum, New Haven. *Am. J. Sci.* 41, 257-75(1916).—The object of this paper was to discuss the subject of summation in a general way as well as in individual cases, and to det. if the departures from the mean value were distributed in any definite and orderly manner. The 3391 analyses of the Washington and Washington-Roth tables formed a basis of study. For details the original article should be consulted. L. W. R.

Petrographic description of several basalts from Patagonia, western Antarctica and the southern Sandwich Islands. OLOF BÄCKSTRÖM. *Bull. Geol. Inst. Univ. Upsala* 13, 115-82(1915).—A large number of specimens are described, analyses being given. The classifications of the rocks in the Osann and C. I. P. W. systems are worked out, and their relations discussed. E. T. W.

Analysis of slate and dike. E. E. WHITE. *Eng. Mining J.* 101, 433-4(1916).—Since it is often impossible to differentiate between the slate and dike in hand specimens, as well as in thin sections, W. has analyzed a number of known slates and known dikes of the Marquette Range, using the results to build up a table of limiting values and factors. The dikes are characterized by high ignition loss, high ratio of Fe^{+} to total Fe, and low insol. residue + Fe oxides. The slates are characterized by low ignition loss, low ratio of Fe^{+} to total Fe, and high insol. residue + Fe oxides. If any one of these 3 factors indicates a different material from the other 2, the sample is considered indeterminate (this occurred in only 3 samples out of 83 analyzed). Insol. residue is detd. by digesting with HCl and evapg. to dryness twice, then adding more HCl, filtering, washing, igniting, and weighing the residue. Tables are given showing results of analysis of 83 samples. Each mine or locality must be taken as a unit and new tables of limits prepd. by analyzing known samples, as the limits reported apply only to the Marquette Range. F. W. SMITH.

Weathering in the podzol

Northland (T)

9. METALLURGY AND METALLOGRAPHY.

WILLIAM BRADY, WILLIAM T. HALL.

Aluminium dust. G. H. CLEVINGER. *Mining Sci. Press* 112, 118(1916).—A representative analysis of a good grade of Al dust is: Al 91.20, Al_2O_3 5.80, SiO_2 1.30, Si 0.40, C 0.23, H_2O 1.07%. N may also be present. Al dust is used chiefly in the cyanide process, in thermite welding and in explosives. L. P. WEBBERT.

Calculations with reference to the use of carbon in modern American blast furnaces. HENRY P. HOWLAND. *Bull. Am. Inst. Mining Eng.* 1916, 627-50.—H. describes methods for calcg. the % C gasified at the tuyères, the vol. of air consumed per unit of coke, and the relation between air, coke, and Fe output, and also for analyzing the work done by the C in the furnace with a view to answering the question of causes of high and low coke consumption. He concludes that the explanation does not lie in differences in the % C gasified at the tuyères, in differences in the air-coke ratio, nor in C contents of the coke, but in variations in coke quality which det. the speed of oxidation at the tuyères. A quickly burning coke made from coal low in ash and high in volatile matter allows a max. concn. of heat in the hearth, which is consistent with high efficiency in fuel consumption. Concn. of heat is further effected by low wind velocity and large hearth area. H. L. OLIN.

Modern American blast-furnace practice. R. V. MCKAY. *Year Book Am. Iron and Steel Inst.* 1914, 85-101.—A detailed account with tables, curves, analytical data, etc., of the various steps followed in obtaining the present very satisfactory results in smelting Mayari (Cuban) ore. F. W. SMITHER.

Modern American blast furnace practice. E. S. COOK. *Year Book Am. Iron and Steel Inst.* 1914, 102-11.—A review of the development of the lines of the modern blast furnace of the East, as illustrated by Warwick furnace No. 2 at Pottstown, Pa. C. sums up as follows: (1) The Edgar Thomason furnace, which did the best work about 1900, using Lake Superior ores and making steel works Fe, proved the most satisfactory furnace at that time for using the various ores of the East on merchant grades of Fe. (2) The development in the East has been along the lines of larger hearths and lower boshes, the same as the development in the West. Somewhat steeper boshes seem desirable. (3) The large furnace, which at first was thought only suitable for making basic Fe, has since been found to make all the grades of merchant Fe (foundry, Bessemer, malleable, and low P) of a satisfactory quality, and with as low fuel consumption as the small furnace. (4) Various difficult materials can be used up to a certain percentage and good work and long life can be got out of a furnace, provided care is taken to see that the stock distribution and the air distribution are correct, and attention given to proper uniformity of operation. F. W. SMITHER.

Modern American blast-furnace practice. H. A. BRASSERT. *Year Book Am. Iron and Steel Inst.* 1914, 15-69; cf. *C. A.* 8, 2864.—A comprehensive review and discussion with drawings, curves, tables, analytical data, etc. Results obtained at the South Works of the Ill. Steel Co. and at Gary are reported. F. W. SMITHER.

Modern American blast-furnace practice. A. J. BOYNTON. *Year Book Am. Iron and Steel Inst.* 1914, 76-84.—A discussion of a paper by Brassert (cf. preceding abstract), and of results obtained at Lorain, O. F. W. SMITHER.

Treatment of blast-furnace flue dust. B. G. KLUGH. *Year Book Am. Iron and Steel Inst.* 1913, 335-48; cuts.—A study of the microscopic structure of the products of the various processes. "A comparison of the products of the various processes in favor of the process employing the least degree of heat-agglomerated material is the constituent of heat-agglomerated ma-

terials which retards the reducibility of such products by enveloping the Fe oxide and hermetically sealing it against the action of the furnace gases. The presence of this objectionable constituent is due to the high temp. employed in the agglomerating process. Agglomeration may be effected at such temps. and with such control of the time element as to produce an agglomerate entirely free from this silicate. Where the latter conditions are attained, the incident porosity of the product, consisting of intercommunicating channels from $\frac{1}{4}$ -in. down to microscopic size, contributes materially to the ideal reducing requirements of the blast-furnace material. An agglomerate which embodies the characteristics of freedom from the sealing constituents of fused silicates and at the same time has a permeability allowing free action of the gases on an infinitely large area is essentially one of max. reducibility and hence of greatest value as a blast-furnace stock."

F. W. SMITHER.

Treatment of blast-furnace flue dust. E. B. CLARK. *Year Book Am. Iron and Steel Inst.* 1913, 314-26.—A review and discussion of processes. F. W. S.

Treatment of blast-furnace flue dust. J. W. DOUGHERTY. *Year Book Am. Iron and Steel Inst.* 1913, 327-34.—A discussion of a paper by Clark (cf. preceding abstract), together with a suggested new method (explained with illustrations) for utilizing flue dust. F. W. SMITHER.

The operation of the blast furnace. J. E. JOHNSON, JR. *Met. Chem. Eng.* 14, 266-8(1916); cf. C. A. 10, 876.—J. gives curves indicating the progressive changes in compn., temp., and pressure of the ascending gas column based on data gathered from the work of various observers. H. L. OLIN.

The use of titaniferous ore in the blast furnace. F. E. BACHMAN. *Year Book Am. Iron and Steel Inst.* 1914, 371-419.—A detailed account of preliminary expts. and of exptl. runs made in the blast furnace at Port Henry, N. Y., using concentrates from the titaniferous ore of Essex Co., N. Y. Drawings photomicrographs, curves, analyses, and tests are given in detail. B. concludes that: Titaniferous concentrates are reduced in the furnace with no greater and probably with less expenditure of heat, and consequently of fuel, than non-titaniferous magnetites, and as a greater proportion of their O is removed by the action of CO than is the case with non-titaniferous magnetites, a lower fuel consumption for the reduction of the Fe may be expected. The slower driving of the furnace for the same wind blown seems to be explicable only on the assumption that more C was burned in the hearth and less in the upper portions of the furnace. With proper concn. Sandford ore should be produced containing Fe from 58 to 60%, and from 9 to 10% TiO_2 . The wt. of slag produced per ton of Fe from an ore of this compn. will be slightly greater than that produced from the av. magnetic concentrate containing 62 to 63% Fe. This additional slag production will about counterbalance the reduced fuel consumption necessary for the reduction of their Fe contents. The slags produced will be of much greater fluidity than those produced when TiO_2 is not present. The operation of the furnace above the tuyère level will be more uniform and there will be less tendency to hang and slip. The Fe produced will contain less S, its Si content will be lower by an amt. equal to 0.5 of the Ti content. With TiO_2 in the slag in excess of 6% the production of high Si iron (Fe containing over 2% Si) will be more difficult. The titaniferous ore being low in SiO_2 is not adapted for the production of high-Si iron. At least until further investigation is made, there is likely to be a tendency to periodical "dirty hearth" conditions in the working of the ore, but they are readily stopped by the removal of titaniferous ore from the mixt. for short periods. F. W. SMITHER.

Laboratory method for determining the capacities of slime-settling tanks. H. S. COE AND G. H. CLEVENGER. *Bull. Am. Inst. Mining Eng.* 1916, 597-625.—In

slime settling 4 distinct zones are recognized, *vis.*, (D) that portion of the pulp wherein the flocs have settled so that they rest upon one another; (C) the transition zone in which the percentage of solids decreases from the bottom where the flocs enter zone (D), to zone (B) where the consistency of the flocculated pulp is the same, as that of the original pulp; and (A) the zone of clear water or soln. The critical settling point is the top of zone (D) just as zone (C) disappears. For calcg. the capacity of a layer of flocculated pulp of any consistency to discharge its solids, the authors propose the formula $C = KR/(F - D)$, where C = capacity in lbs. of solids per sq. ft. per hr., R = rate of settling in feet per hr., F = ratio of fluid to solids in the pulp tested, D = ratio of fluid to solids in the discharge required, and $K = 62.35$, wt. of 1 cu. ft. of water in lbs. The max. capacity of a continuous thickener is, therefore, equal to the minimum value of C for any of its zones. Comparative tests made on vessels 1 to 10 feet deep showed that the critical point is first reached by the surface of the pulp in the most shallow vessel but that the rates of settling in layers of like consistency are the same for vessels of all depths. The tank area A required for thickening 1 ton of solids per day is found by applying the formula $A = 2000(F - D)/24KR$, where D is the fluid-solid ratio in the thickest pulp that can be economically obtained. To find the required depth compute the capacity of the thickening zone which is to contain a supply of solids equal to the total capacity of the tank for the time required to thicken the pulp to the density required in the discharge, add an allowance for the lost space due to the pitch of the drag in the thickener and in addition 2-3 feet for depth of feed and for storage capacity.

H. L. OLIN.

The Liberty Bell methods of precipitate refining. A. J. WEINIG. *Bull. Am. Inst. Mining Eng.* 1916, 651-62.—The cyanide ppt. from this plant varies widely in compn. and its purification requires special care. The method pursued embodies the principle of the addition of an oxidizer and the proper proportionment of fluxes, MnO_2 , KNO_3 , $NaNO_3$, Na_2CO_3 , SiO_2 and $Na_2B_4O_7$, to carry off the oxidized impurities as metallic bases in a fluid slag. The ppt. from the press is mixed with the computed flux while wet, loaded into cast-iron pans, and heated to redness in a cast-iron muffle furnace. The sintered mass makes an excellent charge for crucible melting and a rate of 1300 oz. bullion per hr. with a 65% Au-Ag ppt. is common.

H. L. OLIN.

Cyanidation of flotation concentrate. E. M. HAMILTON. *Mining Sci. Press* 112, 365-6(1916).—H. reports a lab. test on a Calif. Au ore assaying 0.57 oz. Au and a little Ag. The ore was ground to pass an 80-mesh sieve for flotation and yielded a concentrate assaying 9.66 oz. Au and 9.85 oz. Ag. A sample of this concentrate, without filtering or regrinding, was treated by bottle agitation for 72 hrs. with cyanide soln. at 0.2% KCN and at a ratio of 5:1. No preliminary treatment of any kind was given and no reagents were added except CaO and NaCN; the soln. was not changed during treatment, and at the conclusion of agitation the sample was filtered and washed on the filter in the usual way. Extraction: Au, 97%; Ag, 64%. H. believes that given an ore that presents no *a priori* obstacle to cyanidation, the concentrate recovered therefrom by flotation will give no more difficulty in cyanidation than a concentrate from the same ore recovered by any other means.

F. W. SMITHER.

Universal flotation theory. C. T. DURELL. *Met. Chem. Eng.* 14, 251-6(1916).—A discussion of the principles underlying various processes of flotation, including the Delpat, the Minerals Separation, the De Bavay, the Callow, and the liquid-jet types. All processes and kinds of flotation may be satisfactorily explained by gas occlusion. Although oil aids flotation (1) by increasing the surface tension, (2) by decreasing the adhesive force of water for metallic particles by forming films around them and (3) by increasing the cohesive force of particles for each other by means of the film, there is no universal theory that considers oil necessary.

H. L. OLIN.

Flotation concentration at Anaconda, Mont. FREDERICK LAIST AND ALBERT E. WIGGIN. *Bull. Am. Inst. Mining Eng.* 1916, 549-81.—Flotation treatment of slime and mill tailing was tested on a large scale at the Washoe plant with the use of a standard-type Minerals Separation machine treating round table feed. The following agents were used either alone or in combinations: turpentine, crude oil, cresylic acid, stove oil, tar oil, Carolina oil of tar, argols, sludge acid, fuel oil, wood creosote and H_2SO_4 . The best combination for the treatment of slime was found to be H_2SO_4 , sludge acid kerosene, wood creosote and stove oil. The recovery by flotation treatment of round table tailings is no higher than that from direct flotation of slime and the retention of the round tables would, therefore, not be economical. In direct treatment the resulting tailings assayed less than 0.30% Cu with a concentrate carrying not more than 40% insol. The tests proved, furthermore, that the best circuit density for the slime pulp is 12% solids and its optimum temp. 21° and that the presence of acid is essential. The peripheral speed of the agitators should not exceed 1300 ft. per min. Results of tests on mill tailing ground through 60 mesh showed again that sludge acid kerosene and H_2SO_4 made the best combination. Tailings assayed not more than 0.10 Cu and the concentrate carried less than 30% insol. The temp. of the pulp should be 21° and while the presence of acid is beneficial it is not so important as in slime treatment. Compared with the Minerals Separation machine the Callow pneumatic is more sensitive and needs more attention but on the other hand requires fewer repairs. With mill tailing ground through 60 mesh the use of the agitator is unnecessary if the oil is added before the grinding and power costs are therefore lower. H. L. OLIN.

Recovery of white metal from drosses. A. BREGMAN. *Metal Ind.* 14, 103-6 (1916).—The different kinds of drosses are classified according to compn. as follows: (1) Solder—Pb and Sn, (2) tin, (3) lead, (4) hard—Pb, Sb and Sn, (5) Babbitt—Pb, Sb, Sn and Cu. In smelting it is essential not to mix the different kinds. The furnace employed is of the simplest reverberatory type, either coal, gas or oil fired. Detailed directions are given for sweating and smelting, with methods of overcoming difficulties which inhere in the process. Too thick a slag is caused by too much SiO_2 in the dross. This is remedied by the addition of $NaHSO_4$, or of scrap iron. If too much oxide is left in the furnace after the tap, coal, preferably anthracite, should be added. Drosses containing a low % of metal, high % of SiO_2 or residues from sweating rough pigs are found to be refractory. L. W. RIGGS.

Mineral production of the United States in 1914. A summary. H. D. McCASKEY. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 64 pp. (separate A, published February 10, 1916). E. J. C.

The production of metals and ores in 1914. J. P. DUNLOP. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 415-25 (separate, published Nov. 20, 1915). E. J. C.

The production of iron ore, pig iron and steel in 1914. ERNEST F. BURCHARD. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 477-539 (separate 16, published Dec. 9, 1915). E. J. C.

Gold and silver in 1914. H. D. McCASKEY. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 829-65 (separate 23, published Jan. 20, 1916). E. J. C.

Gold, silver, copper, lead and zinc in Nevada in 1914. V. C. HRIKES. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 655-716 (separate 19, published Dec. 21, 1915).—Statistics. E. J. C.

Gold, silver, copper, lead and zinc in Arizona in 1914. V. C. HRIKES. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 427-75 (separate, published Dec. 14, 1915).—Statistics. E. J. C.

Gold, silver, copper, lead and zinc in Idaho and Washington in 1914. C. N. GERRY. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 597-654 (separate 18, published Dec. 17, 1915).—Statistics. E. J. C.

Gold, silver, copper, lead and zinc in Montana in 1914. V. C. HEIKES. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 757-97 (separate 21, published Dec. 24, 1915).—Statistics. E. J. C.

Gold, silver, copper, lead and zinc in California and Oregon in 1914. CHAS. G. YALE. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 353-414 (separate, published Oct. 30, 1915). E. J. C.

Gold, silver, copper, lead and zinc in Colorado in 1914. CHAS. W. HENDERSON. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 255-313 (separate, published Oct. 16, 1915).—Production statistics. E. J. C.

Gold, silver, copper and lead in South Dakota and Wyoming in 1914. CHAS. W. HENDERSON. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 239-54 (separate, published Sept. 24, 1915).—Production statistics. E. J. C.

Gold, silver, copper, lead and zinc in New Mexico and Texas in 1914. CHAS. W. HENDERSON. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 211-38 (separate, published Sept. 23, 1915).—Production statistics. E. J. C.

Gold, silver, lead and zinc in the Eastern States in 1914. J. P. DUNLOP. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 139-63 (separate, published Aug. 20, 1915).—Production statistics. E. J. C.

Silver, copper, lead, and zinc in the Central States in 1914. B. S. BUTLER AND J. P. DUNLOP. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 27-124 (separate, published July 19, 1915).—Production statistics. E. J. C.

Copper in 1914. B. S. BUTLER. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 541-96 (separate 17, published Dec. 8, 1915); cf. C. A. 9, 2209.—Statistics. E. J. C.

Lead in 1914. C. E. SIEBENTHAL. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 799-827 (separate 22, published Jan. 14, 1916); cf. C. A. 9, 2210.—Statistics. E. J. C.

Zinc. C. E. SIEBENTHAL. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 867-919 (separate 24, published Feb. 1, 1916). E. J. C.

Cadmium. C. E. SIEBENTHAL. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 921-2 (separate 24, published Feb. 1, 1916). E. J. C.

Cobalt. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 923-4 (separate 25, published Feb. 26, 1916). E. J. C.

Tin. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 931-4 (separate 25, published Feb. 26, 1916). E. J. C.

Titanium. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 935-6 (separate 25, published Feb. 26, 1916). E. J. C.

Molybdenum. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 925-6 (separate 25, published Feb. 26, 1916). E. J. C.

Nickel. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 927-30 (separate 25, published Feb. 26, 1916). E. J. C.

Quicksilver in 1914: Production and resources. H. D. McCASKEY. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 315-22 (separate, published Oct. 12, 1915). E. J. C.

The production of bauxite and aluminium in 1914. W. C. PHALEN. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 183-209 (separate, published Sept. 9, 1915). E. J. C.

The production of manganese and manganese ores in 1914. D. F. HEWITT. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 165-81 (separate, published Aug. 21, 1915). E. J. C.

Tellurium. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 975-7 (separate 26, published Feb. 26, 1916). E. J. C.

Selenium. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 969-74 (separate 26, published Feb. 26, 1916). E. J. C.

Antimony. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 947-52 (separate 26, published Feb. 26, 1916). E. J. C.

Bismuth. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 965-8 (separate 26, published Feb. 26, 1916). E. J. C.

Tungsten. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 937-42 (separate 25, published Feb. 26, 1916). E. J. C.

The production of platinum and allied metals in 1914. JAMES M. HILL. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 333-52 (separate, published Oct. 18, 1915). E. J. C.

A development of practical substitutes for platinum and its alloys with special reference to alloys of tungsten and molybdenum. FRANK A. FAHRENWALD. Univ. Michigan. *Bull. Am. Inst. Mining Eng.* 1916, 103-49.—A substitute for Pt should melt well above 1200°, should not be easily attacked by chemicals nor by O, should be strong and fairly pliable, should have a low coeff. of expansion, should alloy well with Au, Ag and similar metals and their solders, and should be cheaper than Pt. A consideration of the periodic law indicates that a Pt substitute can hardly be expected except with alloys of the elements Cr, Mn, Fe, Co, Ni, Cu, Ag, Pd, Au, Mo, and W. Each of these 11 elements was combined in varying proportions with each of the other 10, giving 55 series of binary alloys which were examd. with regard to their suitability as Pt substitutes. Behavior under the hammer, or when drawn through draw plates, and treatment with acids and alkalies was sufficient to show whether any particular specimen should be discarded at once. Expts. with the metals having m. p. within the limits of ordinary fusion methods showed that metals or alloys outside of the precious metal groups are unsuitable as substitutes for Pt. Au and Ag alloys with Pd are excellent substitutes for Pt in its softer forms and, although not so resistant chemically as Pt, will fulfil all requirements when the conditions are not too rigid. Except with regard to ease of oxidation and difficulty with soldering, pure, ductile W and, to a lesser degree, Mo meet all the specifications of a practical substitute for Pt and its alloys. The defects can be overcome by coating with a precious metal or alloy, the resulting metal being in some respects superior to Pt and its alloys. This material has met with commercial demand and has replaced already some of the best Pt-Ir alloys. The theoretical and practical considerations involved in the manuf. of wrought W and Mo are discussed at length. Wrought W and Mo were produced on a lab. scale but the attempted production of alloys of W with Au and with Pd was not successful; on the other hand the alloys of the W-Mo series were produced in wrought form. These operations were governed by metallographic control and their success indicates the possibility of a similar method in the treatment of such metals as Ir, Ta, Rh, Os, etc., in combination with one another or with Mo in the hope of producing alloys superior to any now available.

W. T. H.

The relation of ductility to elongation. H. FRIEDMANN. *Machinery* 22, 508-9 (1916).—No strict proportional relationship exists between ductility and elongation and deductions from local distribution of lengthening give better results. A high value of local elongation corresponds to a reduction of area at the point of fracture and the % reduction bears a close relation to ductility. Diagrams of local lengthening are given. The more marked the elevation near the point of fracture, the more ductile the metal, and the straighter and more uniform the line the more brittle the metal. The av. elongation measured by mean ordinate of the diagram is not as important as the general character of the curve. Ductility is judged approx. from the outline of the curve for the broken test-bar. The outline is of less distinct character than the elongation diagram, for the former is proportional to the square root, and the latter to the full value of the area.

W. H. BOYNTON.

The preparation, fusibility and some other properties of silicates of the system $2\text{FeO} \cdot \text{SiO}_2 + 2\text{CaO} \cdot \text{SiO}_2$. B. SĖLIVANOV. *Rev. Soc. Russe Metal.* [2] 1915, 328; *Rev. Metal.* 12, 309-18.—The method of prepn. consisted in heating weighed quantities of FeO, SiO_2 and CaO in a Pt boat to a certain temp. for a given time. The fusion mixt. was protected from oxidation by heating it in an atm. of purified N. The mass was allowed to cool, withdrawn from the furnace and in case fusion had not occurred, heated again for the same time at a higher temp. As a result of heating, the FeO forms Fe and Fe_3O_4 to some extent. Expts. show that in monosilicate slags of the type $(\text{FeO} \cdot \text{CaO})\text{SiO}_2$ the oxide Fe_3O_4 acts as an acid. FeO and Fe_3O_4 furthermore easily unite to form the magnetic oxide Fe_3O_4 . The magnetic permeability of the system slowly increases with the temp. but decreases rapidly after attaining a max. In the slag obtained no complete sepn. of the salts of Ca and Fe from the silica could be made, even by boiling with *aqua regia* followed by evapn. The slags dissolved completely only in HF. The amt. of Fe that passed into soln. on boiling with dil. H_2SO_4 (10%) was detd. by titration with KMnO_4 . In the case of silicates containing 60% $2\text{CaO} \cdot \text{SiO}_2$ the Fe dissolved entirely. Slags containing less than 60% showed a lower solubility of Fe in the acid. Detns. of the density of a number of slags were made. The density diminishes about 0.03 for each increase of 1% in SiO_2 content. Expts. were made to show the reducing action of H on the slag. For this purpose, the latter was placed in a Pt boat and subjected to the action of H, the temp. being controlled by means of a thermoelement. The results indicated a lower temp. of reduction than found by Kohlmeier for the ferrates $\text{CaO} \cdot \text{Fe}_3\text{O}_4$.

L. T. FAIRHALL.

Magnetic studies of mechanical deformation in certain ferromagnetic metals and alloys. H. HANEMANN AND PAUL D. MERICA. *Bull. Am. Inst. Mining Eng.* 1915, 2371-85.—To determine whether relations exist between the physical and magnetic constant of soft Fe simultaneous magnetic and mechanical measurements were made in a tensile-testing machine. It was found that the permeability of Fe is independent of the previous elastic history of the metal provided the alternations or cycles of stress have been within the elastic limit and the number of alternations has been small. A close and nearly linear relation exists between the elastic limit of soft Fe and the values of the stress at which the permeability maxima occur as the material is elongated. The magnetic method indicates the maximum stress to which annealed Fe has been subjected provided the stress has been above the elastic limit and thus is applicable to the study of the previous mechanical history of such Fe. The permeability of annealed Fe is not affected by stress applications under the elastic limit. The effect of initial stresses upon the form of the induction-stress curves was detd. in the case of the material as received, before annealing and after quenching in water.

W. T. HALL.

Recrystallization of cold-worked alpha brass on annealing. C. H. MATHEWSON AND ARTHUR PHILLIPS. Yale Univ. *Bull. Am. Inst. Mining Eng.* 1916, 1-50.—

Strips of brass (70 Cu, 30 Zn) were cut from sheets of metal which had been reduced by cold rolling of thoroughly annealed metal and these strips were subjected to annealing expts. in order to det. (1) the general direction and magnitude of changes accomplished by heating below an effective annealing temp., (2) the time required to produce a measurable degree of softening at the different temps., (3) the microscopic aspects of strain hardening and recrystn., (4) the relations between temp. and time of annealing, degree of deformation and structural alteration in alpha brass and (5) to compare the ordinary physical properties and size of grain considered as functions of the annealing temp. for a fixed annealing period. To produce a drop of 3 points in scleroscope hardness with test pieces which had been reduced 40% by cold rolling, 294 hrs. were required at 225°, 189 hrs. at 240°, 46 hrs. at 255°, 5.25 hrs. at 275°, 2.5 hrs. at 300° and only 18 min. at 325°. After a reduction of 2% by rolling, annealing does not produce sufficient change of structure to be noticeable under the microscope. After a reduction of 4% or more, annealing produces a noticeable recrystn. and refinement of the grain. As the degree of reduction increases, the microscope reveals the structural change at successively lower annealing temps. until with 40% reduction, annealing for 30 min. at 275-300° gives a distinct visible change under 1000 diameters magnification. Assuming that a drop in hardness is due to recrystn., the expts. show that with reductions of 50, 25, 15 and 2% there is a comparatively limited range of temp. where the recrystn. process is active but when the reduction was 12, 8 and 4%, recrystn. took place throughout a wide range of temp. Probably the smallest reduction serves to develop a few widely sep'd. inner surfaces resolving the original grain into comparatively few fragmental units which break down, for the most part, only at an annealing temp. not far below the effective temp. for the grain of normal size. Medium reductions (4-12%) develop many inner surfaces of varying sizes, the smaller of which are affected by annealing at a relatively low temp. and the larger ones only at a high temp. Heavy reductions (more than 12%) develop a great many inner surfaces of uniformly small size which break down quickly at a relatively low annealing temp. The comparison of the physical properties and the number of grains per unit area of section showed that the size of the grain is by no means the only factor that affects the physical properties. The curve representing hardness and tensile strength bore no close relation to the number of grains but, on the other hand, the curve representing reduction of area in the tensile test showed a max. in the temp. region corresponding to a rapid change in the number of grains. As regards method of testing hardness, the Brinell ball test and the Ludwig cone test are no more sensitive than the scleroscope test and their only advantage lies in the fact that the respective results are more easily recalcd. in the terms of other properties.

W. T. HALL.

A transformation of copper. H. HERRENSCHMIDT. *Bull. soc. ind. Rouen* 43, 141(1915).—A yellow metal is produced by a thermal reduction using CuO , V_2O_5 , Al powder and Cu bars.

MILES R. MOFFATT.

The hardening of copper. L. GUILLET. *Rev. metal.* 12, 819-25(1915).—G. points out the fact that the hardness of Cu as defined by the Brinell hardness test is inexact. The size of the steel sphere and the pressure employed are factors which affect the hardness value considerably. When the hardness of the Cu is relatively low, the value as defined by this test attains a relatively high value. Of 2 samples of Cu that have the same hardness number, one is safe in deducing that they are in the same state of hardness only when this value is less than 100. The microstructure of the metal is a more valuable index of hardness.

L. T. FAIRHALL.

Discussion of certain phenomena in the sprouting of silver. W. STAHL. *Metall u. Erz* 12, 501-4(1915).—Ag pptd. by Fe from sulfate soln. frequently sprouts after melting. This has been ascribed to SO_2 from decompn. of basic sulfates. It has been

shown that Ag melted in an atm. of SO_2 will not sprout. The reaction in this case is probably $4\text{Ag} + 2\text{SO}_2 \rightleftharpoons \text{Ag}_2\text{SO}_4 + \text{Ag}_2\text{S}$. The 2 compds. formed fuse together into a liquid slag leaving the surface of the metal bright. In the presence of O the reaction is probably $4\text{Ag} + 2\text{SO}_2 + 4\text{O} \rightleftharpoons 2\text{Ag}_2\text{SO}_4$. The Ag_2SO_4 easily melts and seps. from the metal. It seems, therefore, that SO_2 cannot be the cause of the sprouting. At the high temps. obtained in refining Ag the following reaction may take place: $\text{Ag}_2\text{SO}_4 = 2\text{Ag} + \text{SO}_2 + 2\text{O}$. The O becomes absorbed in the metal either physically or chemically and is released when the metal solidifies, producing the sprouting.

C. R. H.

Tempering in hot water. E. HITZEL. *Rev. metal.* 12, 584-6(1915).—Credit has been given to Langley and Metcalf for discovering in 1892 the effects of tempering in hot water. It is pointed out that H. Caron (in 1872-3) made valuable expts. along the same lines.

D. B.

Metallography of steel for United States naval ordnance. HAROLD E. COOK. *Bull. Am. Inst. Mining Eng.* 1916, 375-400.—The paper states the inspection requirements of the Bureau of Ordnance, the specifications governing the inspection, and the physical and chem. properties of the steel used in the construction of ordnance for the navy. It is suggested that the word *metallography* should signify not only the macroscopic and microscopic examn., but also the study of the relation of the internal structure of metals and alloys to their compn. and to their physical and other properties.

W. T. H.

"Ghost lines" in large steel forgings. J. O. ARNOLD. *Engineering* 100, 542-4; *Iron Coal Trades Rev.* 91, 660(1915).—In big ingots there is usually more or less segregation of the mobile elements, C, S and P, to a series of centers. Photomicrographs are shown which exhibit nodular segregation areas of (1) an isomorphous mixture of $x\text{Fe}_3\text{C}$ - $y\text{Mn}_3\text{C}$; (2) dissolved Fe_3P ; (3) irregular globules of MnS. In a forging the elongated segregation is in turning operations jumped by the tool, leaving in faint relief a white line called the "ghost." Contrary to general belief, the ghosts freeze first at many degrees above the f. p. of the main mass.

H. L. OLIN.

Determination of gases in steel. P. GORRENS AND J. PAQUET. *Iron Age* 97, 720-1(1916); see C. A. 9, 1741.

E. J. C.

The gases contained in liquid steels. L. BARADUC-MULLER. *Rev. metal.* 12, 804-8(1915).—Ingots of steel were melted and the gases contained in the liquid steel pumped off and analyzed. The steel has submitted to metallographic examn. and chem. analysis before and after removing the contained gases. It was also submitted to mechanical tests. The expts. outlined are of a preliminary nature. In one case the quantity of gas pumped out of 550 kg. of liquid steel amounted to 54.2% by vol. Of this hydrogen is the greatest constituent. The mechanical properties of the steel appear to be improved by the removal of dissolved gas. The expts. carried out serve as a preliminary investigation pending the installation of app. for treating ingots of steel of 1200 kg. under greater pressures.

L. T. FAIRHALL.

The preparation of pure iron and iron carbon alloys. J. R. CAIN, E. SCHRAMM AND H. E. CLEAVES. *J. Ind. Eng. Chem.* 8, 217-24(1916); Bur. Standards, *Sci. Paper* No. 266; *Bull. Bur. Standards* 13, 1-26(1916).—Some of the previous work on the Fe-C diagram is unsatisfactory because of the impurity of the materials. To form the basis of a redetn. of the diagram at the Bureau of Standards, a series of Fe-C alloys, with not over 0.04% of impurities has been prepared by melting electrolytic Fe with sugar carbon in magnesia crucibles. The electrolytic Fe was prepd. from ingot iron anodes in a chloride bath with or without the use of porous cups. The Fe was melted with C in a vacuum furnace, using crucibles of especially pure MgO .

E. S.

The magnetic properties of some iron alloys melted in *vacuo*. T. D. YEWSEN. *Proc. Am. Inst. Elec. Eng.* 34, 2455-95(1915); cf. C. A. 9, 906, 1892, 2037.—Y. deals with Fe-B and Fe-Si alloys which have been made from pure materials, using doubly refined electrolytic Fe as a base, and fused *in vacuo*. B was found to have a slightly beneficial effect if used in small amts., but if any measurable amt. combined with the Fe it produced pronounced detrimental results upon the magnetic properties. Weiss' alloy Fe₃Co was also prepd. and it was found that it had a satn. value 13% higher than that of pure Fe, or 3% higher than hitherto found. It is brittle but fairly strong. In the Si series the 2 best alloys for magnetic purposes were obtained with about 0.15% and 3.4% Si after annealing at 1100°. The values for max. permeability for both of these are above 50,000 and the hysteresis loss for B_{max.} = 10,000 and B_{max.} = 15,000 are about 300 and 1000 ergs per cu. cm. per cycle, respectively. This hysteresis loss is 1/3 and 1/5 of the corresponding loss for commercial Si steel. The mechanical properties were also carefully detd. and curves of results given. A so-called "critical point" of non-forgeability was found at 2.5-2.6% Si. The upper limit is 7-8% Si. The sp. elec. resistance increases about 13 microhms for the first % Si, and 11 microhms for each additional % Si added. A large number of photomicrographs are given.

W. E. RUDER.

The action of boiling acetic, propionic and butyric acids on aluminium, with a note on the action of formic and some higher acids. R. SELIGMAN AND P. WILLIAMS. *J. Soc. Chem. Ind.* 35, 88-93(1916).—The main factor in the corrosion of Al, according to the expts. carried out by S. and W., is not the presence or absence of air. The question of acid concn. is all important, however. In the case of acetic acid, the rate of dissolution falls as the acid concn. increases, so that 99% acid has only 1/10 the action that a 90% acid has. The removal of the last 0.05% of water, however, raises the rate of dissolution 100-fold. The acetate formed by the action of the dehydrated acid on Al is a cryst. substance differing from the acetate prepd. from less concd. acids. Boiling butyric acid of 99% strength has practically no effect on Al. A more concd. acid, however, attacks the metal in a manner similar in all respects to the action of acetic acid. Similar effects were observed in the case of propionic acid. Boiling formic acid of 77% strength attacks Al very rapidly. Mixts. of palmitic, stearic and oleic acids do not attack the metal below 270°, but the metal is invariably attacked when the temp. rises above 300°. Two views are given to account for the action of these acids (1) that with acids of low concn. a gelatinous film of basic acetate coats the metal, whereas with acids of high concn. a cryst. coating is formed which does not protect the metal, and (2) with acids of low concn. a film of oxide protects the metal, whereas in the absence of H₂O no film is produced, leaving the metal susceptible to attack.

L. T. FAIRHALL.

The action of certain chlorinated hydrocarbons on some metals in the presence of moisture. S. G. SASTRY. *J. Soc. Chem. Ind.* 35, 94-5(1916).—Thin strips of metal (mild steel, wrought iron, Ni, Cu, Al, Pb) were heated with the chlorinated hydrocarbons (CCl₄, C₂H₂Cl₄, C₂HCl₃, C₂H₂Cl₃, C₂HCl₂) under a reflux condenser for 10 hrs. and the influence of the solvent found by weighing the strips before and after heating. The losses observed were greatest in the case of CCl₄, C₂H₂Cl₄ and C₂HCl₃. With C₂H₂Cl₂ no action whatsoever was observed and in the case of C₂HCl₂ the action was extremely slight.

L. T. FAIRHALL.

Corrosion and the engineer. W. H. WALKER. *Trans. Am. Electrochem. Soc.* 29(advance copy); *Met. Chem. Eng.* 14, 388-9(1916).

C. G. F.

The composition of some German shells. J. E. STEAD. *Iron Age* 97, 536-7(1916).—Shells in large numbers were thrown on the northeast coast of England on Dec. 16, 1914. Fragments of these shells have been collected and analysed. The

armor-piercing shells were easily detected by the presence of Ni and Cr. Such shell material contained about 91.86% Fe, 0.50-0.84% C, 0.38% Mn, 0.40% Si, 0.03% S, 0.03% P, 3.1% Ni and 3.35% Cr. Most of the fragments were small but the fractures indicated material of very high tenacity. The analysis of these shells corresponds with the analyses of similar material made in other countries. The analyses of the high explosive shells, however, showed a very wide range in chem. compn. The max. and min. amts. of each element were: 0.39-1.12% C, 0.38-1.40% Mn, 0.08-0.60% Si, 0.027-0.083% S, 0.028-0.105% P. Such material is of less uniform quality than that corresponding to English specifications. The steel is of relatively high tenacity and much more liable to break by shock than English steel. The presence of considerable N in one of the toughest and best fragments leads to the conclusion that N is not harmful and that basic Bessemer steel is suitable provided sufficient Si and Mn are present to ensure soundness. If steels with 0.07 and 0.1% P did not burst in the gun, it seems probable that great freedom from P is not as important as has been thought.

W. T. H.

The chemistry of the iron war coins. RICHARD LUCAS. *Gera. Z. physik. chem. Unterricht* 29, 29-30 (1916).—The coins are Siemens-Martin steel galvanized by heating in closed vessels with Zn dust to 260-315°.

J. H. MOORE.

Heat treatment of chains. G. S. TAYLOR. *Iron Age* 97, 713 (1916). The metal of a chain deteriorates with use but the tenacity can be maintained by periodic annealing so that accidents are avoidable. The various annealing methods employed in English works are described.

W. T. H.

Nick and break test in rail inspection. ROBERT W. HUNT AND C. W. GEMMET, JR. *Iron Age* 97, 722-6 (1916).—Evidence is cited to show that the nick and break test is reliable as a protection against the acceptance of rails having pipes, laps or any interior mechanical defects. The test made on every ingot is a protection to the buyer and is accomplished with a minimum expense on the part of the seller.

W. T. H.

The corrosion of high chromium steels. ROBERT HADFIELD. *Iron Age* 97, 202-3 (1916).—The special alloy known as stainless steel contains about 0.3% C, 0.01% Si, 0.12% Mn, 12.7% Cr, 0.45% Co and 86.6% Fe. This steel does not show satisfactory resistance to corrosion in the 10% H₂SO₄ test. It is doubtful, therefore, whether high Cr steels are suitable for resisting corrosion in such media as sea water. On the other hand, an alloy with 9.18% Cr and 0.71% C resists corrosion very well.

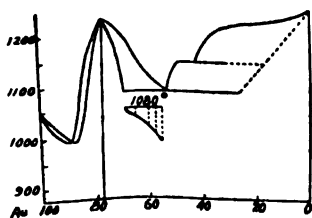
W. T. H.

Autogenous welding of steel tubing. ANON. *Iron Age* 97, 135 8 (1916). A new welding process is described in which continuous oxy-acetylene welding machines are used.

W. T. H.

The alloys of manganese and gold. N. PARRAVANO with U. PRENAT. Univ. Padova and Rome. *Gazz. chim. Ital.* 45, 1, 293 303 (1915). An earlier paper (C. A. 9, 1454) on Zn-Mn furnished a new example of the similarity of behavior of various metals that exists between Mn and Fe, Co and Ni. The system Zn-Mn shows the compds. MnZn₂ and MnZn₃; with Zn-Fe there is FeZn₂ and FeZn₃. In order to extend the knowledge of these relationships, the alloys of Mn-Au were studied. Tammann (C. A. 1, 1953, summarized the work on the behavior of the Cu, Ag, Au group on Mn, Co and Ni and found a marked regularity in the variations of the one series with the other. Cu forms a continuous series of mixed crystals with Mn, with Fe the series shows a break between 2.5 and 4% Cu, with Co the break is from 10 to 14% Cu; with Ni there is complete miscibility in the whole alloy but the capacity of Mn to form mixed crystals is less than in Fe. Ag behaves like Cu with Mn, Fe, Co and Ni. Au shows complete miscibility with Fe, Co and Ni and interpenetrates and miscibility in

Au-Fe between 20 and 82% Fe, in **Au-Co** between 6 and 96.5% CO and in **Au-Ni** between 8 and 80% Ni. Through analogy with Ag and Cu one could expect complete liquid and solid miscibility in **Au-Mn**, more extended than in **Au-Fe**. It was found that Mn dissolves in the solid state in Au up to 10.5% and Au in Mn up to 25%. Of these solubilities the one is less and the other greater than the values for **Au-Fe**. The fusion diagram is more complicated than any of the above, for it shows a definite compd. **AuMn**, that can dissolve Au or Mn in the solid state; it shows a liquid break between 50 and 57.5% of Mn and it also shows complex transformations of an indefinite nature in the solid state. This behavior removes Mn and Au from any close analogies with the above elements. The expts. were done in the usual manner. The fusions were made in Berlin porcelain crucibles up to 45% Mn and in magnesia crucibles above 45% Mn.



The exptl. detns. between 100 and 55% Au are not difficult; at less concns. of Au the detns. of crit. points are involved with marked supercoolings. For alloys between 100 and 60% Au the points on the f. p. curve were detd. 3 times in each alloy, while between 57.5 and 0% Au the detns. were made at least 6 times on 2 specimens of each alloy. The diagram of state was thus detd. with much difficulty. At 990° there is an arrest for the solid break between 10.5 and 14% Mn. At 1140° and at 1080° there are also true arrests, the duration of which could not be accurately detd. On adding Mn the m. p. of Au drops to 990° at 10.5% and seps. mixed crystals which may be interpreted as follows: (1) There is a m. p. curve of mixed crystals with a minimum or (2) the horizontal eutectic at 990° extends a little to one side of the minimum. Similar relations have been found for **Pd-Pb** between **Pd₃Pb** and **Pd** (*Z. anorg. Chem.* 52, 355 (1907)) and in **Au-Cd** between **AuCd** and **Au** (*Saldau, C. A.* 9, 779). This point was discussed at length and left undecided. On increasing the Mn content beyond 10% the m. p. rises and reaches a max. at 1225° at 21.8% Mn. Between 10 and 14% Mn there is a primary and a secondary solidification at 990°, resulting from 2 constituents, a primary and a secondary eutectic. On increasing the Mn content again the m. p. drops regularly to 1080° at 46% Mn. Between 21.8 and 30% the alloys solidify in a single interval of temp. and are homogeneous; those solidifying between 30 and 46 solidify in 2 layers and have a heterogeneous structure, a primary constituent and a eutectic. The mixed crystals that sep. at about 1080° are about 30% Mn. The max. at 21.8% Mn corresponds to the compd. **AuMn**. From 46% Mn on the m. p. rises irregularly to that of Mn; between 50 and 57.5% Mn the curve is broken by a horizontal line due to partial liquid miscibility. The mixts. in this region are sepd. in 2 liquid layers in the liquid state. It was not possible to det. the cooling curves accurately above 75% Mn. On roasting the 80 and 90% Mn alloys they assume a homogeneous structure of coarse crystals after a few hrs. at 1000–50°. The 70% Mn alloy gives on first cooling a primary constituent and a eutectic; after roasting as above a small amt. of the eutectic remained. This alloy is thus near the limit of solid miscibility. The 75% Mn alloy treated thus became homogeneous and so the concn. of a satd. soln. of Au in Mn was fixed at 25% Au. The alloys from 30 to 90% Mn undergo a transformation ranging between 700° and 550°, which is accompanied by strong supercooling and weak thermal effects, but which could not be precisely detd. This transformation is accompanied by a considerable increase of vol. such that the crucible was frequently burst. Alloys between 45 and 70% Mn roasted 20 hrs. at 500° showed that the coarse crystals are reduced to minute cryst. aggregates but no conclusions as to the nature of the reaction were drawn. The alloys between 14 and 30%

Mn are composed of a phase that may vary in compn. in a continuous manner between these limits and that is clearly sepd. from the solids nearly at the middle of the 2 eutectic intervals. The m. p. curve with a max. at 21.8% Mn and the homogeneous structure have led to the admission that a chem. compd., AuMn, is formed. Kurnakov (C. A. 4, 435; 8, 1080, 2089) showed that a phase of variable compn. in which a definite compd. may be present ought to have at an invariable compn. a discontinuity in the curve representing the property. If this discontinuity is lacking the max. on the m. p. curve ought to be interpreted as an irrational max. that is characteristic of pairs of solid solns. and the solid phase ought to be considered a compd. of variable compn. In accordance with this idea the significance of the point at 21.8% Mn was studied by detg. the hardness diagram for alloys from 0 to 35% Mn in the app. of Meneghini (C. A. 9, 1453). The results show that with increasing Mn the hardness of Au gradually but not linearly increases up to about 10% Mn, i. e., the limit of miscibility in the solid state. From 10 to 14% Mn it increases linearly in accordance with the heterogeneous nature of the alloy for this interval. From 14 to 35% it at first increases to a max. at 15% and then diminishes to a minimum at 21.8% Mn. It then rises again and finally varies at a nonlinear arrest near the upper limits of satn. of Mn. The minimum on the hardness curve corresponds exactly with the max. on the m. p. curve and thus contains the compd. AuMn.

E. J. WITZEMANN.

Blistering of gold alloys. H. D. COLEMAN. *Metal Ind.* 14, 118(1916).—When high grade Au, 999 + fine, and pure electrolytic Cu are used and the melt is kept covered with charcoal, there should be no blister troubles if the metal is not poured too hot. The annealing temp. should usually be about 650°. High grade ingots which are void of ring and lack malleability are often helped by heating with 0.025% of Cu-Cl₂ + 2H₂O.

W. T. H.

The manufacture of soft solder from scrap metal. ADOLPH BERGMAN. *Metal Ind.* 14, 59-62(1916).—The methods employed in the commercial treatment of white metals is described.

W. T. H.

Copper and nickel in ammunition. GEORGE LYON, JR. *Metal Ind.* 14, 1-5 (1916).—Cu-Ni is used in the manuf. of bullet jackets largely because of the non-corrosive character. The method of making the alloy is described in detail.

W. T. H.

Chemigraphic processes for the decoration of metals. F. HUTH. *Elektrochem. Z.* 22, 204(1916).—A résumé of patent and periodical literature.

W. E. RUDER.

Influence of frequency of alternating or infrequently reversed current on electrolytic corrosion (McCOLLUM) 4. Earth resistance and its relation to electrolysis of underground structures (McCOLLUM) 4.

Soldering. J. LAVINE. *Brit.*, 22,356, Nov. 11, 1914. In gold soldering, particularly Ni or Ni alloys, Fe or Fe alloys, or for dental purposes, the gold solder is formed during the process of soldering. The parts to be joined are first united by Ag solder, and Au is then applied to the joint and heated to m. p. so that it may alloy with the Ag alloy.

Non-oxidizing heating of iron. W. MÖLLHOFF. *Aust.*, 70,920, Jan. 10, 1916. Continuous heating of Fe and metal articles in a gas-tight, closed, undivided chamber filled during the heating with reducing (combustible) gases. Before, as well as during the charging of the furnace, incombustible indifferent gases are introduced into the heating chamber, for the purpose of forcing out the combustible gases, whereupon, after closing the furnace, combustible gases are introduced, with expulsion of the indifferent gases.

Crucible melting furnace. V. MASEK. Aust., 70,741, Dec. 27, 1915. A pre-heating crucible is disposed over the melting crucible, with a space between the two crucibles to allow passage of the heating gases.

Open-hearth furnaces. J. WARD and A. P. TOWNSEND. Brit., 22,789, Nov. 20, 1914. The furnace is heated by the combustion of liquid fuel in two stages, the first stage of partial combustion with regeneratively heated air takes place in the gas-producing chamber, and the combustion is completed in the melting chamber by further supplies of heated air.

Concentrating ores. MINERALS SEPARATION and DE BAVAY'S PROCESSES AUSTRALIA PROPRIETARY, LTD. Brit., 22,145, Nov. 6, 1914. Mixed sulfides are sepd. by subjecting ores, concentrates, tailings, slimes, etc., to a froth-flotation process in H_2O to which a permanganate of an alkali metal has been added without a frothing agent, whereby a concentrate relatively rich in certain sulfides is obtained, leaving a residue relatively rich in other sulfides which may be recovered by known processes. Cf. C. A. 9, 2220.

Tin, terne, and like plates. D. R. JAMES. Brit., 22,587, Nov. 16, 1914. Sn, terne, and other plates coated with metal on one side only are produced by passing the plates in pairs, back to back, through the coating app. Cf. C. A. 9, 2638.

Decorating aluminium surfaces. F. SCHÖNBACH and M. TISCHER. Aust., 70,914, Jan. 10, 1916. See Ger., 280,940, C. A. 9, 1540.

Refining nickel. L. P. BURROWS. Can., 165,916, Nov. 9, 1915. Desulfurizing, reducing and refining Ni by applying the gas or gases derived from H_2O , which are produced by suddenly expanding steam, separating the steam without condensation from any H_2O suspension, heating the gaseous product to a high temp. and then subjecting the Ni ore to the action of the resultant gaseous product in a chamber from which atmospheric O is excluded.

Reduction of precious metal ores. W. H. JAMES. Can., 166,137, Nov. 23, 1915. Process of treating refractory precious metal ore, by electrolyzing a soln. of a salt of a mineral acid, withdrawing separately from the electrolytic circuit the portion of the soln. in the vicinity of one of the electrodes, treating the ore therewith until the refractory constituents are dissolved and removing the soln. and with it the refractory constituents, whereby the ore is left amenable to the ordinary cyanide process for the extn. of the precious metal.

10. ORGANIC CHEMISTRY.

C. A. ROULLIER.

Synthesis of hydrocarbons in the aryl and cyclohexane series. P. SABATIER and M. MURAT. *Ann. chim.* 4, 253-309(1915); cf. C. A. 6, 2082, 2738, 3272; 7, 1485, 3109, 3311; 8, 1088, 1752, 2148.—Collective article. LOUIS E. WISE.

Biochemical synthesis of glucosides of alcohols. III. Monoglucosides of polyvalent alcohols. E. BOURQUELOT. *Ann. chim.* 4, 310-79(1915); cf. C. A. 8, 938, 2675, 3180, 3438; 9, 1309, 2521, 2639.—Collective article. LOUIS E. WISE.

Characterization of chloroketones. E. E. BLAISE. *Bull. soc. chim.* 17, 425-8 (1915).—The ketones previously described (cf. C. A. 8, 3777; 9, 786) yielded characteristic semicarbazones. Unsym. Cl ketones of the type $CHCl_3COR$ gave normal or disemicarbazones depending on the amt. of $H_2NCONHNH_2$ used. Those of the type $RCCL_3COR'$ yielded disemicarbazones. In general the latter could be distinguished from the normal compds. by their marked insoly. in org. solvents (other than AcOH and

LOUIS E. WISE.

(excluding HCO_2H).

LOUIS E. WISE.

Alkaloids of the Calabar bean. IV. Partial synthesis of eserine and geneserine. MAX POLONOVSKI AND CHARLES NITZBERG. *Bull. soc. chim.* 19, 27-37(1916); cf. *C. A.* 9, 3222.—Eseroline (A) and geneseroline (B) were readily obtained by the hydrolysis of eserine (C) and geneserine (D), resp., in the presence of 50% H_2SO_4 . By heating 0.5 g. of (A) in 10 cc. benzine with 0.22 g. MeCNO in 10 cc. benzine in a sealed tube at 100° for 4 hrs., P. and N. obtained an isomer of (C), *isoeserine* (E), $C_{11}H_{17}O_4N$, cryst., m. 195-6°; $[\alpha]_D$ in 95% alc. -236°, neutral, sol. in aq. NaOH, forming a *picrate* m. 170°, but no methiodide, and yielding $BaCO_3$ and $MeNH_2$ when treated with $Ba(OH)_2$ (but much more slowly than in the case of (C)). (E) appears to be a substituted urea deriv. of (A), with a $-C_6H_4OH$ group. Attempted esterification of (E) by means of $MeC_4H_9SO_3Et$ in the presence of EtONa led to the formation of an oil (ester?) which was not purified. When a mixt. of 0.5 g. (A) in 20 cc. anhydrous Et_2O and 1.5 g. of 10% MeCNO in benzine was allowed to stand at room temp., an addition product, *eseroline methyl isocyanate* (F), $[C_{11}H_{17}(OH)N]NMeCNO$, powder, softens 102°, m. 110-15°, was obtained. (F) was converted into (E) on heating at 110° or when heated in benzine. (C), m. 106°, was synthesized by treating (A) in anhydrous Et_2O with 0.0005 g. Na and subsequently with 15 g. of 10% MeCNO in benzine. (C) was shown to be identical with natural eserine; its salicylate, m. 181°; benzoate, m. 116°.

(B), 0.5 g. in 20 cc. anhydrous Et_2O , when treated with Na and subsequently with 0.15 g. MeCNO , yielded (D), m. $126-7^\circ$, identical with the natural product. (B), unlike (A), yields no products analogous to (E) or (F). When (A) in benzene was heated with 2 mols. MeCNO in a sealed tube in the absence of Na, a mixt. of (E), (C) and an uncrystallizable oil, probably a urea urethan, $\text{C}_{13}\text{H}_{18}\text{N}(\text{OCONHMe})\text{CONHMe}$, was obtained. The latter was probably identical with an oil, a by-product formed in the synthesis of (E), and could not be obtained under other exptl. conditions which P. and N. have described in detail.

LOUIS E. WISSE.

True homologs of glycerol. Heptanetriol. J. L. HAMONET. *Compt. rend.* 162, 225-6(1916).—Up to the present no true homologs of glycerol (type formula $[\text{HOCH}_2(\text{CH}_2)_n]\text{CHOH}$, have been described. Attempts to prepare 1,3,5-pentanetriol were unsuccessful. $\text{MeO}(\text{CH}_2)_3\text{MgI}$ when acted upon by HCO_2Et and the product hydrolyzed by H_2O gave rise to 1,7-dimethoxy-4-heptanol (A), $[\text{MeO}(\text{CH}_2)_3]\text{CHOH}$, b. $246-8^\circ$, d_{18} 0.969, which could be readily converted into 1,4,7-heptanetriol, $[\text{HOCH}_2(\text{CH}_2)_3]\text{CHOH}$ (B), bitter, viscous liquid, b. $230-2^\circ$, d_{18} 1.075, by treatment with HI. A less satisfactory method of converting (A) into (B) involved the use of HBr, which first yielded $[\text{CH}_2\text{Br}(\text{CH}_2)_3]\text{CHOH}$ (C) or $[\text{CH}_2\text{Br}(\text{CH}_2)_3]\text{CHBr}$ (D) (depending on the temp. of the reaction), which in turn were transformed into the corresponding di- and triacetins. The latter yielded (B) on hydrolysis. Attempts to hydrolyze (C) or (D) by boiling with H_2O led to the formation of $\text{HOCH}_2(\text{CH}_2)_3\text{CH}_2\text{CH}_2\text{CH}_2\text{CH}_2\text{O}$

LOUIS E. WISSE.

Nitro derivatives of o-toluic acid. MAX MAYER. *Wien. J. prakt. Chem.* 92, 137-73(1915).—These derivs. have been prepd. from the corresponding nitrotoluidines by the Sandmeyer reaction with subsequent hydrolysis of the resulting nitriles. 5-Nitro-2-toluenitrile (a), from 5-nitro-2-toluidine (b), by decomp. the diazonium chloride with $\text{KCu}(\text{CN})_2$ at 70° , seps. from alc. in yellow needles, which an. $113-15^\circ$, sublime on slow heating, and can be steam distd. only with difficulty. By concd. KOH (a) is readily hydrolyzed with the formation of 5-nitro-2-toluic acid, which corresponds in all respects to the "γ-nitrotoluic acid" of Jacobsen (cf. *Ber.* 17, 162). (a) is not reduced to the corresponding NH_2 compd. by either $\text{Sn} + \text{HCl}$, $\text{NH}_3 + \text{H}_2\text{S}$, $\text{Zn} + \text{HCl}$, $\text{SnCl}_2 + \text{HCl}$ or $\text{Zn} + \text{AcOH}$ (cf. Beilstein and Kreisler, *Ann.* 144, 175), which behavior may be considered according to M. as a case of steric hindrance. The Me group of (a) cannot be oxidized to CO_2H without the simultaneous hydrolysis of the CN group; although many oxidizing agents were employed 5-nitro-o-phthalic acid ("β-nitrophthalic acid") was always formed (cf. *Ann.* 208, 229). 3-Nitro-2-toluenitrile (c), from 10 g. 3-nitro-2-toluidine (d) by diazotization in an excess of glacial AcOH with 10 cc. HCl (d. 1.2) and 5 g. pulverized NaNO_2 at 0° , with subsequent treatment with $\text{KCu}(\text{CN})_2$, at 80° , lustrous branching yellow needles from alc., m. $89-91^\circ$. The following generalities in regard to nitrotoluenitriles may be made: Those compds. in which the NO_2 is adjacent to Me have the lowest m. ps.; those in which the NO_2 is adjacent to CN possess m. ps. midway between those with these groups in the 1:3 and 1:4 positions. When Me and CN are 1:3, the products are colorless; 1:4, yellow; 1:2, either colorless or yellow; and when the Me and NO_2 are 1:3 the products are yellow; 1:4, white; 1:2, usually, but not always, colorless. No uniformity in color is observed when the relative positions of the CN and NO_2 are considered. 3-Nitro-2-toluic acid (e) is formed in 80% yield by hydrolysis of (c) with concd. aq. KOH (preferably) or dil. H_2SO_4 , needles from alc., of indefinite m. p. ($200-210^\circ$), partially subliming and partially decomp. into its anhydride; sodium salt, 2 H_2O , efflorescent monoclinic columnar prisms from H_2O ; potassium salt, needles from alc.; ammonium salt, hexagonal leaves from H_2O , which lose NH_3 on standing; silver salt, small tables

from H_2O ; *lead salt*, slender rhombic needles from H_2O ; *copper salt*, bluish green rectangular tables from alc.; *magnesium salt*, efflorescent cubical crystals containing several (?) mols. H_2O ; *barium salt*, 3 H_2O , large prisms from H_2O ; *calcium salt*, H_2O , radiating leaves; *zinc salt*, wart-like formations from H_2O ; *neutral aluminium salt*, cryst. crust from H_2O or alc. (e) is not esterified by treatment with MeOH or EtOH in the presence of HCl; with Me_2SO_4 , the *methyl ester* is obtained in small yield, needles, m. $72-5^\circ$, but with Et_2SO_4 , no Et ester is formed. Both (c) and (e) are oxidized by boiling alk. $KMnO_4$ to " α -nitrophthalic acid" (Beilstein and Kurbatow, *Ann.* 202, 217, and Miller, *Ann.* 208, 237). 3-Amino-2-toluic acid (f), from (e) by reduction with Sn and HCl, is so unstable, breaking up into CO_2 and *m*-toluidine, that it cannot be isolated; its formation in soln., however, was demonstrated by conversion into 3-hydroxy-2-toluic acid. The diazotized soln. of (f) may be converted by $KCu(CN)_2$ into *vic*-methyl-*o*-phthalic acid, while an aq. soln., evapd. *in vacuo* treated with Ac_2O + AcONa and then with $KMnO_4$, and finally hydrolyzed, gives *vic*-amino-*o*-phthalic acid. On standing 2 weeks, (e), which m. $200-210^\circ$ and is rather easily sol. in H_2O when freshly prepd., apparently passes into a structural isomer, difficultly sol. in cold H_2O and m. $180-5^\circ$ (decompn.). This 2nd form on heating reverts to the sol. form. The isomers do not differ chemically and M. suggests the following structures: $MeC_6H_4(NO_2)CO_2H$ (the sol. form) and $MeC_6H_4.CO.O.N.O.OH$. NORMAN A. SHEPARD.

Dimolecular nitriles. E. VON MEYER. Dresden. *J. prakt. Chem.* 62, 174-93 (1915); cf. C. A. 8, 3045. I. The action of dinitriles on ketones. With KURT WAGNER. (Preliminary report on work interrupted by the death of W.).—The behavior of dinitriles, $RC(:NH)CH_2CN$, towards ketones is exactly analogous to their behavior towards aldehydes (cf. Mohr, *J. prakt. Chem.* 56, 125 (1897); Klemstück, C. A. 3, 1747). One mol. of the ketone reacts with 2 mols. of the dinitrile in the presence of 1 mol. HCl in alc. at 5° , when allowed to stand for several days, forming derivs. of dihydropyridine. The behavior of AcMe, AcEt, AcPr, $AcCH_2Ph$, Et_4CO , cyclohexanone and methylcyclohexanone toward $MeC(:NH)CH_2CN$; AcMe, AcEt, AcPr, AcBu, $AcCH_2Ph$, Et_4CO , AcPh, cyclohexanone, methylcyclohexanone and $(AcH)_3$ toward $PhC(:NH)CH_2CN$; and AcMe, AcEt, AcPr, $AcCH_2Ph$, Et_4CO , cyclohexanone and methylcyclohexanone toward *p*- $MeC_6H_4C(:NH)CH_2CN$ has been investigated and the % yields of the dihydropyridines recorded, but all exptl. data are reserved for a future communication. The yields with the last dinitrile are especially good. The CN groups in the dihydropyridines formed cannot be hydrolyzed to the corresponding acids; all the dihydropyridine derivs. obtained from ketones containing Ac,

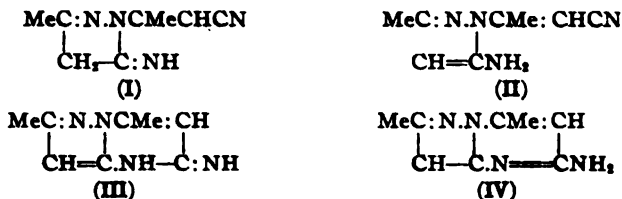
$MeCR.C(CN):CR.NH.CR:CCN$, on oxidation with CrO_3 in AcOH, lose the H of the NH and the radical R, forming 4-methylpyridine derivs. II. New dinitriles; derivatives of benzoacetodinitrile. With ELIS. SPRECKLE. The dinitriles obtained from the Cl derivs. of PhCN have been investigated in order to ascertain the effect of the Cl on the chem. behavior of the products. *o*-Chlorobenzoacetodinitrile (a), $ClC_6H_4C(:NH)CH_2CN$, from 26 g. *o*- ClC_6H_4CN and 17 g. MeCN in C_6H_6 with 9 g. Na, stout cubical crystals from 50% alc., m. $106-7^\circ$, is readily hydrolyzed on warming in 70% alc. with HCl to *o*-chlorophenyl cyanomethyl ketone (b), cubes from alc. m. 101° ; benzal derivative, $ClC_6H_4COC(:CHPh)CN$, leaflets, m. 90° . 1-Phenyl-4-*o*-chlorophenyl-2-

iminopyrazolone, $ClC_6H_4C:N.NPh.C(:NH).CH_3$, by the action of $PhNH.NH_2.AcOH$ in alc. on (a), needles of reddish tint, m. 137° . Treated with BzH in alc. and one mol. HCl, (a) gives 2,6-di-*o*-chlorophenyl-4-phenyl-3,5-dicyano-1,4-dihydropyridine,

$PhCH.C(CN):C(C_6H_4Cl).NH.C(C_6H_4Cl):C.CN$, crystals from alc., m. 260° . *p*-Chloro-

benzoacetodinitrile (c), yellow needles, m. 144°, is converted by HCl into *p*-chlorophenyl cyanomethyl ketone (d), light yellow needles, m. 127°; benzal derivative, needles, m. 125°. With PhNHNH₂.AcOH (c) gives 1-phenyl-4-*p*-chlorophenyl-2-iminopyrazolone, needles, m. 185°, and with BzH + HCl, 2,6-di-*p*-chlorophenyl-4-phenyl-3,5-dicyano-1,4-dihydropyridine, needles, m. 233°. *m*-Chlorobenzoacetodinitrile (e), stout prisms, m. 86°, gives *m*-chlorophenyl cyanomethyl ketone (f), leaves, m. 81°, on hydrolysis; benzal derivative, needles, m. 118°. (b), (d) and (f) all give PhCH:NNHPh when treated with PhNHNH₂. 1-Phenyl-4-*m*-chlorophenyl-2-iminopyrazolone, colorless crystals, m. 108°. 2,6-Di-*m*-chlorophenyl-4-phenyl-3,5-dicyano-1,4-dihydropyridine, needles, m. 248°. The yields of (a), (c) and (e) are approx. 70% of the theoretical quantity. *p*-Ethoxybenzoacetodinitrile (g), from *p*-EtOC₆H₄CN and MeCN in 94% yield, leaves, m. 136.5°. *p*-Ethoxyphenyl cyanomethyl ketone, crystals, m. 123°. 1-Phenyl-4-ethoxyphenyl-2-iminopyrazolone, prisms from alc., m. 188°. 4-Ethoxyphenyl-2-iminoisox-

azolone, EtOC₆H₄C:N.O.C(:NH).CH₃, from (g) and NH₂OH, needles, m. 127°. 2,6-Diethoxyphenyl-3,5-dicyano-4-phenyl-1,4-dihydropyridine, crystals, m. 194°. 2,6-Diethoxyphenyl-3,5-dicyano-4-methylethyl-1,4-dihydropyridine, from (g) and AcEt, slender filaments, m. 116°. *p*-Dimethylaminobenzoacetodinitrile (h), light yellow leaves, m. 210°. *p*-Dimethylaminophenyl cyanomethyl ketone, leaves, m. 166°. III. Hydrazine derivatives of acetodinitrile. With ELIS. SPRECKLES. When MeC(:NH)CH₂CN (i) is treated with N₂H₄, the corresponding pyrazolone is not formed, but three isomeric substances C₆H₁₀N₄, previously designated [A], [B], and [C] (cf. *J. prakt. Chem.* 52, 97). On reinvestigation, M. and S. were able to obtain but 2 of these products, [A] and [C]. They now consider the course of the reaction as follows: NCCH₂CMe: - NNH₂ + NH₂CMe:CHCN → NCCH₂CMe:NNHCMe:CHCN + NH₃ → (A) (I or II) → (C) (III or IV). [A], on diazotation and coupling with *m*-HOC₆H₄OH (l),



gives a reddish yellow dye, indicating the presence of free NH₂ (II). On the other hand treatment of [A] with HNO₃, in the absence of HCl, gives a red ppt., probably the isonitroso derivative, which is sol. in NaOH and m. 167° (decompn.), indicating -CH₂(I). With Ac₂O a monoacetyl derivative, needles, m. 140°, is formed and with PhNCO a phenylurea derivative, clusters of needles from alc., m. 188°, is produced. [C] may be diazotized, giving a brown dyestuff with (l), but it does not form an isonitroso deriv. The monoacetyl derivative, needles from alc., m. 106°; the phenylurea, needles from alc., m. 137°. IV. *N*-Halogen derivatives of dinitriles. With ELIS. SPRECKLES. Iodoacetodinitrile, m. 85°, is pptd. when (i) is treated with I in KI at room temp.; when warmed with HCl, it decomps. into NH₃, ICl and AcCH₂CN (cf. *J. prakt. Chem.* 52, 85). When *N*-chloroacetodinitrile is treated with PhNH₂ in dil. AcOH, a chlorophenylacetodinitrile, to which is provisionally assigned the structure MeC(:CHCN)NCiPh, is produced. This substance is to receive further investigation. V. *N*-Aryl derivatives of dinitriles. With ELIS. SPRECKLES. *N*-Phenylbenzoacetodinitrile (j), which Schumacher was unable to prep. from PhC(:NH)CH₂CN in aq. soln. (cf. *C. A.* 3, 1747), is formed when this dinitrile is treated with PhNH₂.AcOH in alc. at 120-30°, light yellow crystals from alc. + Et₂O, m. 187°. *N*-Phenyl-*p*-toluacetodinitrile, yellow crystals, m. 189°. *N*-*p*-Dimethylaminophenylacetodinitrile, light reddish leaves, m. 151°. *N*-

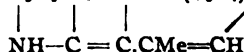
p-Methoxyphenylacetodinitrile (*k*), reddish needles, m. 123°. The reaction proceeds differently with *o*-NH₂C₆H₄OMe and will be further investigated. (*j*) in cold AcOH with HNO₃ gives 2 products, one, probably the *isonitroso derivative*, MeC(:NPh)C(:NOH)CN, a bright yellow ppt. sol. in NaOH, and the other, a brick-red powder, insol. in NaOH, m. 270°, which probably has the structure MeC(:NPh)C(CN):N.CH-(CN)CMe:NPh. Only one product is obtained in the action of HNO₃ on (*k*), the *isonitroso derivative*, needles, m. 155°.

NORMAN A. SHEPARD.

Trimethylgallic aldehyde and syringaic aldehyde. F. MAUTHNER WITH G. SZÖNYI. Univ. Budapest. *J. prakt. Chem.* 92, 194-201(1915).—Trimethylgallic aldehyde (*a*) undergoes a normal transformation with MeMgI, yielding, on hydrolysis of the addition product, 3,4,5-trimethoxyphenylmethylethylcarbinol (*b*), b₁₁ 179-80°, in 65% yield; a C₆H₆ soln. of (*a*) is employed, owing to the difficult soly. of (*a*) in Et₂O. With CrO₃, (*b*) gives 3,4,5-(MeO)₃C₆H₂COMe (*c*) (cf. Mauthner, *C. A.* 5, 281). 3,4,5-Trimethoxyphenylethylcarbinol (*d*), b₁₁ 184-5°, obtained under similar conditions from (*a*) and EtMgI, gives, on oxidation with K₂Cr₂O₇ + H₂SO₄ below 60°, 3,4,5-trimethoxyphenyl ethyl ketone, which was identified by conversion into its *p*-nitrophenylhydrazone, reddish brown needles from alc., m. 170-1°, by warming in 50% AcOH with *p*-NO₂-C₆H₄NHNH₂. 3',4',5',3,4,5-Hexamethoxychalcone, (MeO)₆C₆H₂COCH:CHC₆H₄(OMe)₂, from (*a*) and (*c*) in NaOH, light yellow needles, m. 128-9°. Acetoveratrol condenses in like manner with (*a*), forming 4',5',3,4,5-pentamethoxychalcone, bright yellow leaves, m. 131-2°, which give a blood-red color with concd. H₂SO₄. 3,4,5-Trimethoxynitrostyrolene, in 80% yield from (*a*) and MeNO₂ in alc. at -5° with alc. KOH, yellow leaves, m. 119-20°, which also produce a red color in concd. H₂SO₄. Syringaic aldehyde (*e*) with MeNO₂ gives 4-hydroxy-3,5-dimethoxynitrostyrolene, yellow leaves, m. 115-6°, producing a violet color with concd. H₂SO₄. 2.6 g. (*e*) intimately mixed with 2.6 g. BzNHCH₂CO₂H and 1.5 g. anhydrous AcONa and then heated for 2 hrs. at 100° with 6.5 cc. Ac₂O gives 3,5-dimethoxy-4-acetoxy- α -benzoyliminocinnamic anhydride, lemon-yellow needles, m. 212-3°, producing a red color with concd. H₂SO₄.

NORMAN A. SHEPARD.

Oxidation of phenolic substances. ADOLF JOLLES. Wien. *J. prakt. Chem.* 92, 202-7(1915).—J. has investigated the chem. nature of the products obtained when indoxyllic acid (*a*) and certain phenols are jointly oxidized, in order to det. the mechanism of the reaction between urine indican and thymol (*b*) in the presence of FeCl₃ (cf. *C. A.* 8, 722), which gives a violet product. When 30 g. (*a*), freed from resin by soln. in hot H₂O and filtration and kept in soln. by the addition of a small amt. of AcOH, is treated with 25 g. (*b*) in AcOH, the mixt. poured into FeCl₃.HCl soln. (110 g. in 300 cc. concd. acid) and finally poured into concd. Na₂CO₃, 4-cymol-2-indolindolignone (*c*) seps. as a reddish brown mass mixed with Fe(OH)₃. This is dried, freed from (*b*) by extrn. with ligroin and then extrd. from the Fe(OH)₃ with Et₂O. The residue after removal of the Et₂O is crystd. from PhNO₂ when (*c*) seps. in red pointed prisms, m. 218-20° (decompn.). (*c*) forms a violet soln. in org. solvents with HCl, the color reverting to red on washing out the acid. It dissolves in alkali, giving a yellow soln., from which it may be pptd. unaltered by acids. On hydrolysis with 10% NaOH, *o*-NH₂C₆H₄CO₂H is obtained and though *p*-thymotinic aldehyde could not be isolated in the mother liquors, J. believes it to be present and therefore assumes the "indolignoid" structure C₆H₄.CO CH:C(C₆H₇).CO for (*c*) (cf. Friedländer, *C. A.* 2, 2679). This

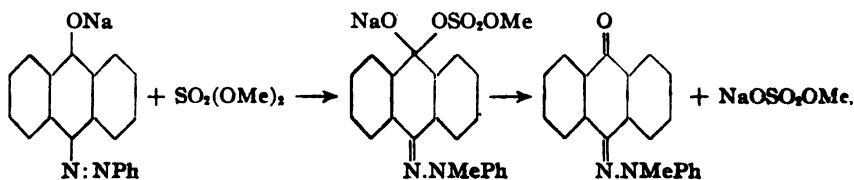


structure is supported by the fact that (*a*) will dye neither mordanted nor unmordanted animal or vegetable fibers, a thing hardly to be expected of an "indigoid" substance. (*c*) is obtained in purer form when (*a*) is replaced by *N*-acetindoxyl and the

reaction allowed to proceed in the cold for 5 days; *hydrochloric acid salt*, brownish black prisms. When α -naphthol is used instead of (b) and the reaction mass boiled with dil. Na_2CO_3 , the alk. soln. contains 4-naphthalene-2-indolindolignone which is pptd. by acids, while the residue contains 2-naphthalene-2-indolindigo (cf. Bezdzik and Friedländer, *C. A.* 2, 2680).

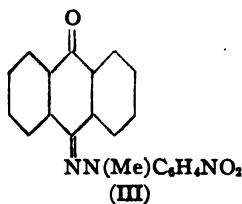
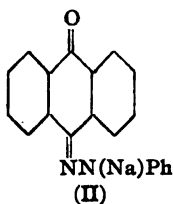
NORMAN A. SHEPARD.

The so-called benzeneazoanthranol and its methyl ether. G. CHARRIER. Univ. Torino. *Gazz. chim. ital.* 45, I, 502-16(1915); *Atti accad. sci. Torino* 50, 779-94(1915). —It is known that while the ethers of the hydroxyazo compds. were considered as *O*-ethers (i. e., derivs. of the enolic form), the corresponding hydroxyazo compds. keto-enol desmotropes were assigned the enol formulas of the true hydroxyazo compds. by some and the ketonic form of quinonehydrazone by others. The *N*-ethers obtained by the action of *asym*-alkylarylhydrazines on the quinones are considered as derived from the ketonic form while recent work seems to show that the free hydroxyazo compds. have the enolic form and may easily undergo a rearrangement to give the keto form. In such cases of isomerism in which there is an equil. (between an enolic and ketonic form) which can be displaced with great velocity from practically a zero concn. of the one to a zero concn. of the other isomer it is logical to admit that one cannot det. the constitution of the compd. by reactions such as alkylation. The enolic formula now generally assigned to the free stable hydroxyazo compds. shows that in this class of compds. the aromatic grouping is more stable than the quinonic, and in this form the enol H or metallic substituent is replaced with the alkyl to give the ether, so that the formation of an *O*-ether gives grounds for assigning the enol form to the compd. undergoing esterification, while the formation of an *N*-ether would support the presence of the hydroxyazo compd. in the keto form. If, as Meyer and Zahm (*C. A.* 7, 1873) suggest for the so-called benzeneazoanthranol, the alkylation takes place by addition and subsequent elimination of the group thus:



it seems logical to admit that by an analogous mechanism the *N*-ethers of this and other hydroxyazo compd. could be formed. The *N*-ethers are also distinguished from the *O*-ethers by their scission reactions, by being less intensely colored and by being hydrolyzed by dil. acids into the *asym*-alkylarylhydrazine and quinone, while the *O*-ethers are sapond. more or less easily to give the hydroxyazo compd. from which they were formed. The *O*-ethers are strongly basic (not so the *N*-ethers) and give with 2 mols. of a monobasic acid salts which undergo an important splitting reaction. The hydrochlorides heated give the alkyl chloride + hydroxyazo compd.; the nitrates give diazonium nitrate + nitrophenol, in which the diazo group is displaced by NO_2 . By the latter reaction it is possible to det. with much probability whether a keto-enol desmotope of this group should have the enol or keto formula. The general form of reaction for the enol is: $\text{ArN:NArOH}(\text{OR}, \text{NH}_2, \text{NR}_2) + \text{HNO}_2 - \text{H}_2\text{O} \rightarrow \text{NO}_2\text{ArOH}(\text{OR}, \text{NH}_2, \text{NR}_2) + \text{Ar}'\text{N}(\text{NO}_2):\text{N}$. The keto or quinonehydrazone has been found in some cases to give: $\text{O:Ar:NNHAr}'(\text{HNO}_2, \text{H}_2\text{O}) \rightarrow \text{O:Ar:O} + \text{Ar}'\text{NHNH}_2$. HNO_2 in Et_2O acting on the Me ether of phenylazoanthranol (a), gave anthraquinone + $\text{PhNMe.NH}_2.\text{HNO}_2$. (a), which may be obtained by the action of PhN_2Cl on the Na salt of anthranol, by the action of PhNHNH_2 on dibromo- or monobromoanthrone, was obtained by M. and Z. by methylating the supposed hydroxyazo compd. or by the

action of PhNMeNH_2 on dibromoanthrone and was shown to be a *N*-Me ether. But M. and Z., contrary to the opinion of Kaufler and S. (*C. A.* 1, 1280), considered the parent hydroxyazo compd. as an enol (I) and explain the formation of the *N*-ether by the addition reaction given above. This so-called benzeneazoanthranol (*b*) although it gives an *O*-Bz deriv. (derived from the OH form), different from that obtained from PhNBzNH_2 + dibromoanthrone (the *N*-Bz deriv. of the keto form), reacts with HNO_3 in Et_2O to give anthraquinone and $\text{PhNHNH}_2 \cdot \text{HNO}_3$, *i. e.*, products similar to those obtained from its Me ether (*N*-ether). If (*b*) were the azo deriv. (I) it would give



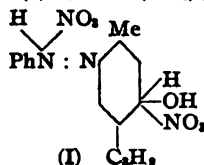
nitroanthranol as well as $\text{PhN}(:\text{N})\text{NO}_2$ which also arises in the above reaction by the action of HNO_3 on the $\text{PhNHNH}_2 \cdot \text{HNO}_3$ formed. The diazo scission of the nitrates is not a reaction that can escape the objections that a tautomeric change takes place, so that no absolute conclusions about the constitution can be drawn; still, the results with numerous hydroxyazo and aminoazo compds. that react as if they contain the azo group show this striking reaction without exception. The copulation of the diazonium salt with Na anthranolate gives a labile intermediate product as yellow flocks (K. and S.) that is probably the diazonium salt of anthranol and this in NaOH-EtOH gives the salt of anthraquinonephenylhydrazone (II), which reacts with Me_2SO_4 to give a *N*-ether or with BzCl a *N*-acyl deriv. which under the conditions is transformed into the *O*-acyl deriv. M. and Z. noted that the *O*-Bz deriv. is much more colored (red) than the parent supposed hydroxyazo compd. It is known that substituting H in this OH diminishes the color. This C. considers another argument for considering the parent compd. a quinonehydrazone which undergoes a tautomeric change in this reaction. It is concluded that (*b*) is *anthraquinonephenylhydrazone* (*c*). (*c*) was prepd. according to K. and S. By the action of HNO_3 in Et_2O (*c*) was always decompd. into anthraquinone and PhNHNH_2 but the latter was more or less completely oxidized, depending on the conditions, to $\text{PhN}(\text{NO}_2):\text{N}$. About 1 g. of (*c*) in 10 cc. Et_2O cooled with a freezing mixt. and treated with 20% of a 50% $\text{Et}_2\text{O-HNO}_3$ soln. were dild. in a few mins. with Et_2O to ppt. anthraquinone (0.6 g.). The filtrate treated with H_2O gave a soln. which with alk. β -naphthol soln. gave a slight reaction for $\text{PhN}(\text{NO}_2):\text{N}$. At higher temps. the quantity of the latter product formed increases. That PhNHNH_2 is easily oxidized to $\text{PhN}(\text{NO}_2):\text{N}$ in the presence of anthraquinone was shown by sep. expts. The *methyl ether* of (*c*) was obtained by the action of Me_2SO_4 on (*c*) in 30% NaOH + some EtOH . The Me ether treated in Et_2O with HNO_3 - Et_2O at room temp. seps. anthraquinone (m. 284-5°). The filtrate treated with H_2O , then neutralized with 30% NaOH and extd. with Et_2O gave a mixt. of bases from which PhNMeNH_2 was sepd. by prepg. its BzH deriv. (m. 102-3°). Only a little $\text{PhN}(\text{NO}_2):\text{N}$ is formed. If the temp. is kept down during the reaction not a trace of $\text{PhN}(\text{NO}_2):\text{N}$ is formed but a yellow-red cryst. compd. seps. This compd. $\text{C}_{21}\text{H}_{18}\text{N}_2\text{O}_3$ is nearly insol. in EtOH and Et_2O but crysts. from CHCl_3 as orange-red leaves with a gold reflex, m. 240-1° (decompn.), sol. in concd. H_2SO_4 with a red-brown color but is repptd. on dild.; it is insol. in alk. hydroxides even in the presence of EtOH or Me_2CO which indicates that it is a deriv. of the ether (*c*). Hydrolyzed by boiling concd. HCl it gives anthraquinone (m. 283-5°). The acid filtrate treated with NH_4OH seps. a base, $\text{C}_7\text{H}_8\text{N}_2\text{O}_4$,

as yellow needles, m. 142° , which is probably $O_2NC_6H_4NMeNH_2$. The position of the NO_2 has not yet been detd. for lack of material. This hydrolysis shows that the NO_2 deriv. (m. $240-1^{\circ}$) is (III). The formation of this compd. containing NO_2 in the aromatic nucleus by the action of HNO_3 on (c) is a new proof of the greater resistance offered by the quinonic group to the action of HNO_3 as compared with the aromatic nucleus.

E. J. WITZEMANN.

The transformation of the nitrates of arylhydrazines into aryldiazonium nitrates through the action of nitric acid. G. CHARRIER. Univ. Torino. *Gazz. chim. ital.* 45, I, 516-28(1915); *Atti accad. sci. Torino* 50, 589-605(1915).—In the preceding paper it was shown that HNO_3 in Et_2O acting on anthraquinonephenylhydrazine gives anthraquinone + $PhNHNH_2$ and more or less $PhN(NO_2):N$. Later in repeating this test with arylhydrazine nitrates (i. e., in the absence of quinone), a small amt. of $PhN(NO_2):N$ was formed but the reaction is different in the absence of anthraquinone. C. has studied the influence of anthraquinone on this reaction and decided that it is due simply to an acceleration of the reaction. Equimol. amts. of other quinones (*p*-benzoquinone, thymoquinone, 1,2-naphthoquinone, phenanthrenequinone and acenaphthenequinone), acting on $PhNHNH_2.HNO_3$, *o*-, *m*-, *p*- $CH_3C_6H_4NHNH_2.HNO_3$ and the nitrates of *asym-m*-xylylhydrazine, *s*-pseudocumylhydrazine and *p*-anisyl- and *p*-phenetylhydrazine were studied. These expts. make it possible to det. whether the formation of aryldiazonium nitrates is connected with diazo scission, i. e., whether the 1st effect of the quinone on arylhydrazines is an oxidation of this into diazonium nitrate, accompanied by a contemporary reduction of the quinone to phenol and then the formation of the hydroxyazo compd. nitrate, which then by diazo scission could easily give the aryldiazonium nitrate. *p*-Benzoquinone oxidizes $PhNHNH_2$ with the evolution of N, oxidizes *asym*-alkylphenylhydrazine to tetrazones, reacts with *o*-nitro- and *o,p*-dinitrophenylhydrazine to give *p*-hydroxyazo compds. Thymoquinone gives arylhydrazones with arylhydrazines; β -naphthoquinone and phenanthrenequinone give *o*-hydroxyazo compds.; of anthraquinone and acenaphthenequinone the former does not react directly with $PhNHNH_2$ and the latter forms arylhydrazones with arylhydrazines (C. A. 5, 877). The transformation of arylhydrazine nitrates into aryldiazonium nitrates with HNO_3 in Et_2O proceeds differently in the presence or absence of quinones. The quinones negatively catalyze the effect of the HNO_3 , but nitrous vapors are always evolved. When the quinones are excluded the reaction is violent and red gases are rapidly evolved, due no doubt to the oxidation of arylhydrazine by HNO_3 . Such actions may be written thus: $ArNHNH_2.HNO_3 + 2HNO_3 \longrightarrow N_2O_5 + 3H_2O + Ar(NO_2):N$ or $2ArNHNH_2.HNO_3 + 2HNO_3 \longrightarrow 2ArN(NO_2):N + 5H_2O + N_2O$, etc. Further the arylhydrazines can react with the diazonium salts thus: $PhN_2NO_3 + PhNHNH_2.HNO_3 \longrightarrow PhN_2$ (diazobenzeneimide) + $PhNH_2.HNO_3$ and the latter may react to give so-called "buzylenic" derivs., $PhN:NNPhNH_2$ or $PhN(:N)NPhNH_2$. In the presence of quinones HNO_3 acts on arylhydrazines with almost no gas evolution. With β -naphthoquinone and thymoquinone the primary product is the hydroxyazo compd. nitrate which by diazo scission gives the diazonium nitrate and $O_2NC_6H_4OH$. With anthraquinone the effect on the reaction is relatively slight and nitroanthranol was not found, which was as expected since the arylhydrazine of anthraquinone is decompd. by HNO_3 into anthraquinone and arylhydrazine and the latter is readily oxidized to aryldiazonium nitrate. *p*-Benzoquinone, phenanthrenequinone and acenaphthenequinone have no effect on the action of HNO_3 on arylhydrazine. The action of HNO_3 in Et_2O on arylhydrazine nitrates and β -naphthoquinone and thymoquinone with the primary formation of 2-arylaazo-1-naphthol and 6-arylaazothymol nitrates is a new confirmation of the theory on the mechanism of the Population that admits the intermediate formation of hydroxyazo compds.

(C. A. 8, 81; 9, 1316) and that permits as possible the formation of hydroxyazo compds. from quinones and arylhydrazines. The formation of hydroxyazo compds. from quinone and arylhydrazines may be considered as possible not through an intramol. change of the quinone hydrazone first formed but by oxidation of the arylhydrazine salt to the diazonium salt by the quinone which is thus reduced to phenol, and copulation of the diazonium salt with phenol with the intermediate production of the hydroxyazo salt compd. according to the scheme previously proposed (C. A. 9, 1316). Attempts to isolate arylhydrazine nitrates containing 2 equivs. of HNO_3 (like $\text{PhNHNH}_2 \cdot 2\text{HF}$) failed. Contrary to statements in the literature arylhydrazine nitrates are quite stable. Some new ones were prepared. 2.16 g. PhNHNH_2 dissolved in 120 cc. CHCl_3 , cooled, treated gradually with 40 cc. of Et_2O containing 20 cc. HNO_3 and heated on a bath under a condenser sepd. $\text{PhNHNH}_2 \cdot \text{HNO}_3$ which redissolves with the evolution of red fumes. The liquid shaken with H_2O gives a soln. which with β -naphthol ppts. phenylazo- β -naphthol, showing the presence of much $\text{PhN}(\text{NO}_2):\text{N}$. The other hydrazines mentioned above similarly treated gave much nitrous vapors and the corresponding diazonium salts as shown by their derivs. with β -naphthol. 6.48 g. *p*-benzoquinone in 240 cc. CHCl_3 treated gradually with 120 cc. of the HNO_3 - Et_2O mixt. and heated on the H_2O bath developed no red vapors and gave a negative test for $\text{PhN}(\text{NO}_2):\text{N}$. Similar results were obtained with *p*-tolylhydrazine and *asym-m*-xylylhydrazine. The *p*-benzoquinone prevents the existence of aryl diazonium nitrate. Using an equiv. amt. of thymoquinone the above was repeated. White crystals of $\text{PhN}(\text{NO}_2):\text{N}$ sepd. which in alk. soln. with β -naphthol ppts. phenylazo- β -naphthol. The Et_2O - CHCl_3 soln. was washed with 5% NaOH ; the ext. gave on adding H_2SO_4 a ppt. of 6-nitrothymol (*a*), m. $140-2^\circ$. But (*a*) is formed normally in the diazo scission of 6-phenylazothymol nitrate so that the reaction must be thus: $\text{thymol} + \text{PhN}(\text{H} \cdot \text{NO}_2)\text{HNH}_2 \cdot \text{HNO}_3 \rightarrow (\text{I}) \rightarrow (\text{a}) + \text{PhN}(\text{NO}_2):\text{N} + \text{H}_2\text{O}$. A mol. equiv. amt.



of β -naphthoquinone similarly treated and warmed gently became wine-red (2 phenylazo-1-naphthol nitrate) and then the color diminished and white $\text{PhN}(\text{NO}_2):\text{N}$ sepd. as was shown by the β -naphthol test. The Et_2O - CHCl_3 soln. treated as above gave 2-nitro-1-naphthol, m. $127-8^\circ$. In this case the intermediate formation of 2-phenylazo-1-naphthol was observed. The reaction is similar to the preceding. Similar results were obtained by using equiv. amts. of *o*- and *p*- $\text{MeC}_6\text{H}_4\text{NHNH}_2$, *asym-m*-xylylhydrazine and *s*-pseudocumylhydrazine instead of PhNHNH_2 . Treating 2.16 g. $\text{PhNHNH}_2 + 4.16$ g. anthraquinone with 120 cc. CHCl_3 and 60 cc. of Et_2O - HNO_3 mixt. on the H_2O bath evolved a trace of nitrous gas, and gave on dilg. with Et_2O unchanged anthraquinone and a little $\text{PhN}(\text{NO}_2):\text{N}$ but no nitroanthrol nor its tautomer nitroanthrone. With the other hydrazines analogous results were obtained. Under similar conditions PhNHNH_2 with phenanthrenequinone or acenaphthenequinone a trace of $\text{PhN}(\text{NO}_2):\text{N}$ was formed and the tumultuous reaction in the absence of the quinones is impeded by mol. amts. of the quinones. Small amts. of the quinone are without effect in all these cases. A dil. Et_2O soln. of PhNHNH_2 acting on Et_2O - HNO_3 seps. phenylhydrazine nitrate, $\text{PhNHNH}_2 \cdot \text{HNO}_3$, fine white needles, m. $145-6^\circ$, decomp. $185-90^\circ$. *o*-Tolylhydrazine nitrate, large white leaves, m. $98-100^\circ$; *m*-compound, white needles, m. $145-7^\circ$ (contract); *p*-compound, shining white leaves, m. $152-3^\circ$; *asym-m*-xylylhydrazine nitrate, splendid white laminas, m. $146-7^\circ$ (decompn.); *o*-anisylhydrazine nitrate, gel-

atinous mass, very sol. in H_2O , m. 108° (decompn.); *p-anisylhydrazine nitrate*, colorless prismatic needles, discolors in the light, m. $95-6^\circ$ (decompn.); *p-phenetylhydrazine nitrate*, white leaves, become rose-colored in the light and air, m. $107-8^\circ$ (decompn.).

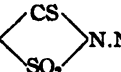
E. J. WITZEMANN.

Thiosaccharin. ANNA MANNESSIER. Univ. Pavia. *Gazz. chim. ital.* **45**, I, 540-52 (1915).—In preceding papers (*C. A.* **5**, 1090; **9**, 72, 73) it was shown that P_2S_5 acting on the CO group in camphorimide, $C_8H_{14}(CO)_2NH$, and chlorocamphorimide, $C_8H_{13}Cl(CO)_2NH$, give thiocamphorimide, $C_8H_{14}(CS)_2NH$, and thiochlorocamphorimide $C_8H_{13}Cl(CS)_2NH$, resp. M. has studied the action of P_2S_5 on an imide derived from a group different from the 2 preceding, i. e., saccharin, in order to obtain the thio deriv. When a mixt. of saccharin and P_2S_5 is heated to 220° a good yield of thiosaccharin (*a*) is obtained as intense yellow crystals, m. 180° . The constitutional

formula was demonstrated by the action of hydrolyzing agents: $C_4H_4 \begin{array}{c} \diagup CS \diagdown \\ \diagdown SO_2 \diagup \end{array} NH +$

$H_2O \longrightarrow C_4H_4 \begin{array}{c} \diagup CO \diagdown \\ \diagdown SO_2 \diagup \end{array} NH + H_2S$. Prolonged boiling with H_2O evolves H_2S and on

cooling seps. crystals of saccharin. Alk. carbonates give a yellow soln. with (*a*) in the cold which, acidified, seps. (*a*) unchanged; when boiled, however, the color is intensified and on acidifying H_2S is evolved and a mixt. of saccharin + (*a*) ppts. Alk. hydroxides give with (*a*) in the cold an orange-yellow soln. which when acidified evolves H_2S and seps. a mixt. of saccharin and (*a*); when heated the alk. mixt. is decolorized slowly. The cool decolorized soln. acidified with H_2SO_4 seps. crystals of $HO_2CC_4H_4SO_2NH_2$ slowly. Thus the action of alkalis on (*a*) takes place in 2 stages: (*a*) $\longrightarrow$ saccharin $\longrightarrow HO_2CC_4H_4SO_2NH_2$. The last is also formed by the action of NaOH on saccharin (Wilson, *Chem. Zentr.* **1904**, I, 276). In either hot or cold NH_4OH (*a*) dissolves with a yellow coloration and ppts. (*a*) unchanged on acidifying. Dil. HCl does not dissolve (*a*) in the cold, but dissolves it slowly on prolonged heating, giving a yellow soln. and evolving H_2S ; finally decoloration becomes complete. Evapd. on the H_2O bath a sirup is obtained from which $HO_2CC_4H_4SO_2NH_2$ seps. (The same result is obtained on boiling saccharin with HCl (Krannich, *Ber.* **33**, 3485).) In this case (*a*) $\longrightarrow$ saccharin $\longrightarrow HO_2CC_4H_4SO_2NH_2$. (*a*) like saccharin behaves like an acid owing to the presence of imide H between 2 negative groups. Using NH_4 thiosaccharinate, which was isolated and analyzed, salts of heavy alk. and alkaline earth metals were prepd. Attempts to obtain other derivs. of (*a*) by substituting the imide H with different radicals failed in general because of its easy transformation into saccharin, the derivs. of which were obtained. MeI reacting with (*a*) in EtOH in the presence of KOH in the hot is completely transformed into saccharin. Boiling (*a*) with dry C_6H_6 in the presence of Me_2SO_4 gives a mixt. of *methylthiosaccharin* with much saccharin. Acetylation of (*a*) with Ac_2O gives acetylsaccharin. (*a*) treated with C_4H_9N in the cold gave *pyridine thiosaccharate* with the evolution of heat and a trace of H_2S . This salt is sol. in excess of C_4H_9N and on boiling eliminates H_2S ; on dilg. with H_2O was pptd. a small amt. of a yellow-brown, basic N compd., m. 260° , which is to be studied further. Concd. HNO_3 reacts on (*a*) in the cold, giving a NO_2 deriv., of which the study was not completed because of the lack of accurate knowledge about NO_2 derivs. of saccharin. (*a*) is not the only possible product of the action of P_2S_5 on saccharin; a small amt. of an intensely red compd. free from N, m. 98° , was sepd.; this may become the principal product of the reaction when the conditions are properly changed as will be shown in another paper. *Prepn. of (a)*: Equimol. amts. of finely triturated saccharin and P_2S_5 were heated slowly in a metal bath. At 180° H_2S is evolved and a light sublimate

seps. on the walls of the vessel. The browning proceeds from the edge toward the center and at 220° is complete and the mass is transformed into a yellow liquid. If it is desired to obtain a large yield of (a) no further rise in temp. is permissible. If the mass resolidifies a small deflagration and a violent instantaneous reaction take place and the N-free red compd. is the principal product. The product obtained by heating up to 220° is repeatedly extd. by boiling with C_6H_6 and on distg. off the C_6H_6 (a) is sepd. Using 2 g. saccharin at a time the yield may be 90%. (a) may be crystd. from most org. solvents. The red compd. is sol. in the same solvents and its formation must be avoided in order to obtain pure (a) easily. (a) is bitter and mixed with an equal amt. of saccharin has a mild taste. An excess of (a) treated in the cold with concd. NH_4OH , then filtered and the NH_4OH allowed to evap., sepd. *ammonium thiosaccharinate*, C_6H_4  $N.NH_4$, as yellow needles, sol. in H_2O . The NH_4 salt treated with

$Cu(OAc)_2$ gave a brown, with $Pb(OAc)_2$ a white, with $FeCl_3$ a yellow, with salts of the alk. earths white, with salts of the alk. metals straw-yellow ppts. With $AgNO_3$ the NH_4 salt ppts. the yellow *silver salt*, m. 250.5° , blackens in the light; $HgCl_2$ ppts. the *mercury salt* as a white cheesy ppt. that blackens in the light; the NH_4 salt treated with concd. $NaCl$ soln. ppts. the *sodium salt* as straw-yellow scales. 2 g. (a) dissolved in C_6H_6 boiled with 3.8 g. dry Me_2SO_4 under a condenser for 3 hrs. darkened and on cool-

ing sepd. *methylthiosaccharin* C_6H_4  NMe , as colorless prismatic needles; re-

crystd. from $EtOH$ and then C_6H_6 it m. 221° . A further quantity was sepd. by adding dry Et_2O . It is insipid to the taste. The yield is small. Much saccharin is formed and some (a) is recovered unchanged.

E. J. WITZEMANN.

The aromatic nitro derivatives: solubility of some nitro derivatives of toluene and of benzene in the solid state. IV. MICHELE GIUA. Univ. Milan. *Gass. chim. ital.* 45, I, 557-66(1915).—In a preceding paper (*C. A.* 10, 598) in examg. some binary mixts. of NO_2 derivs. of $PhMe$ that form the "oil of drainage" obtained in the prepn. of 2,4- $(NO_2)_2C_6H_3Me$, G. observed the formation of addition compds. completely dissociated in the liquid state. This result together with the contradictory behavior of NO_2 derivs. toward various solvents has compelled G. to continue the study of other NO_2 derivs. of $PhMe$ and C_6H_6 . In the nitration of many NO_2 compds. it often happens when 2 or 3 compds. are formed simultaneously that the purification by fractional crystn. is long and laborious. Thus in nitrating $m-O_2NC_6H_4Me$ to obtain the di- NO_2 deriv. the oily product contains at least 3 di- NO_2 derivs. that are difficult to sep. by ordinary means. Beilstein and Kuhlberg (*Ann.* 155, 25(1870)) sepd. the γ -isomer (3,4- $(O_2N)_2C_6H_3Me$, m. 60°) which Häussermann and Grell (*Ber.* 27, 2220(1894)) could not sep. but which together with the 3,5-deriv., was sepd. as the benzoic acid derivs. after oxidation. The union in such a mixt. is more intimate than the purely physical one of mixing. Of the binary systems reported here only that between α - and γ -trinitrotoluene is a clear case of the formation of a compd. dissociated in the liquid state. In this system because of the slowness in the formation of the compd. there is a metastable field that persists up to the intersection of the 2 arms of the curve, which does not correspond to the eutectic mixt., since the system shows 2 eutectic points considerably above the f. p. of this pt. of intersection. The part of the curve that belongs to the compd. lies nearly parallel to the axis of abscissas, is without a pronounced max. and extends through an interval of about 15% in the concn. (i. e., from 30 to 45% of the γ -deriv.). 3 other systems, $p-O_2NC_6H_4Me$ -2,6- $(O_2N)_2C_6H_3Me$, $p-O_2NC_6H_4Me$ -2,4,6- $(O_2N)_3C_6H_2Me$ and 2,4,6- $(O_2N)_3C_6H_2Me$ -1,3- $(O_2N)_2C_6H_4$, show the same char-

acteristic curve but the line parallel to the axis of abscissas is much more limited. It was not possible to det. by thermal analysis what compn. corresponds to the compd. The existence of a region, however limited, parallel to the axis of abscissas, arguing thermodynamically, is to be ascribed to the formation of an addition compd. The curves for the system, $p\text{-O}_2\text{NC}_6\text{H}_4\text{Me-1,3-C}_6\text{H}_4(\text{NO}_2)_2$, $2,4\text{-(O}_2\text{N)}_2\text{C}_6\text{H}_3\text{Me-1,3-C}_6\text{H}_4\text{-(NO}_2)_2$, $p\text{-O}_2\text{NC}_6\text{H}_4\text{Me-NHPh}_2$ show a simple eutectic. The latter system is of interest in the explanation of the behavior of NO_2 derivs. toward NHPh_2 . Many NO_2 derivs. as $p\text{-O}_2\text{NC}_6\text{H}_4\text{Me}$, the nitrotoluenes, the dinitrotoluenes, $1,3\text{-C}_6\text{H}_4(\text{NO}_2)_2$, tetranitromethylaniline, hexanitrodiphenylamine and various nitrobenzoic acids give in the hot, with NHPh_2 even in dil. solns., a red-yellow coloration which disappears slowly with cooling. This behavior suggested the possibility of the existence of such association compds. with NHPh_2 , but the fact that the system $p\text{-O}_2\text{NC}_6\text{H}_4\text{Ph}_2\text{-NHPh}_2$ behaves normally in every way excludes an interdependence between this coloration and a hypothetical compd. The study of this part relating to the NHPh_2 system will be continued. For 5 systems the f. p. method was used and the thermic method for the 2 others. 10 g. of the mixt. was used in each expt. The curves and numerical data are given in the original. The system α - and γ -trinitrotoluene shows the formation of an addition compd. between 3 mols. of the α - and 2 mols. of the γ -derivs. The eutectic between the α -deriv. and the compd. lies at 56.75° ; that with the γ -deriv. and the compd. at 58.2° . With $p\text{-O}_2\text{NC}_6\text{H}_4\text{Me-2,6-O}_2\text{NC}_6\text{H}_3\text{Me}$ for 3 mols. of the 1st and 2 of the 2nd the m. p. of the compd. (compn. not detd.) and that of the eutectic between the compd. and the 1st coincide. With $p\text{-O}_2\text{NC}_6\text{H}_4\text{Me-(O}_2\text{N)}_2\text{C}_6\text{H}_3\text{Me}$ the parallel part of the curve covers 5% in compn. and corresponds to a compd. between 3 mols. of the 1st and 2 of the 2nd, as in the preceding system. With $\alpha\text{-(O}_2\text{N)}_2\text{C}_6\text{H}_3\text{Me-1,3-C}_6\text{H}_4(\text{NO}_2)_2$ an addition compd. between 1 mol. of each is formed which is dissociated into its components in the liquid state. The system $p\text{-O}_2\text{NC}_6\text{H}_4\text{Me-1,3-C}_6\text{H}_4(\text{NO}_2)_2$ shows a eutectic with 2 f. ps., the final f. p. being 29.5° ; the system $2,4\text{-O}_2\text{NC}_6\text{H}_3\text{Me-1,3-C}_6\text{H}_4(\text{NO}_2)_2$ shows a eutectic with 2 f. ps., the latter one being at 42.9° . The system $p\text{-O}_2\text{NC}_6\text{H}_4\text{Me-NHPh}_2$ shows a eutectic that f. 18.5° . Very small amts. of the 1st compd. give the rose-yellow color characteristic of the system. Cf. C. A. 9, 1479, 2089.

E. J. WITZEMANN.

Mixtures of explosive nitrates and the nitration of toluene. MICHELE GRUA. Milan. *Gazz. chim. ital.* 45, II, 32-44(1915).—Picric acid has long been used in explosives as the Na or NH_4 salt in mixts. with other NO_2 derivs. These mixts. always have a lower m. p. than either component and are used primarily in order to avoid certain grave inconveniences in the fusion and compression of pure $\text{C}_6\text{H}_3(\text{NO}_2)_3\text{OH}$. Thus Girard states that the following mixts. are used as explosives: (1) the mixt. 1 mol. $\text{C}_6\text{H}_3(\text{NO}_2)_3\text{OH}$ (m. 122°) + 1 mol. nitronaphthalene (m. 61°), m. 49° ; (2) a similar mixt. with dinitrotoluene (m. 71°) m. 47° ; (3) with trinitrocresol (m. 107°), m. 70° ; 2 mols. $\text{C}_6\text{H}_3(\text{NO}_2)_3\text{OH}$ + 1 mol. trinitrocresol, m. 78° . The latter mixt. is called "Kresylite" and the cresol deriv. renders the picric acid less dangerous and more resistant to shock. With the substitution of trinitrotoluene (a), for picric acid the use of the former in mixts. also was largely extended. Thus "plastrotyl" of Bichel (*Ger. Pat.* 193213 (1906)) is a resinous mixt. of tri-, mono- and dinitrotoluene; plastic trinitrotoluene (Rudeloff, *Ger. Pat.* 201306(1906)) for grenades and torpedoes is a mixt. of (a), dinitrotoluene gelatinized with collodion cotton, KClO_3 and $\text{Pb}(\text{NO}_3)_2$; "macarite" is a mixt. of 4 mols. of (a) and 7 mols. $\text{Pb}(\text{NO}_3)_2$; "yonckite" (Dautriche, C. A. 8, 1208) is a mixt. of 20% (a), 20% NH_4ClO_4 , 27% NaNO_3 and 6% $\text{Pb}(\text{NO}_3)_2$; "ammonal" used in the Austrian army and navy is a mechanical mixt. of (d), NH_4NO_3 , C and Al. Nitroaromatic compds. that have recently become important are tetranitromethylaniline (b) or trinitromethylnitroaminobenzene, tetranitroaniline (c)

(Flürscheim, Simon, *Chem. News*, 1910, 218) and hexanitrodiphenylamine (d) or *p*-picrylamine. (b) and (c) are used as detonators in caps. Not much is known about the use of (d). In its acid properties and sensibility it resembles picric acid, but in its explosive power stands between picric acid and (a). Mixts. of (a) and (d) may have practical interest and such mixts. together with some other systems were studied. In mixts. of (a) and (b) ranging from 100% to 48% of (a) the initial f. p. and eutectic temp. indicate the formation of an addition compd. of 3 mols. (a) with 2 mols. of (b) which dissociates at the m. p. The eutectic lies at 65.5–66°. In the system *p*-O₂-NC₆H₄Me–(b) there is a eutectic with 2 f. ps. very close together, a case which is well known. The system (a)–(d) even with small concns. of (d) is strongly canary-yellow in color. The small lowering in the f. p. is attributed to the formation of solid solns. **Nitration of PhMe:** After reviewing the nitration of PhMe G. gives the results of Van der Arend (*Chem. Zentr.* 1908, I, 2092) in which it was shown that the ratio of *o*-, *m*-, and *p*-O₂NC₆H₄Me varies somewhat with the temp. of nitration. In 4 nitrations at –30°, 0°, 30° and 60°, resp., the initial f. p. decreased from 4.1° to –0.8°. The formation of dinitrotoluene is discussed historically. Recently Silks (*Rec. trav. chim.* 27, 208(1907)) found that nitrating *m*-O₂NC₆H₄Me gives 3,4-, 2,3- and 2,5-(O₂N)₂C₆H₃Me, which agrees with the results of Hepp (*Ann.* 215, 366(1882)), Will (*C. A.* 8, 1590) and G. (*C. A.* 9, 2089). Blanksma (*Rec. trav. chim.* 25, 165(1905)) and Will (*C. A.* 8, 1590) have found that 3,5-(O₂N)₂C₆H₃Me cannot be further nitrated. Thus direct nitration of PhMe can only give (α) 2,4,6-, (β) 2,3,4- and (γ) 3,4,6-(O₂N)₃C₆H₂Me and only indirectly through dinitrotoluidine can the other 3, namely, 3,4,5-, 2,3,5- and 2,3,6-(O₂N)₃C₆H₂Me, be obtained (Körner, Contardi, *C. A.* 9, 1478, 3218). The direct nitration of PhMe to (O₂N)₃C₆H₂Me is of interest from a technical point of view and gives principally 2,4-O₂NC₆H₃Me and considerable of a yellow "oil of drainage" composed of *m*- and *p*-O₂NC₆H₄Me, various dinitro- and at least α- and γ-trinitrotoluene. Nitration expts. were done with mixts. of HNO₃, H₂SO₄ and H₂O in varying proportions used with varying amts. of PhMe. The wt. of the solid product and the oil drained off, the f. p. of the solid, etc., are given in the table (cf. original). The same method of nitration was used for all, i. e., the PhMe was added to the acid-H₂O mixt. a little at a time with constant agitation and the temp. controlled with a thermometer in the mixt. The f. p. of the crude solid product was taken after draining off the oil at 35–40°. The solid product could be further nitrated to (O₂N)₃C₆H₂Me with anhydrous H₂SO₄-HNO₃ mixts. containing 18–30% HNO₃. The results indicate an analogous condition for the di-NO₂ deriv. as that found by V. d. Arend for the com. mononitrotoluene.

E. J. WITZEMANN.

The glucoside of *m*-hydroxybenzaldehyde. G. BARGELLINI AND R. DE FAZI. *Gazz. chim. ital.* 45, II, 10–2(1915).—Jowett (*J. Chem. Soc.* 77, 707) extd. a glucoside different from salicin from the black bark of *Salix discolor* which he called *salinigrin*, white crystals, m. 195°, $[\alpha]_D^{15}$ –87° 3', and which on hydrolysis gave *m*-HOC₆H₄CHO, indicating that the parent compd. is a glucoside of *m*-HOC₆H₄CHO. Since Mauthner (*C. A.* 7, 772) synthesized the glucoside of *o*- and *p*-HOC₆H₄CHO it was thought of interest to obtain the *m*-deriv. This paper is a preliminary report. 4 g. *m*-HOC₆H₄CHO in 30 cc. of *N* NaOH and 30 cc. H₂O and 10 g. acetobromoglucose in 60 cc. Et₂O were agitated for 2–3 days. The liquid, if not alk., was made alk. The Et₂O evapd. in dry air and the semisolid residue crystd. from Me₂CO + H₂O(1:1) sepd. discolored crystals of the *m*-hydroxybenzaldehyde glucoside tetraacetate, m. 103–7°, $[\alpha]_D^{25}$ –43° 22', sol. in cold EtOH, C₆H₆ and Me₂CO. Attempts to hydrolyze this compd. with Ba(OH)₂ under the accepted conditions gave a resinous oil. It is expected that repetition under better conditions will give a deriv. identical with saligrin.

E. J. WITZEMANN.

Azohydroxamic acids. I. G. PONZIO. Univ. Sassari. *Gazz. chim. ital.* **45**, II, 12-29(1915).—The expts. here described were done in order to obtain derivs. of dinitrocarbonyl, O_2NCONO_2 . The analogy between $PhCH(NO_2)_2$ and $CH(NO_2)_3$ appears from their nitronic forms $Ph(NO_2)C:NOOH$ and $(O_2N)_2C:NOOH$. In the same way that the diazonium salt $Ph(NO_2)C:NOON_2Ph$ gave $Ph(NO_2)C:NNHC_6H_4NO_2$ (*C. A.* **2**, 2812; **5**, 693), P. expected $(O_2N)_2C:NO_2NPh$ to rearrange in moist Et_2O to the dinitrocarbonyl-*p*-nitrophenylhydrazine, $(O_2N)_2C:NNHC_6H_4NO_2$, but a product of decompn., *phenylazoformhydroxamic acid* (a), $PhN:NC(:O)NHOH$, was obtained which is the 1st term of a new series of compds. The reaction may be $(O_2N)_2C:NO_2N_2Ph + 2H_2O \longrightarrow (a) + 2HNO_3$. But P. considers that the behavior of this salt is similar to that of the *p*-substituted aryldiazonium salts of $Ph(NO_2)C:NO_2N_2ArX$ ($X = Cl, Br, Me, NO_2$, etc.) which in moist Et_2O rearrange into benzoylarylnitrosohydrazines, $PhC(:O)N(NO_2)N(NO)ArX$, which lose N_2O_2 spontaneously to give benzoylazoaryls, $PhC(:O)N:NArX$, as the final product (*C. A.* **5**, 685, 686; **8**, 2692). Thus analogously $(O_2N)_2C:NO_2N_2Ph$ probably isomerizes into nitrocarbonylphenylnitro-nitrosohydrazine (b), $ON_2CON(NO_2)N(NO)Ph$, which gives nitrocarbonylazophenyl, $O_2NCON:NPh$, and by this reduction gives (a). It is also possible as was shown with the Bz deriv. (*C. A.* **2**, 2812, **5**, 686) that 2 H_2O acting on (b) gives $O_2NC(:O)NHNHPh + HNO_2 + HNO_3$ which explains the formation of the acids, but the oxidation of the hydrazo group of the latter to azo and the reduction of NO_2 to $NHOH$ can not take place with only H in the mol., and ought to be attributed to 2 other reactions. According to Bamberger and Rust (*Ber.* **35**, 45 (1902)) $HCHNOOH$ gives $HC(:O)NHOH$, and thus phenylazonitromethane (c), $PhN:NCHNO_2H$, should give (a) and it would have to be that $PhN(Ac):N$ acting on $CH(NO_2)_3$ would not give a diazonium salt, as was found, but $PhN:NC(NO_2)_3$, which by the action of H_2O would give $PhN:NCH_2NO_2$ and this (c) and, by rearranging, (a). This does not seem logical. It was found that other aryldiazonium salts of $CH(NO_2)_3$ react the same way in moist Et_2O to give $HOHNC(:O)N:NAr$ but P. has limited himself in this paper to the Ph deriv. and the discussion of reasons for attributing formula (a) to it instead of that of the tautomer phenylazoformhydroxamic acid, $PhN:NC(OH):NOH$. The formula (a) explains all the properties of this compd. and above all its transformation into phenylazide, $PhN:N:N$, a reaction which is common to all members of the series and which constitutes a good new method of prepn. of the arylazides, $ArN:N:N$ or $ArN.N:N$. In this

reaction 1 mol. (a) gives $PhN:N:N + CO_2 + H_2$, a reaction which is similar to the prepn. of HN_3 from azodicarbonamide (d): $H_2NCON:NCONH_2 + 2O \longrightarrow HN_3 + 2CO_2 + NH_3$; and of PhN_3 from phenylazocarbonamide, (e): $PhN:NCONH_2 + 2O \longrightarrow PhN:N:N + CO_2 + N_2O$ (*C. A.* **1**, 2479). In the case of (d) P. explains the reaction by admitting that triazenecarboxamide $H_3NCON:NNH_2$ is formed and tautomerizes into cyclotriazane, $H_3NCON.NH.NH$, which is oxidized to the azide.

$H_2NCON.N:N$, and sapond. to give HN_3 . A similar explanation was used for (e).

In (a) as well as (d) and (e) the CO group is eliminated as CO_2 . Urea, (d) and (e) however do not give N_2 , HN_3 and PhN_3 with alkalis alone but only when $NaOCl$ or $NaOBr$ is present which oxidizes carbonyl to CO_2 while with (a) the CO_2 is formed by intramol. oxidation in the presence of alkali alone. There is not enough O however to oxidize the H intramol. so that it is evolved. Thus (a) behaves like a hydroxyurea deriv. Hydroxyurea, according to Conduché (*C. A.* **2**, 658, 999), exists in 2 forms: (1) $H_2NCONHOH$ and (2) $H_2NC(OH):NOH$. (1) gives no color with $FeCl_3$ and gives a HCl salt; (2) gives an intense blue color with $FeCl_3$ and forms metallic salts. Since (a) behaves like (1) this is further confirmation of the formula. These expts. show the

marked difference in the behavior of MeNO_2 , $\text{CH}_2(\text{NO}_2)_2$ and $\text{CH}(\text{NO}_2)_3$ toward PhN_2OAc : $\text{MeNO}_2 \longrightarrow \text{O}_2\text{NCH:NPh}$; $\text{CH}_2(\text{NO}_2)_2 \longrightarrow (\text{O}_2\text{N})_2\text{C}(\text{N:NPh})_2$; and $\text{CH}(\text{NO}_2)_3 \longrightarrow \text{HOHNC}(\text{O})\text{N:NPh}$. A cold satd. aq. soln. of $(\text{NO}_2)_2\text{C:NO}_2\text{K}$ was added gradually with ice cooling to an equimol. amt. of PhN_2OAc in not too dil. aq. soln. A cryst. ppt. (the *phenyldiazonium salt of trinitromethane*) (*f*), $(\text{NO}_2)_2\text{C:NO}_2\text{N}_2\text{Ph}$, seps., which, washed well with H_2O , taken up in Et_2O and pptd. with Me_2CO , seps. as golden yellow crystals that explode easily. It is little sol. in cold and more sol. in hot H_2O ; the yellow soln. decomps. with the evolution of N_2 , but with care most of (*f*) can be recovered by quickly cooling the soln. made at $50-60^\circ$. It is insol. in cold EtOH , Et_2O , CHCl_3 , C_6H_6 , and ligroin but quite sol. in Me_2CO . Boiled with H_2O it evolves nitrous vapors and resinifies; boiled with Et_2O it gives AcH . That (*f*) is $(\text{NO}_2)_2\text{C:NO}_2\text{N}_2\text{Ph}$ and not phenylazotritromethane, $(\text{NO}_2)_3\text{CN:NPh}$, is shown (1) by the action of H_2O which gives $\text{CH}(\text{NO}_2)_3$, PhOH and N_2 quant.; (2) by adding 35% HCl gradually to the compd. while cooling, which gives PhNCl:N and $\text{CH}(\text{NO}_2)_3$, of which the former was recognized by giving phenylazo- β -naphthol with β -naphthol, and the 2nd as the salt of nitron obtained by the action of an aq. soln. of $(\text{NO}_2)_2\text{C:NO}_2\text{K}$ with the AcOH soln. of nitron 1,4-diphenyl-3,5-endanilodihydrotriazole. The *trinitromethane salt of nitron*, $\text{CH}(\text{NO}_2)_3 \cdot \text{C}_{10}\text{H}_{10}\text{N}_4$, is a yellow ppt. which crysts. from EtOH as golden yellow needles, m. 150° (decompn.). P. believes now that the product similarly obtained from $\text{PhCH}(\text{NO}_2)_2$ (C. A. 2, 2812; 5, 693) with PhN_2OAc is $\text{PhC}(\text{NO}_2)_2\text{N:NO}_2\text{N}_2\text{Ph}$, although some of its properties make $\text{PhC}(\text{NO}_2)_2\text{N:NPh}$ more probable; likewise the product obtained with $\text{PhCH}(\text{CN})\text{NO}_2$ must be phenylazophenylcyanonitromethane, $\text{PhC}(\text{CN})(\text{NO}_2)\text{N:NPh}$. When (*f*) is agitated in moist Et_2O in a cold H_2O bath it is gradually dissolved with the evolution of nitrous gases. The Et_2O soln. is carefully washed with a little H_2O and allowed to evap. in the air; (*a*) seps. as splendid white needles, m. $84-5^\circ$, sol. in EtOH , Et_2O , Me_2CO , C_6H_6 and CHCl_3 , sol. in H_2O but more sol. in H_2O containing inorg. acids or AcOH ; it reduces Fehling or $\text{Ag}_2\text{O-NH}_3$ soln. in the cold, sol. in concd. H_2SO_4 and is reprecip. on dilg.; CrO_3 in AcOH oxidizes it completely, but PCl_5 , PCl_3 , $\text{Br-H}_2\text{O}$, Ac_2O and KMnO_4 are without action; it gives no coloration with FeCl_3 or $\text{Cu}(\text{OAc})_2$; decomps. in alk. soln. as described above. Heated in the sealed tube at $175-80^\circ$ with fuming HCl it decomps., giving in part PhN_3 , PhNH_3 and NH_3 . The hydrazo deriv. of (*a*), PhNHNHCONHOH , could not be obtained by reduction. When (*a*) is suspended in abs. EtOH and EtOH-KOH added it dissolves and on acidifying later a yellow oil, which is to be studied further, sepd.; this may be *phenylazoxymethyldroxamic acid*, $\text{PhN:NC}(\text{OH})\text{:NOH}$. Heating (*a*) with HNO_3 (d. 1.52) on the H_2O bath and pouring on ice seps. *p*-nitrophenylazoxymethyldroxamic acid (*g*), $\text{O}_2\text{NC}_6\text{H}_4\text{N:NC}(\text{O})\text{NHOH}$, crysts. from EtOH as yellow needles, m. $165-6^\circ$, little sol. in EtOH and ligroin, more sol. in C_6H_6 and CHCl_3 , sol. in boiling H_2O , more sol. in dil. HNO_3 , sol. unchanged in concd. H_2SO_4 or HNO_3 . Some (*g*) is formed when (*f*) reacts too rapidly in moist Et_2O or if the Et_2O is distd. off on the H_2O bath. In this case the Et_2O residuc is extd. with petr. ether repeatedly in which (*g*) is insol. The formation of (*g*) proves that (*f*) gives rise to HNO_3 in its decompn. Heated with alkalis (*g*) decomps. thus: (*g*) $\longrightarrow$ *p*- $\text{O}_2\text{NC}_6\text{H}_4\text{N}_3 + \text{CO}_2 + \text{H}_2$. The *p*-nitrophenylazide was sepd. by steam distn.; it crysts. from ligroin as yellowish laminas, m. $71-2^\circ$ (Bamberger, Renault, Ber. 30, 2288(1897)).

E. J. WITZEMANN.

The formation of azides. G. PONZIO AND G. CANUTO. Univ. Sassari. *Gazz. chim. ital.* 45, II, 29-31(1915).—It was stated in a preceding paper (C. A. 2, 2812; 5, 685) that acylarylnitrosohydrazines (*a*), $\text{ArN}(\text{NO})\text{NHCOR}$, are transformed by boiling H_2O into acylarylhydrazines, ArNHNHCOR , and HNO_2 . This reaction was generalized by Giovetti (C. A. 5, 694) and consists in replacing NO with H which ought to be favored by the presence of alkalis. But (*a*) heated with 20% NaOH gives $\text{ArN.N:N} +$

RCO_2H . The formation of ArN_2 confirms the position occupied by NO in the acylarylhydrazines and confirms what had been detd. in an indirect way. It also favors the cyclic formula for the arylazides. $\text{PhN}(\text{NO})\text{NHCHO}$ was prepd. according to Wohl (Ber. 33, 2759(1900)). Dissolved in 20% NaOH and distd. with steam it gives PhN_2 and a little PhNH_2 . The latter was eliminated by washing with HCl. The PhN_2 was nitrated (Tilden, J. Chem. Soc. 63, 257(1893)) and transformed into $p\text{-O}_2\text{NC}_6\text{H}_4\text{N}_2$, m. 71° (Bamberger, Renauld, Ber. 30, 2288(1897)). $\text{BrC}_6\text{H}_4\text{N}(\text{NO})\text{NHCHO}$ was prepared according to Giovetti, using 50% HCO_2H acid instead of 5%. This with 20% NaOH and steam distn. gave $p\text{-BrC}_6\text{H}_4\text{N}_2$ and some $p\text{-BrC}_6\text{H}_4\text{NH}_2$. $\text{PhN}(\text{NO})\text{NHAc}$ (Wohl and Schiff, Ber. 35, 1902(1902)) similarly treated gave only PhN_2 . Acetyl-*p*-bromophenylnitrosohydrazine, $p\text{-BrC}_6\text{H}_4\text{N}(\text{NO})\text{NHAc}$, was obtained by adding to $p\text{-BrC}_6\text{H}_4\text{NHNHAc}$ in 2 *N* NaOH the calcd. amt. of NaNO_2 and after cooling in a freezing mixt. acidifying with 2 *N* H_2SO_4 ; it was purified by pptg. from Et_2O with petr. ether and seps. as yellowish laminas, m. $108\text{--}10^\circ$ (decompn.); with concd. H_2SO_4 it gives a wine-red color; boiled with H_2O it evolves nitrous fumes and gives $p\text{-BrC}_6\text{H}_4\text{NHNHAc}$, m. 161° . Treated with 20% NaOH as above it gave $p\text{-BrC}_6\text{H}_4\text{N}_2$. $\text{PhN}(\text{NO})\text{NHBz}$ (Wosvinkel, Ber. 34, 2352(1901)) similarly treated gives PhN_2 . E. J. WITZEMANN.

Spontaneous oxidation in the presence of aldehydes. Isoxazolecaboxylic compounds containing anisic or cinnamic residues. MARIO BETTI AND SERGIO BERLINGOZZI. Univ. Siena. Gass. chim. ital. 45, II, 44-51(1915).—In a preceding paper (C. A. 10, 599, 600) the spontaneous oxidation of the benzylidene deriv. of phenyl- and methylisoxazolone in the presence of BzH was described, by which deriva. of isoxazolecaboxylic acid were obtained. These new expts. were done in order to det. if other aldehydes (anisic and cinnamic) have the same effect. In both cases the typical derivs were formed. B. and B. wished to learn whether under analogous conditions other compds. would undergo the same oxidation. Previously it had been suggested that under the action of $\text{NH}_3\text{-EtOH}$ the oxazolone ring opens to form the intermediate $\text{HON}:\text{CRC}(\text{CONH}_2):\text{CHPh}$ in which the 2 *H* atoms in italics are removed by the action of atm. O_2 favored by the presence of BzH . Attempts were made to see if $\text{HON}:\text{CMeCH}:\text{CHPh}$ (a), which differs by having H for CONH_2 , is transformed into γ -methyl- α -phenylisoxazolone, $\text{N}:\text{CMe.CH}:\text{CPh.O}$, which has been obtained in another way

(l. c.). The (a) was recovered unchanged in all cases. This result raised the supposition that the position in space of the $>\text{NOH}$ may impede the oxidation. In expts. with the *cis* and *trans* isomers of $\text{PhCH}:\text{CHCH}:\text{NOH}$ both were recovered unchanged. This will be taken up again in later papers. The anisalmethylisoxazolone (b), $\text{MeO-C}_6\text{H}_4\text{CH}:\text{C.CO.O.N}:\text{CMe}$ used was prepd. by treating $\text{AcCH}_2\text{CO}_2\text{Et}$ with a mol.

amt. of free NH_4OH and adding the anisaldehyde and boiling a few mins.; (b) seps. as S-yellow refractive crystals, m. 174° . (b) dissolved in cold $\text{NH}_3\text{-EtOH}$, treated with a little BzH and boiled under a condenser for 1 hr., seps. some unchanged (b) on cooling. The filtrate after standing several days imperfectly stoppered and adding $\text{NH}_3\text{-EtOH}$ redissolves the yellow compd. and seps. whitish crystals gradually. The amidomethoxyphenylmethylisoxazolecaboxylic acid (c), $\text{MeOC}_6\text{H}_4\text{C}:\text{C}(\text{CONH}_2)\text{CMe}:\text{N.O}$,

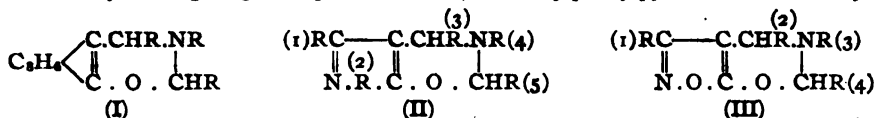
obtained, m. 195° , and is analogous to the other similar derivs. previously obtained. Boiled with NaOH it evolves NH_3 from which the Na salt is crystd. The Na salt with HCl gives the free acid, white ppt., m. 178° , sublimes without decompn. Benzalmethylisoxazolone in $\text{NH}_3\text{-EtOH}$ treated with anisaldehyde as above sepd. at first some (b), m. 174° . This treated again with the reaction mixt. behaved as above and sepd. (c), in a few days; some phenylmethylisoxazolecaboxylamide, m. 256° , was sepd. from the mother liquors. With anisaldehyde the oxidation is slow. Cim-

namalmethylisoxazolone, $\text{MeC:N.O.CO.C:CHCH:CHPh}$, was prepd. from cinnamal-

dehyde + $\text{MeC(:NOH)CH}_2\text{CO}_2\text{Et}$, and treated with $\text{NH}_3\text{-EtOH}$ + BzH gave *phenyl-ethylenemethylisoxazolecarboxamide*, $\text{MeC:N.O.C(CH:CHPh):C.CONH}_2$, pearly crys-

tals, m. $185-6^\circ$; free acid, obtained as above, m. $118-20^\circ$. E. J. WITZEMANN.

Pyrazo-oxazine and oxazo-oxazine. Two new types of bisheterocyclic derivatives with the naphthalinoid bond. MARIO BETTI. *Gazz. chim. ital.* 45, II, 75-81(1915).—Cyclic compds. even quite different in nature but containing —CH:C(OH)— (or $\text{—CH}_2\text{CO—}$) give place frequently to the formation of derivs. similar in structure, in the manner of their synthesis and in physical and chem. properties; e. g., β -naphthol and pyrazolone. The following derivs. which are analogous in structure and methods of formation are known: dinaphthol and dipyrazolone, benzalbinnaphthol and benzalbispyrazolone, methylenedinaphthol and methylenedipyrazolone, methenyldinaphthol and methenyldipyrazolone. Derivs. of other rings like isoxazolone are similar in this respect to β -naphthol. B. has tried the action of derivs. of pyrazolone and isoxazolone on aldehydes and primary amines. Open chain compds. containing —CH:C(OH)— give pyridine derivs. under these conditions by eliminating the enolic OH. With β -naphthol (*Gazz. chim. ital.* 30, *et seq.*) the enolic OH is not eliminated but the O enters a heterocyclic ring to give naphthoxazine (I). Methylphenylpyrazolone and methyl-



isoxazolone give pyrazoxazine (II) and oxazooxazine (III) in this way. In the reaction 1 mol. of the azolone, 2 mols. of the aldehyde and 1 mol. of the amine eliminate 2 H_2O and give (II) or (III). Mixing warm EtOH solns. of methylphenylpyrazolone, BzH and $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$ gives an orange-red liquid from which sep. white crystals of benzalbis[methylphenylpyrazolone] (a), $(\text{MeC:N.NPh.CO.CH})_2\text{:CHPh}$, m. $165-6^\circ$

(Lachowicz, *Monatsh.* 17, 358(1896)). The filtrate on standing a few days seps. 2 kinds of crystals; these pressed and washed with NaOH to remove (a), washed with H_2O , and dissolved in EtOH , give white needles of (b), a deriv. of (II), $\text{C}_{24}\text{H}_{21}\text{ON}_2$, m. 227° , in which $\text{R(1)} = \text{Me}$, R(2) , R(3) , and $\text{R(5)} = \text{Ph}$ and $\text{R(4)} = \text{C}_{10}\text{H}_7$. On long boiling with concd. HCl it gives an incipient decompn. and some BzH . It is sol. in boiling Ac_2O but does not recryst. unchanged. In the synthesis of (I) (*Gazz. chim. ital.* 31, II, 173(1901)) the reaction was found to proceed in 2 stages. Attempts to obtain the intermediates for (II) in EtOH soln. failed. Mixing equimol. amts. of methylphenylpyrazolone and benzalnaphtylamine in C_6H_6 gives an orange-red liquid from which sep. (a) + yellow-rose crystals (m. $140-70^\circ$); the latter were freed from (a) by washing with NaOH . In attempting to purify in EtOH it was decompd. and (b), m. 227° , was pptd., and free pyrazolone and $\text{C}_{10}\text{H}_7\text{NH}_2$ formed. The yellow-rose crystals are probably the intermediate in question although they differ in some respects from the intermediate of (I). Benzalmethylisoxazolone in concd. EtOH soln. treated with BzH and $\beta\text{-C}_{10}\text{H}_7\text{NH}_2$ and boiled a few min. gave a cryst. paste of (c), a deriv. of (III), in which $\text{R(1)} = \text{Me}$, R(2) and $\text{R(4)} = \text{Ph}$ and $\text{R(3)} = \text{C}_{10}\text{H}_7$, white silky needles, m. 257° . (c) is very stable toward chem. reagents. The intermediate addition compd. in C_6H_6 soln. was not obtained. E. J. WITZEMANN.

Sitosterol and stigmasterol. A. HEIDUSCHKA AND H. W. GLOTH. Univ. Munich. *Arch. Pharm.* 253, 415-26(1915).—Sitosterol was first prepd. by Burian (*Monatsh.* 18, 551) from wheat and rye seedlings, later also by Windaus (*C. A.* 1, 1002; 2, 86)

from the fat of the calabar bean. According to W., its compn., as also that of cholesterol, is represented by $C_{27}H_{46}O$, while B. advocated the formula $C_{27}H_{44}O$. B. showed the alc. nature of the O by prepg. the acetate, propionate and benzoate. In addition to W., other chemists as Jaeger (*C. A.* 1, 3060) and Pickard and Yates (Philip, *C. A.* 2, 2487) have noted important differences in the behavior of sitosterol and cholesterol. Stigmasterol was first obtained by Windaus (*Ber.* 39, 4378) from so-called phytosterol of the calabar bean. Its m. p. (as obtained by H. and G., 170°) is considerably higher than that of sitosterol ($136-7^{\circ}$) and it differs also in compn., having the formula $C_{28}H_{48}O$ or $C_{28}H_{46}O$. It adds 2 mols. Br while sitosterol adds only 1 mol. With acid it enters into combination to yield esters. *Sitosteryl salicylate*, $HOC_6H_4CO_2C_{27}H_{46}$, by heating the well triturated components 4 hrs at $160-70^{\circ}$, gelatinous flakes from Et_2O + alc., gradually becoming cryst., m. 147° . *Phenylurethan*, $PhNHCO_2C_{27}H_{46}$, by heating the alc. with $PhNCO$ a few min. at 180° , crystals from Et_2O + pet. ether, m. 174° . Br in excess converts sitosterol at the ordinary temp. into the *bromides*, $C_{27}H_{44}Br_{10}O$, brown powder, m. about 185° , and $C_{27}H_{42}Br_8O$, yellow powder, m. about 120° . Cholestenone, first reported by Diels and Abderhalden (*Ber.* 37, 3099), was obtained in better yield by Windaus (*Ber.* 39, 1518) by oxidizing the Br addition-product of cholesterol with $KMnO_4$ in H_2SO_4 and reducing the resulting ketodibromide with Zn and AcOH to the corresponding ketone. Similar treatment of sitosterol lead to the formation of *sitostenone*, $C_{27}H_{44}O$, crystals from MeOH, m. 82° . *Semicarbazone*, $C_{28}H_{47}ON_3$, crystals sintering 243° , m. 254° (decompn.). The following derivs. of stigmasterol were prepd.: *Palmitate*, $C_{16}H_{32}CO_2C_{28}H_{48}$, crystals of intense silky luster, m. 99° . *Stearate*, silky crystals, m. 101° . *Oleate*, crystals, m. 44° . *Salicylate*, needles, m. 175° . *Cinnamate*, crystals, m. 155° . *Tetrabromide*, $C_{28}H_{46}OBr_4$, by treating the sterol in Et_2O with Br in AcOH, crystals, m. 205° (decompn.).

W. O. E.

The action of alkali and alkaline earth cyanides on sugars. II. E. RUPP AND A. HOGLZLE. Univ. Koenigsberg. *Arch. Pharm.* 253, 404-15(1915).—The exptl. clarification of the interaction between dextrose and K and Ba cyanide solns. resulted in developing a simple method for the prepn. of α -glucoheptonic acid (cf. *C. A.* 8, 1356). Further work along this line has shown that a diminution in the OH ion concn. or decrease in the hydrolysis of KCN brings about a smoother reaction. Thus, a concd. soln. of Zn K cyanide likewise develops with grape sugar copious quantities of NH_3 , the reacting mixt. remaining practically colorless over the space of a week. Pure $Zn(CN)_2$, however, on account of its insoly., shows no tendency to react with dextrose. Heretofore, only the easily sol. Ba salt of α -glucoheptonic acid, $(C_7H_{13}O_6)_2Ba$, was known, hence the opportunity was taken to prep. the difficultly sol. *basic barium salt*, $CH_2OH(CHOH)_4CO_2BaOH$, in the form of warty crystals. In studying the velocity of action and expenditure of CN in solns. containing dextrose and KCN, the observation, interesting both from a chem. and forensic standpoint, was made that weak acid solns. containing dextrose and HCN suffer no greater decrease in cyanogen even after the lapse of weeks than those containing a minimum of alkali within an hour's time. It may be readily understood from the above that HCN in cadavers often disappears with great rapidity down to the merest traces, while, on the other hand, cases are known where the poison could be easily detected after the lapse of weeks and even months. The behavior of mannose towards KCN and $Ba(CN)_2$ is very like that recorded for dextrose (cf. *C. A.* 8, 1356). By means of this reaction the prepn. of mannosecarboxylic acid becomes an easy matter. In the case of levulose, KCN and $Ba(CN)_2$ at first cause liberation of HCN (indicated by a strong odor) which after several hrs is followed by a distinct NH_3 odor. The ketohexose differs in this respect from the aldohexoses, dextrose and mannose, which immediately develop NH_3 . The behavior

of galactose, lactose and maltose, towards the above cyanides was not essentially different from that noted for levulose.

W. O. E.

Some points connected with the representation of the benzene formula. GARRAISE LEBAS. London. *Chem. News* 113, 73-4(1916).—A new formula (I) for

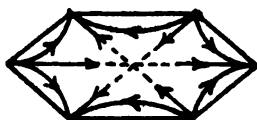


(I)



(II)

C_6H_6 , proposed in a previous article, is discussed in its relations to the centric (Armstrong) and the Kekulé formulas. In combination with the centric, it gives a formula (II) which expresses more than either, and suggests the possibility of the Kekulé formula. But (II) is incomplete; it must be made to express the hypothesis of a difference between the valences of different atoms. The centric formula supposes the forces to be directed inward. They should be represented as directed alternately inward and outward. On this assumption the combination formula can also be modified (III). With the additional assumption of vibrating valences, the centric formula

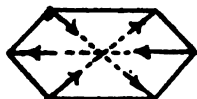


(III)



(IV)

(V) can be regarded as a phase of the vibration of 2 extreme phases, represented by



(V)

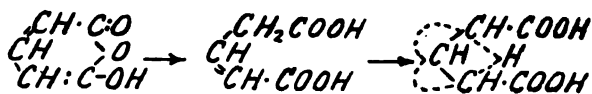


(VI)

alternate Kekulé formulas (IV and VI). (III) involves all three. From a static viewpoint it resembles the field of force shown by 6 magnetic poles arranged in a ring, alternately + and —, the forces directed outwardly from the + poles and inwardly from the — poles. Dynamically, the diagram shows the disposition of the free valences at different phases of the vibration. The possibility of interaction between the valences in the *p*-position, causing the centrally directed valences to resemble those in the diagonal formula of Claus, can be represented by completing the diagonals by dotted lines. (III), though incomplete, is more nearly complete than any other one, and is probably best worth preserving, together with (IV), (V) and (VI). J. F. SMITH.

Glutaconic acid. I. P. E. VERKADÉ. *Proc. Acad. Wetenschappen* 18, 981-92 (1915).—Thorpe (*J. Chem. Soc.* 87, 1669 (1905); *C. A.* 6, 1150-1, 3408-9; 7, 336-7, 1710; 8, 69, 325, 1747) has given a survey of the peculiar structure and isomerism phenomena of the alkyl and aryl derivs. of glutaconic acid and their anhydrides, dicarboxylic esters, etc. With this paper begins the publication of some physico-chem. confirmations of some of the peculiarities of these acids. T. showed that in the glutaconic acid mol., $CO_2H.CH_2.CH:CH.CO_2H$, the α and γ positions

are identical. A true methylene group ($>CH_2-$) is not present in these acids; one of the H atoms is mobile between the α and γ C-atoms: The double bond is "floating." If an acid of the "mobile" class is dehydrated under certain conditions, a hydroxyanhydride is formed, from which, on rehydration, the normal acid is regenerated:



Hence, the normal acid is preceded by a *labile* acid. In some cases the labile acid has been isolated. The labile acid has a double bond, and should show *cis* and *trans* isomerism. This is indeed the case with β -phenyl- α -glutaconic acid (C. A. 8, 69), so that 3 isomers of this acid are known, which powerfully supports T.'s conceptions. The other labile acids are known in only one form, probably the *cis* form. As to the relation of glutaconic acid to this theory: (1) It may be obtained by several different methods: (A) Conrad and Guthzeit (*Ann.* 222, 253(1883); *Ber.* 15, 2841(1882)), m. 130-4°. (B) Pechmann-Blaise (*Ann.* 261, 157(1891); *Ber.* 24, 3250(1891); *Bull. soc. chim.* [3] 29, 1013(1903)). (C) Morgenstern and Zerner (*Sitz. Akad. Wiss., Wien* 119, 589(1910)), m. 129-9.5°. (D) von Pechmann (*Ann.* 264, 301(1891)), m. 132-4°. (E) Büchner (*Ber.* 23, 703(1890); *Ann.* 273, 238(1893)), m. 127-8°. If the identity of these forms were established, one form would appear which was formed under all conditions and must be the most stable. Such differences in stability of *cis* and *trans* isomers are not otherwise known. Further, Perkin and Tattersall (*J. Chem. Soc.* 87, 361(1905)) failed in every attempt to produce an isomer of glutaconic acid. (2) Thorpe's sym. formula is supported by the fact that the known glutaconic acid does not possess all the properties of either the *cis* or *trans* form. (3) For an acid with a floating double bond the reduction velocity should differ from that of an acid with an ordinary double bond. Measurements with glutaconic and aconitic acids (C. A. 7, 591) do in fact show such differences. (4) T. (C. A. 6, 3408) obtained from glutaconic acid a hydroxyanhydride, $\text{CH}:\text{CH}.\text{CO}.\text{O}.\text{C}(\text{OH}):\text{CH}$, which on hydration under

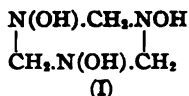
different conditions yields the same acid (m. 137°). Therefore the intermediate labile acid is very unstable. To prove the existence of the labile acids by a physico-chem. process, the hydration of the hydroxyanhydride was observed under various conditions at different temps. *Prepn. of glutaconic acid by different methods*: (A) gave most rapid results, but only a 20% yield, m. 136-8°, without decompn. (B) gave excellent results. The yields are those stated by Blaise; m. p. as in (A). (C) gives glutaconic acid as a secondary product (Fichter and Dreyfus, *Ber.* 33, 1452(1900)); m. p. 135-7°. For the prepn. of large quantities this is the best method; it is cheap and gives relatively high yields. (D) gave an 18% yield, m. 135-7°. (E) (linking $\text{N}_2\text{CH}_2\text{CO}_2\text{Et}$ with $\text{CH}_2:\text{CH}.\text{CO}_2\text{Me}$) yielded (a) *trans*-trimethylene-1,2-dicarboxylic, (b) glutaconic, and (c) *cis*-trimethylene-1,2-dicarboxylic acids. In contrast with (a) and (c), (b) instantly reduces alk. KMnO_4 ; it m. 136-8°. The glutaconic acids obtained by methods (A) to (E) were identical in all respects. This identity is confirmed by the results to be discussed in the communication to follow. In no case could the presence of an isomeric glutaconic acid be detected. *Properties of glutaconic acid*: No anhydride is formed by keeping for months *in vacuo* over P_2O_5 . On evapn. of an aq. soln., a little β -hydroxyglutaric acid is formed, and some resinification occurs. No color is obtained with FeCl_3 in EtOH, but in aq. soln. a brownish red color occurs. No $\text{Fe}(\text{OH})_3$ is deposited on boiling. *Attempt to find a new synthesis of glutaconic acid*: Thorpe and Rogerson (*J. Chem. Soc.* 87, 1685(1905)) obtained β -alkylglutaconic acids by condensation of $\text{NCCHNaCO}_2\text{Et}$ with $\text{AcCH}_2\text{CO}_2\text{Et}$ or its alkyl derivs. $\text{C}_6\text{H}_5\text{N}$ derivs. were often formed also. A similar condensation was tried with $\text{HCOCHNaCO}_2\text{Et}$ and $\text{NCCH}_2\text{CO}_2\text{Et}$ in the hope of obtaining ethyl α -cyanoglutaconate. To a soln. of 60 g. of $\text{HCOCHNaCO}_2\text{Et}$ in 150 cc. of abs. EtOH were added 45 g. of $\text{NCCH}_2\text{CO}_2\text{Et}$ and the whole heated on a H_2O bath 0.5 hr. (until decompn. set in). The yellow gelatinous mixt. was taken up in dil. HCl and shaken with Et_2O , washed with dil. NaOH and H_2O , and the Et_2O

evapd., leaving 30–35 g. of a pale yellow, very thick viscid oil. This ester completely resembled the α -cyanoglutaconic ester obtained by Guthzeit and Eyssen (*C. A.* 4, 901) from isoimidodicarboxylglutaconic ester, and the same ester prepd. with aq. NaOH. It had a bitter taste, gave a carmine color with alc. FeCl_3 , and could not be distd. under any circumstances. Guthzeit and Eyssen could not isolate any hydrolysis product after sapon. with acids or alkalis. In this research tests were made, after sapon. with dil. KOH, KOMe, 10% HCl, concd. H_2SO_4 , and 30% H_2O_2 + KOH, for the presence of glutaconic, malonic and 2,6-dihydroxypyridine-5-carboxylic acids, and for Et 2,6-dihydroxypyridine-5-carboxylate and 2,6-dihydroxypyridine, all of which might be expected. The result was always negative. The acid thus prepd. must then have another structure. An isoimido structure, $\text{EtO}_2\text{CC}:\text{CH}:\text{CH}:\text{C}(\text{OEt})\text{O}:\text{C}:\text{NH}$, is supported by the fact that NH_3 splits off in all

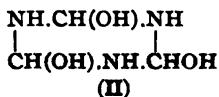
the sapon. methods tried, and by the carmine color shown by all sapon. products when exposed to air, probably indicating the presence of 6-ethoxy- α -pyrone derivs. An effort to condense $\text{HCOCHNaCO}_2\text{Et}$ and malonic ester to isoaconitic ester failed; a simple double decompn. took place, yielding sodiomalonic and free formylacetic esters.

J. F. SMITH.

The composition of the hydrochlorides obtained from formaldoxime. C. H. SLURRGA. *Proc. Akad. Wetenschappen* 18, 1007–12 (1915).—According to Schöll (*Ber.* 24, 579 (1891)), the hydrochloride obtained from formaldoxime has a variable compn. owing to a progressive change during its formation. Dunstan and Bossi declare that it consists of 3 mols. of oxime to 1 mol. of HCl. A study of these contradictory results showed that the primarily formed salt loses HCl readily until it contains 2 mols. of oxime to 1 mol. of HCl; the primary product (recrystd. once from MeOH and then from Et_2O , and freed from Et_2O at 60° by a current of dry air containing HCl), contained 1 mol. of oxime to 1 mol. of HCl. After 2 hrs. *in vacuo* over H_2SO_4 it contained 2 mols. of oxime to 1 mol. of HCl. After repeated recrystns. and drying for weeks *in vacuo* over KOH it contained approx. 3 mols. of oxime to 1 mol. of HCl. The colorless oil from which the primary product crystd., freed from Et_2O by dry air at 60° and dried for weeks *in vacuo* over H_2SO_4 , contained approx. 2 mols. of oxime to 1 mol. of HCl. On distn. under 1 atm. it decompd. at about 110° , as did the solid salts at 130° , with violent evolution of HCl. These results seem to support Schöll's belief that the free acid causes a change in the salt mols. The nature of this change is studied by observing the basicity of the bases of the three salts. For this purpose the velocity consts. (k') of their catalytic influence on the sapon. of EtOAc, and on the inversion of sucrose at 25° , were compared with those of equiv. amts. of HCl (k). The catalytic influence of the neutral oxime salt mols. was compensated in the free acid by the addition of amts. of NaCl corresponding with the nonhydrolyzed portion of the oxime salt. Putting degree of hydrolysis $x = k'/k$, the dissociation const. of the base $k_b = K_w (1 - x)/(N - x^2)$, where k is the ion product of H_2O (1.1×10^{-14} at 25°) and N is the normality of the soln. The salt with 1 mol. of oxime gave values of approx. 24 for the const. $k_b \times 10^{-13}$. The salt with 3 mols. of oxime gave values of approx. 3; for the salt with 2 mols. of oxime, x becomes nearly = 1; k_b is much smaller than for the other two salts. The inversion measurements agreed satisfactorily with those of sapon. These values of k_b indicate that the basicity of the solid salt decreases with decreasing HCl content, and hence that the HCl causes a shifting of atoms which lessens the basicity. This may be due to formamide formation, but is better explained by assuming a cyclic arrangement of 3 oxime mols.; the base of the primarily formed salt then would be:



Of this base 1 mol. can combine with 3 mols. of HCl; its dissociation const. is about $k_b = 23 \times 10^{-12}$. If now a Beckmann rearrangement sets in, the base of the secondarily formed salt would be:



One mol. of this base can combine with only 1 mol. of HCl; its dissociation const. is only $k_b = 3 \times 10^{-12}$. The base of the liquid salt is still weaker. The rearrangement here seems to have passed through the 2nd phase, forming the $>\text{C:O}$ group, and breaking up the cycle. How can (I) and (II) explain the decompn. studied by Dunstan and Bossi? The salt $(\text{CH}_2\text{:NOH})_3\text{HCl}$, heated some hrs. in a sealed tube at 120° in H_2O with an excess of HCl, yielded 2 mixts.: $\text{NH}_2\text{OH} + \text{CH}_2\text{O}$ and $\text{NH}_3 + \text{CH}_2\text{O}$. The higher the HCl concn., the more of the first was formed. An excess of H^+ ion would shift the equil. between the trimol. bases in the direction of (I), which must, according to the structure, yield NH_2OH and CH_2O . The weaker base (II) yields NH_3 and CH_2O . The reduction of the salt $(\text{CH}_2\text{:NOH})_3\text{HCl}$, converting all the N to NH , agrees with the structure of (II), since $-\text{OH}$ attached to N is more readily reduced than when attached to C. A more extended article in *Rec. trav. chim.* will explain the subject further.

J. F. SMITH.

Action of sodium and alkyl halides on aldehydes, ketones, etc. NAGAYOSHI NAGAI, AKIRA OGATA AND KAMETARO TAKATA. *J. Pharm. Soc. Japan* 1916, No. 407, 3-21; cf. Schorigin, *C. A.* 2, 3353.—The reaction on ketones runs smoothly with the formation of approx. 60% of the theoretical amt. of tertiary alc. Camphor forms a compd. of the same chem. compn. as methylborneol but with a lower m. p. ($135-46^\circ$) (cf. Zelinski, *Ber.* 34, 2883). Methylmenthol, m. $105-6^\circ$, and $\text{PhCH}_2\text{CMe}_2\text{OH}$, m. $88-93^\circ$, were prepd. from menthone and PhCH_2Ac , resp. With aldehydes the reaction proceeds less smoothly. Na, EtI and BzH yielded only 31% PhCHEtOH ; piperonal, etc., only 7% piperonaethylcarbinol. PhBr, BzH and Na yielded 46% PhCOH ; BzCl, EtI and Na 40% PhCOEt . On passing a current of CO_2 into PhBr and Na in Et_2O , 7.5% BzOH was formed. An abstr. in German precedes the article.

H. W. DAUDT.

Tetrahydroxybiphenyl from resorcinol melt. OSCAR V. FRIEDRICH. *Arch. Kemi. Min. Geol.* 6, No. 19, 1-20(1915).—As the temp. of fusion of resorcinol with NaOH is increased more biresorcinol and less phloroglucinol is formed. By methylating biresorcinol in Et_2O with CH_3N_3 , biresorcinol di-Me ether, $\text{C}_{12}\text{H}_6(\text{OH})_2(\text{OCH}_3)_2$, m. 76° , is prepd. Crystals from H_2O contain 1.5 mols. H_2O and m. 67° . MeI and Me_2SO_4 yield the tetra-Me ether, m. 108° . Attempts at oxidation of the di-Me ether with KMnO_4 and CrO_3 with a view to forming $(\text{HO})_2\text{C}_6\text{H}_4\text{CO}_2\text{H}$ were unsuccessful. Treatment of biresorcinol with fuming HNO_3 resulted in the formation of $(\text{CO}_2\text{H})_2$ and a red NO_2 compd., probably hexanitrobiresorcinol, which is very sol. in Et_2O and explodes at about 230° . Benedick and Julius (*Monatsh.* 5(1884)) prepd. the pure compd. by titration of the Ac deriv. It behaves like an acid, decomp. carbonates with formation of orange-yellow salts. The H_2O soln. is colored deep red by FeCl_3 . It cannot be methylated with Me_2SO_4 . On reduction with Sn and HCl it yields hexaaminobiresorcinol hydrochloride, $\text{C}_{12}(\text{NH}_2)_6(\text{OH})_4\cdot 4\text{HCl}$, colorless, decomp. $180-90^\circ$, very sol. in H_2O , difficultly sol. in alc. The H_2O soln. turns red on heating or on exposure to air. FeCl_3 forms a carmine-red color. The free base could not be isolated on account of its in-

stability in soln. The salt reduces AgNO_3 . Hexanitrobiresorcinol tetra-Me ether is formed by methylating the hexa- NO_2 compd. with CH_3N_3 , yellow needles from alc., m. 208° , sol. in C_6H_6 and Et_2O . Nitration of tetra-Me ether with fuming HNO_3 yields tetranitrobiresorcinol tetra-Me ether, yellow needles from acetone, sol. in AcOEt , no definite m. p., begins to discolor and decomp. at about 220° . When Cl is passed into bireisorcinol in ice-cold AcOH hexachlorobiresorcinol, m. 283° , is formed; rosettes from alc. If the above soln. is not cooled a more energetic reaction takes place with the formation of the decachloro compd., white needles from AcOH , m. $170-7^\circ$. Hexachlorobiresorcinol forms a tetra-Ac compd., with Ac_2O and anhydrous AcONa , needles, m. 229° . With CH_3N_3 the di-Me ether, m. 180° , is formed; with Me_3SO_4 the tetra-Me ether, which crysts. from AcOH , sinters 185° , m. 220° . Hexabromobiresorcinol was prepd. by adding Br to bireisorcinol in AcOH until the color remained permanent (cf. Meyer and Desamari, *C. A.* 3, 2696), crystals from alc.; begin to decomp. 180° but do not m. 320° . The di-Me ether, m. $194-6^\circ$, is prepd. by methylating hexabromobiresorcinol with CH_3N_3 ; the tetra-Me ether, m. 211° , with Me_3SO_4 . Br with bireisorcinol tetra-Et ether forms hexabromobiresorcinol tetra-Et ether, needles from C_6H_6 , m. 288° . In German.

H. W. DAUDT.

Stereochemical investigations. BROR HOLMBERG. *Arkiv. Kemi. Min. Geol.* 6, No. 1, 1-20(1915); cf. E. Biilmann, *Ann.* 339, 351(1905).—Inactive, *l*- and *d*-thiomalic acids were prepd. from the corresponding xanthogensuccinic acids and NH_3 . *i*-Acid, m. $149-50^\circ$. *l*-Acid, m. $152-3^\circ$. For solns. of 1 g. in 20 cc., $[\alpha]_D^{17}$ in acetone -75.8° , in AcOEt -76.5° , in abs. alc. -64.8° , in H_2O 46.7° . *d*-Acid, m. $152-3^\circ$; $[\alpha]_D^{17}$, as above, in acetone 76.1° , in AcOEt 76.5° , in abs. alc. 64.4° . No noticeable conversion of the *l*-acid to the *d*-acid is caused by heating for 6 hrs. on the water bath with 1 *N* H_2SO_4 , 0.25 *N* KOH or 0.25 *N* KSH . When a 0.25 mol. soln. is heated alone a change of 7% takes place and when between 0.25 and 0.75 mol. KOH per equiv. acid is added the change is as high as 60%. KSH with *l*-bromosuccinic acid forms either *d*- or *l*-thiomalic acid depending on the conditions of concn., etc. *l*-Disulfidosuccinic acid, prepd. by oxidation of *l*-thiomalic acid with air in the presence of FeCl_3 , m. $167-8^\circ$. For solns. of 0.5 g. in 10 cc., $[\alpha]_D^{17}$ in abs. alc. -272.9° , in acetone -269.3° , in H_2O 290.5° . *d*-Disulfidosuccinic acid, prepd. in like manner from *d*-thiomalic acid, m. $167-8^\circ$; $[\alpha]$ in abs. alc. 272.8° , in acetone 270.2° . The Ba salt is a white powder. *dl*-Disulfidosuccinic acid was prepd. by mixture of the *l*- and *d*-acids in equal quantity. *i*-Thiomalic on oxidation yields a mixture of *dl*- and mesodisulfidosuccinic acids, which are difficult to sep. An abstr. in German follows the article.

H. W. DAUDT.

The preparation of absolute alcohol. L. W. WINKLER. *Z. angew. Chem.* 29, I, 18(1916).—In order to prep. 100%, NH_3 -free EtOH , 99% EtOH is distd. with Ca filings which are prepd. as follows: First the filings are well sieved to remove most of the Ca nitride. They are then shaken in a flask with CCl_4 and collected on a filter, after which another washing with CCl_4 suffices to remove all the petroleum and most of the remaining nitride. After drying the filings in an atm. of CO_2 until the odor of the CCl_4 is no longer perceptible, they are ready for use. Twenty grams of filings are used for every l. of EtOH to be distd. In order completely to remove the NH_3 from the anhydrous distillate, a few cg. of alizarin are dissolved in a l., and 0.5 g. of dried tartaric acid is dissolved in another 10 cc. The alc. tartaric acid soln. is carefully added to the anhydrous distillate containing the alizarin until the reddish blue color of the latter turns to a clear yellow. After adding a few more drops of the alc. tartaric acid soln. the neutralized soln. is distd. again with precautions to exclude atm. moisture.

E. A. TSCHUDY.

Nitrosohydrazones and their rearrangement. M. BUSCH AND HERM. KUNDER. Univ. Erlangen. *Ber.* 49, 317-34(1916); cf. *C. A.* 10, 328.—B. and K. believe their

work shows beyond doubt that nitrosohydrazones have the nitrosoamine structure, $RN(NO)N:CHR$, and are not C-nitroso compds. $RNHN:C(NO)R$ (Bamberger and Pemsel, *Ber.* 36, 359 (1903)). When $PhNHN:CHPh$ in 20 parts cold $AcOH$ and a little alc. is treated slowly with excess of $NaNO_2$ and then with H_2O , a yellow to brown-yellow viscous oil, $PhN(NO)N:CHPh$, is obtained; it gives the Liebermann reaction, dissolves in concd. H_2SO_4 with blue color and reforms the hydrazone with Zn dust and $AcOH$; if allowed to stand in Et_2O some time, it deposits yellow needles, m. 189° , of $(PhCH:NNPh)_2$, and the filtrate, allowed to stand 1-2 days more and concd., yields red crystals, m. $101-2^\circ$, of $PhNHN:C(NO_2)Ph$; under the influence of ethylates, it rearranges into $PhN:NC(:NOH)Ph$. $PhNMeN:CHPh$, on the other hand, is unchanged by HNO_2 under the above conditions, even after several hrs. *Benzal p-bromophenylnitrosohydrazone*, yellow needles, m. $68-9^\circ$ (foaming), gives the Liebermann reaction, dissolves in H_2SO_4 with green color, yields on standing in C_6H_6 red needles probably consisting of the compd. $BrC_6H_4NHN:C(NO_2)Ph$, while from the Et_2O soln. after standing some time petr. ether ppts. yellow crystals m. 85° , at once resolidify to a blood-red mass and m. again 120° ; not enough was obtained for further study; it may be an isomer of the NO compd. *Benzophenone phenylnitrosohydrazone*, $PhN(NO)N:CPh_2$, obtained almost quant. from 20 g. $PhNHN:CPh_2$ in 250 cc. $AcOH$ slowly treated at $15-20^\circ$ with 10 g. $NaNO_2$ in concd. aq. soln., lemon-yellow crystals, stable for days in the air, decomp. quite rapidly in sealed vessels with evolution of nitrous fumes, seps. from Et_2O -petr. ether in lemon-yellow needles, from Me_2CO-H_2O in lemon-yellow columns, turns brown about 100° , m. 105° (foaming), gives the Liebermann reaction, dissolves in H_2SO_4 with blue to greenish blue color, regenerates the hydrazone with alc. KOH , with Zn dust in cold $AcOH$ or when boiled with C_6H_6 . When, however, the concd. C_6H_6 soln. is allowed to stand 2-3 days at room temp. and treated with petr. ether there is pptd. 70% of $p-O_2NC_6H_4NHN:CPh_2$, light yellow needles or leaflets, m. 154.5° . The same change is smoothly effected in 8-10 parts Et_2O and a few drops of $AcOH$; B. and K. believe that their compd. is identical with Bamberger's $PhN:NC(NO_2)Ph_2$ and that possibly in his synthesis of his compd. from PhN_2X and $PhCH_2NO_2$ (*Ber.* 33, 2055 (1900)), the nitrohydrazone was formed by rearrangement during the purification of the crude product with boiling alc. If HCl gas is passed through the Et_2O soln. of the NO compd. until it just assumes a reddish tinge or it is treated with a little alc. HCl and allowed to stand 15-20 hrs., $o-O_2NC_6H_4NHN:CPh_2$, red needles or prisms from Me_2CO , m. 165° , is formed in addition to the p -compd., from which it is sepd. by means of cold alc. KOH , the o -compd. being almost insol. in this reagent. The p - and o -compds. are also obtained, in 10 and 3.5 g. yield, resp., from 20 g. $PhNHN:CPh_2$ in 350 cc. Et_2O allowed to stand 24 hrs. with 3 cc. N_2O_4 . In alc. the rearrangement of the NO compd. gives, besides the above o - and p - NO_2 compds., 2,4- $(O_2N)_2C_6H_2NHN:CPh_2$, orange-red prisms, m. 231° , also obtained from $PhNHN:CPh_2$ and N_2O_4 when the Et_2O is distd. off before removing the excess of N_2O_4 , when the NO compd. is allowed to rearrange in C_6H_6 in the presence of $AmNO_2$ or when the o - or p - NO_2 compd. in Me_2CO is allowed to stand 10-15 min. with a few drops of concd. HNO_3 . The p - NO_2 compd. with Zn dust and $AcOH$ not much above 20° gives *benzophenone p-aminophenylhydrazone*, faintly yellowish leaflets from C_6H_6 -petr. ether, m. $166-7^\circ$; *hydrochloride*, gray leaflets from alc.- Et_2O , m. $215-6^\circ$, decompd. by boiling H_2O ; *chloroplatinate*, light leather-yellow needles; *acetyl derivative*, brownish needles from C_6H_6 -petr. ether, m. 204° . Diazotization in HCl gives a greenish yellow soln. depositing after a time, especially on warming, dark brown amorphous products, with evolution of N ; coupling with α - $C_{10}H_7NH_2$ yields the dye $Ph_2C:NNHC_6H_4N:-NC_{10}H_7NH_2$, difficultly sol. in boiling alc. with yellow-red color and sepg. in black-brown druses with greenish reflex, rubs to a dark red-brown powder, m. 203° , sol. in

H_2SO_4 with violet-blue color changing to crimson on diln. with H_2O . With BzH the hydrazone gives the *benzal compound*, $\text{Ph}_2\text{C}:\text{NNHC}_6\text{H}_4\text{N}:\text{CHPh}$, pointed needles from alc., m. $138-9^\circ$, hydrolyzed by boiling dil. H_2SO_4 ; with PhNCS in boiling alc. is obtained the *thiourea*, $\text{Ph}_2\text{C}:\text{NNHC}_6\text{H}_4\text{NHC(S)NPh}$, leaflets, m. 180.5° . *Acetophenone phenylnitrosohydrazone*, yellowish needles from Me_2CO , H_2O or C_6H_6 -petr. ether, m. about 82° (decompn.), quite unstable; its solns. evolve nitrous gases on gentle warming; in the air it quickly becomes yellow-green to green, the original color being restored in an NH_3 atm.; in concd. H_2SO_4 it dissolves with pure blue color immediately changing to violet-blue; the Liebermann test gives a beautiful blue color; NaOEt or Zn-AcOH regenerates the hydrazone; the C_6H_6 soln. on standing deposits $p\text{-O}_2\text{NC}_6\text{H}_4\text{-NHN}:\text{CMePh}$, brown- to orange-yellow needles from C_6H_6 -petr. ether, m. $182-3^\circ$. *o*-Substituents in ketone arylhydrazones seem at times to render the formation of NO compds. more difficult but in no case to prevent it. *Acetophenone pseudocumylhydrazone*, needles from alc., m. $140-1^\circ$, treated in the usual way with HNO_3 , gives the *nitroso compound*, unstable felted needles, gives the Liebermann reaction; with proper precautions it can be crystd. from C_6H_6 -petr. ether in yellowish, silky, felted needles, turns brown 50° , m. about 70° (decompn.), but decomps. so quickly, finally yielding a dark brown oil, that it could not be analyzed. *Acetophenone o-iodophenylhydrazone*, prisms from $\text{EtOH-Et}_2\text{O}$, m. 87° ; *nitroso compound*, prepd. in a large vol. of glacial AcOH , yellow needles, turns brown 72° , m. 75° (decompn.), regenerates the hydrazone with Zn-AcOH . *Benzophenone o-anisylhydrazone*, prisms from alc., m. 101° ; *nitroso compound*, pptd. from AcOH by H_2O as a vivid yellow flocculent product quickly boiling up to a resin. *Benzophenone vic-m-xylylhydrazone*, very faintly yellow, silky, flat needles from alc., m. $111-2^\circ$; *nitroso compound*, brownish yellow resinous mass, sol. in H_2SO_4 with green-blue color quickly becoming dark. CHAS. A. ROULLIER.

o-Substituted xyllyltellurium compounds. KARL LEDERER. Brussels. *Ber.* 49, 334-44(1916); cf. *C. A.* 6, 3417.—When the Grignard reagent from 156 g. 2,5- $\text{Me}_2\text{-C}_6\text{H}_3\text{Br}$, 20.7 g. Mg and 500 cc. Et_2O is slowly treated with 60 g. TeBr_3 , boiled 3 hrs., decompd. with ice H_2O , the Et_2O soln. washed with H_2O , freed in CO_2 from Et_2O , $\text{C}_6\text{H}_5\text{Me}_2$ and unchanged $\text{Me}_2\text{C}_6\text{H}_3\text{Br}$, the residue heated 0.5 hr. in CO_2 at 280° with Cu powder and distd. under 34 mm. the greater part b. $260-75^\circ$ and solidifies in the receiver. Crystn. from MeOH or EtOH gives 36.6 g. of *di-p-xylyl telluride*, silky needles, m. 72° . The mother liquors, concd., freed from the remaining telluride with HgCl_2 and from the excess of HgCl_2 with NaOH , leave *di-p-xylyl* as an oil of pleasant odor (Jacobson, *Ber.* 14, 2112(1881), describes it as m. 125°). From 5 g. of the telluride treated in Et_2O with Cl is obtained 6 g. *di-p-xylyltellurium dichloride*, needles from $\text{CHCl}_3\text{-MeOH}$, m. $197-8^\circ$. *Dibromide*, yellow needles from $\text{CHCl}_3\text{-EtOH}$, m. $189-90^\circ$. *Diiodide*, deep red-brown needles with 1 mol. CHCl_3 from $\text{CHCl}_3\text{-alc.}$, without solvent of crystn. from $\text{C}_6\text{H}_6\text{-benzine}$, sinters 156° , m. $161-2^\circ$. *Oxide*, $(\text{Me}_2\text{C}_6\text{H}_3)_2\text{-TeO}$, quant. obtained from 5 g. of the dibromide heated 1 hr. on the H_2O bath with 16 g. NaOH in 100 cc. H_2O , microcryst. powder from C_6H_6 , sinters 223° , m. $225-6^\circ$, very difficultly sol. in H_2O , the soln. being only extremely faintly alk.; on cooling it seps. in needles which do not lose wt. at 150° , so that it apparently seps. as the oxide, not the dihydroxide. When 1.5 g. of the dichloride is boiled with 300 cc. H_2O for some time, the undissolved part dissolved in 150 cc. H_2O and the combined solns. concd. to 300 cc. and cooled, there seps. a cryst. powder, sinters 223° , m. 227° , with 9.18-9.50% Cl ; 1.5 g. of this product, boiled with 500 cc. H_2O , the residue dissolved in 200 cc. H_2O and the combined solns. concd. to 300 cc., yields a powder which sinters 208° , m. 210° , with 6.67-6.82% Cl . The basic chloride, $(\text{Me}_2\text{C}_6\text{H}_3)_2\text{Te(OH)Cl}$ (calcd. Cl , 9.09%) or its anhydride (Cl , 9.56%), is therefore further hydrolyzed. The dibromide behaves similarly; the product obtained by one recrystn. when treated in H_2O with

KI gives the *basic iodide* or its *anhydride* (found 41.18% C, 4.45% H, 25.47% I), red-brown powder, sinters 50°, m. about 70°. *Di-p-xylylmethyltelluronium iodide*, from 2 g. telluride allowed to stand 10 days with 5 g. MeI, sinters 134°, m. 137° (decompn.); *picrate*, needles from alc., scales from H₂O, sinters 166°, m. 170°. *Di-p-xylyl telluride-mercuric chloride double salt*, from the telluride in Et₂O and aq. HgCl₂ columns from alc., contracts 170°, m. 179–80°. *Mercuric bromide salt*, from the components in alc., broad needles from alc. or AcOH, contracts 165°, m. 169–70°. *Mercuric iodide salt*, golden yellow needles, sinters 164°, m. 166–7°. *Di-2,4-xylyl telluride*, yellowish oil, b₁₀ 202–3°, is obtained in 25 g. yield from 156 g. Me₃C₆H₃Br, 20.7 g. Mg and 60 g. TeBr₃, the crude product, b₁₀ 200–30°, being purified by conversion into the dibromide (57 g.), 40 g. of which is slowly added to 50.5 g. MeI, 8.8 Mg and 250 cc. Et₂O, boiled 0.5 hr., decompd. with ice H₂O, treated with dil. HCl and the Et₂O soln. washed, dried and distd. in CO₂. *Telluronium dichloride*, microscopic columns from CHCl₃-MeOH, sinters 185°, m. 187–8°. *Dibromide*, yellow, microscopic, prismatic columns from CHCl₃-alc., sinters 197°, m. 200–1°. *Diiodide*, ruby-red, 4-sided columns from C₆H₆-Et₂O, sinters 179°, m. 181–2°. *Oxide*, sinters 212°, m. 216–7°, very difficultly sol. in H₂O, the soln. being only very faintly alk. The dichloride recrystd. from H₂O gives needles, m. 239–40°, with 50.24% C, 4.61% H, 9.55% Cl, sol. in H₂O with acid reaction and sepg. on cooling as a gelatinous mass which, when air-dried, forms a powder, m. 229–30°, with 6.10% Cl, again forming an acid aq. soln. *Di-o-xylyl telluride-mercuric chloride double salt*, from the telluride in Et₂O and aq. HgCl₂, seps. as a waxy ppt. quickly becoming cryst., sinters 98°, m. 106°, with 11.22% Cl (calcd., 11.64%); from much alc. it seps. in crystals sintering 83°, m. 88°, with 12.76% Cl, and from AcOH in crystals sintering 98°, m. 110°, with 10.89% Cl. *Mercuric bromide salt*, warty forms from alc., quickly disintegrating to a light powder, sinters 95°, m. 99°. *Mercuric iodide salt*, yellow, microscopical, 4-sided plates from alc., sinters 102°, m. 107–8°.

CHAS. A. ROULLER.

Mesityltellurium compounds. KARL LEDERER. Brussels. *Ber.* 49, 345–9(1916); cf. preceding abstr.—*Dimesityl telluride*, obtained in 27.2 g. yield from 97.25 g. MeC₆H₃Br, 10.3 g. Mg (12 hrs. boiling is required completely to dissolve the Mg) and 30 g. TeBr₃ boiled 6 hrs., dild. with 100 cc. C₆H₆, decompd. with ice H₂O, the washed Et₂O soln. freed from Et₂O, C₆H₆, C₆H₅Me₃ and Me₂C₆H₃Br in CO₂, the residue heated 0.5 hr. in CO₂ at 275° with 15 g. Cu powder, distd. under 16 mm. and crystd. from alc., softens 123°, m. 129°. *Telluronium dichloride*, needles from benzine-alc., sinters 177°, m. 178–9°. *Dibromide*, yellow needles from CHCl₃-alc., m. 105–6° (decompn.). *Diiodide*, 4-sided, deep dark red, almost black columns from Et₂O, sinters 108°, m. 111°. *Oxide*, from the dibromide and NH₄OH on the H₂O bath (with NaOH the reaction is very slow), apparently monoclinic columns from benzine, sinters 202°, m. 204–5°, difficultly sol. in H₂O with neutral reaction. The dichloride recrystd. from H₂O gives a substance sintering 223°, m. 237°, yielding on recrystn. a powder m. about 220°, with 6.74% Cl. The product once crystd. gave with KI a yellow ppt. contracting 93°, m. 100°, with 43.03% C, 4.57% H (calcd. for the *basic iodide anhydride*, 43.15, 4.39%, resp.). From 2 g. of the telluride allowed to stand 4 weeks with 6 cc. MeI is obtained, together with much unchanged telluride, only a small amt. of substance containing I, scales, m. 168–9°; if the mixt. is gently boiled 2 days or heated 15 hrs. at 100°, there is no reaction. HgCl₂, HgBr₂, and HgI₂ do not combine with the telluride.

CHAS. A. ROULLER.

Preliminary communication on mixed lead tetraaryls. KARL LEDERER. Brussels. *Ber.* 49, 349–50(1916); cf. Grüttner, *C. A.* 9, 804.—*Lead diphenyl di-o-tolyl*, needles from alc., sinters 129°, m. 134–5°, is obtained by slowly treating the Grignard reagent from 5.6 g. o-BrC₆H₄Me and 0.8 g. Mg with 5 g. Ph₂PbI₂, heating 0.5 hr. on the H₂O

bath, adding 25 cc. PhMe, decomp. with cold dil. HCl, freeing the Et₂O-PhMe layer from most of the solvents by distn. and from the rest by steam distn. and recrystg. the residue.

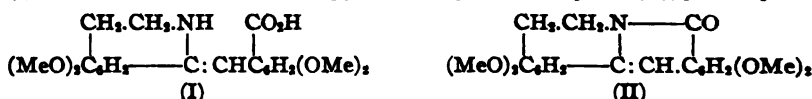
CHAS. A. ROULLER.

Crystallized polysaccharides from glycogen. HANS PRINGSHEIM AND STEFANIE LICHTENSTEIN. Univ. Berlin. *Ber.* 49, 364-9(1916); cf. *C. A.* 9, 83.—A Merck glycogen, practically ash-free, was used; it still contained a little albumin which, however, sepd. in dark flocks on sterilizing the aq. solns., that remaining in soln. being removed by protein precipitants. The fermentation with the *Bacillus macerans* is much more difficult than in the case of starch. The degradation products are the same as with starch, the only difference, possibly, being that more β -hexaamylose, as compared with tetraamylose, is formed with glycogen. Two 17.5 g. portions of glycogen in 5% aq. soln. were sterilized and inoculated with a potato culture of the bacillus; after 2 days at 37° the first gas bubbles formed; the gas evolution then increased, so that flocks of protein in the soln. rose to the surface, this stage lasting about a week; the fermentation then decreased and after 4 weeks no more gas was formed. The filtered soln. was now pptd. with colloidal Fe(OH)₃ and the filtrate and washings evapd. to 10 cc. *in vacuo* at 50°; after 24 hrs. in the ice chest, the dextrin β , mixed with a little of the "sludge" (presumably octaamylose), crystd. out; after soln. in 40 cc. H₂O, filtration from the sludge after 24 hrs. and concn., 1.5 g. pure β -hexaamylose was obtained (C 43.55%, H 6.41%, $[\alpha]_D^{20}$ in H₂O 157.8°); it gave the dibromide, orange prisms, and the I compd., red-brown prisms. Treatment of the filtrate from the dextrin β with I-KI yielded the characteristic green needles with metallic luster of the dextrin α I compd. from which, by decompn. in H₂O with Ag₂CO₃, filtration, treatment with H₂S, evapn. of the filtrate to dryness *in vacuo*, heating to boiling with 10 cc. of 96% alc. and diln. with hot H₂O until dissolved, is obtained 0.5 g. of the tetraamylose (C 44.09%, H 6.46%, $[\alpha]_D^{20}$ in H₂O 138.5°), gives the Br compd., light yellow needles. That these products were not formed from the starch in the potato cultures was shown by subjecting 20 g. maltose inoculated with a similar culture to fermentation for several weeks at 37°; although the gas evolution was very slight, the characteristic odor (due to Me₂CO) of *B. macerans* fermentations was recognized. The products worked up as above showed no amylose by the I reaction; the formation of the osazone with Ph-NHNH₂ showed the presence of considerable maltose. This, like the earlier negative expts. with glucose, also meets the objection that the amylose might have been synthesized by the bacillus from lower sugars.

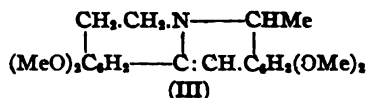
CHAS. A. ROULLER.

Action of methylal on tetrahydropapaverine. AMÉ PICTET AND TSAN Q. CHOU. Univ. Geneva. *Ber.* 49, 370-6(1916); cf. *C. A.* 8, 101.—In order to det. why the condensation of tetrahydropapaverine (a) with MeCH(OEt)₂ takes place between the N atom of the isoquinoline ring and the 6-C atom of the veratryl ring, while the condensation of the similarly constituted veratrylnorhydrohydrastinine with HCH(OMe)₂ takes place at the 2-C atom (*C. A.* 6, 484), 5 g. (a)-HCl in 20 cc. HCl (d. 1.06) on the H₂O bath was treated in the course of 1 hr. with 10 g. HCH(OMe)₂; on cooling was obtained 80-5% of the *hydrochloride*, needles from HCl, m. 213°, of *morcoralydine* (b), C₂₁H₂₈O₄N, leaflets from dil. alc., m. 157-8°, sol. in cold H₂SO₄ without color but turning brown-red on heating, slowly turns yellow in the air or in neutral aq. solns. of its salts. *Picrate*, yellow needles from alc., m. 138°, turns red in the air; *chloroplatinate*, orange-red prisms from alc., blackens on heating and m. about 231°; *mercuric chloride salt*, yellow ppt., m. 158°. The constitution of (b) is analogous to that of the compds. obtained with MeCH(OEt)₂, but it is formed in only 1 (not 2 stereoisomeric) form; attempts to resolve it into its optical components with *o*-bromocamphor-sulfonic acid failed. For its physiol. properties, cf. Mayor and Wiki, *Rev. méd. Suisse romande*, 35, 490(1915), and Aftandilian, *Diss. Geneva*, 1914. Oxidation gives exclu-

sively *m*-hemipinic acid. Heating 0.4 g. (b), 0.8 g. I and 15 cc. alc. 2 hrs. at 100° gives *dehydronorcoralydine iodide* (c), $C_{21}H_{20}O_4NI$, yellow needles from 40% AcOH, m. 252.5°; *nitrate*, from the iodide and $AgNO_3$, prisms from H_2O , m. 261°; *chloride*, from the iodide and $AgCl$ in boiling H_2O , needles, m. 220°; *picrate*, needles from dil. AcOH, m. 255°. Free *quaternary base*, from the chloride and Ag_2O in warm H_2O , amorphous substance from alc.- Et_2O , m. 175°. When the nitrate suspended in $CHCl_3$ or Me_2CO is shaken vigorously with a few drops of concd. KOH, the base seps. with the solvent; short yellow needles, m. 215°, from $CHCl_3$; dark yellow needles, m. 150°, from Me_2CO . The chloride or nitrate forms in 10% KOH a clear reddish soln., which on standing or short warming on the H_2O bath deposits a pulverulent, brown, basic substance (probably corresponding to dehydroberberine), m. about 195° (*hydrochloride*, yellow needles, m. 212°); the alk. filtrate remains clear and doubtless contains the salt (I) but addition of acid at once ppts. *ketodehydronorcoralydine* (II), yellow prisms from



C_6H_6 or xylene, m. 190°, insol. in H_2O , acids and alkalis, gives in H_2SO_4 with 1 drop HNO_3 an intense violet color. (c) boiled 1 day with $MeMgI$ in Et_2O and shaken with HCl gives the *hydrochloride*, m. 120°, of the base (III), yellow crystals from $MeOH$,



m. about 180°, which was obtained in such small amt. that its constitution was detd. merely by converting it with alc. I into dehydrocoralydine iodide, golden yellow needles, m. 263° (picrate, m. 243°).

CHAS. A. ROUILLER.

Introduction of acid radicals into the side benzene rings of anthracene. Preparation of 1-hydroxy-2-anthracoyl-*o*'-benzoic acid. ALFRED SCHAARSCHMIDT, partly with A. REH. Berlin. *Ber.* 49, 381-5(1916); cf. *C. A.* 9, 2255.—It was previously shown that in the introduction of acid residues into anthracene (a), *meso*-derivs. are always formed on account of the extraordinary reactivity of the H atoms of the middle ring. S. has now tried 2 ways of so lessening the reactivity of these atoms that acid radicals might be introduced into the side rings: (1) By reducing the (a) to the dihydro compd. and coupling it under very mild conditions with $BzCl$ in the presence of $AlCl_3$, but, probably with intermediate regeneration of (a), the Bz radical enters chiefly the *meso*-position. (2) By taking advantage of the orienting force of HO groups which, in general, is greater than the reactivity of *meso*-H atoms (cf. Bayer & Co., *C. A.* 6, 1536). As a matter of fact, when 45 g. $C_6H_5(CO)_2O$, 150 g. H_2BO_3 and 60 g. 1- $C_{14}H_9OH$ are ground to a uniform powder and quickly heated, the mixt. begins to become fluid at 195-200° and after short stirring at this temp. solidifies. After cooling, the brown-red mass is powdered and ground with H_2O , whereby it becomes brownish yellow; it is now boiled up with 4 l. H_2O , filtered, washed with hot H_2O , boiled up with 5 l. H_2O and 100 cc. concd. NH_4OH , filtered and cooled; during the filtration golden yellow crystals sep. on the filter and more are deposited from the filtrate. They consist of *ammonium 1-hydroxy-2-anthracoyl-*o*'-benzoate*, $HOC_{14}H_9COC_6H_4CO_2NH_4$. The crystals on the filter are purified by decantation with cold H_2O , combined with those sepg. from the filtrate, boiled with 7 l. H_2O and 25 g. soda, filtered hot and treated hot with dil. HCl . There is thus obtained 28 g. of the free acid (b), brownish yellow crystals from xylene, yellow needles from AcOH, m. 221°, sol. in H_2SO_4 with intense blue color soon changing to green; on pouring into H_2O the soln. deposits a brown-red ppt.

(see below). In attempting to prep. an acetate, it was found that a difficultly sol. red product was formed with AcOH , Ac_2O and NaOAc (but not without NaOAc) and, in pure cryst. form (brown-red leaflets, sinter 241° , m. 246°) with Ac_2O in xylene without NaOAc . It dissolves in H_2SO_4 with green color and is identical with the product obtained by allowing (b) to stand in H_2SO_4 , and, conversely, if H_2O is added to its H_2SO_4 soln., it gives (b). It is insol. in NaOH , even on addition of $\text{Na}_2\text{S}_2\text{O}_4$. S. assigns to it the *o*-quinone lactone structure $\text{O}:\text{C}_{14}\text{H}_9:\text{C}_6\text{H}_4.\text{CO.O}$.

CHAS. A. ROULLER.

Reduction products of 1- and 2-benzoylanthraquinones. ALFRED SCHAARSCHMIDT AND D. IRINGU. Berlin. *Ber.* 49, 386-96(1916); cf. *C. A.* 9, 2256.—In order to obtain further light on the deeply colored reduction products of 1-benzoylanthraquinones a general study has been made of the reduction products of the 1- and 2-Bz compds. in acid and in alk. soln. A new analysis of the blue compd. obtained in acid soln. from the 1-*p*- $\text{ClC}_6\text{H}_4\text{CO}$ deriv. (a) confirms the earlier results; attempts to split the product by heating with quinoline, KOH or 50% H_2SO_4 have thus far given no positive result, the products being non-homogeneous and showing so little tendency to cryst. that none has been isolated pure. 2-*p*-Toluylanthraquinone (b) treated in cold H_2SO_4 with the amt. of Al equiv. to 2 atoms H is practically not attacked; with the equiv. of 6 atoms H , the reduction product is for the most part sol. in alkalis with a red color which disappears on shaking with air, depositing a solid; attempts to recryst. the reduction product gave no satisfactory result, AcOH alone yielding a small amt. of a by-product, sinters 242° , m. 252° , with 82.01% C , 5.69-6.09% H ; the AcOH soln. was then boiled 1 hr. with Ac_2O and NaOAc , yielding light yellow felted needles, m. 154.5° , whose compn. (av. C 81.31%, H 5.25%) corresponds to that of a *toluylanthranyl*

acetate, $\text{C}_6\text{H}_5\text{CH}(\text{C}(\text{OAc}))\text{C}_6\text{H}_4\text{COC}_6\text{H}_4\text{Me}$. In NH_4OH with Zn dust, (a) is much more

difficultly reduced than (b); besides unchanged (a) is obtained a blue product of the same properties as that obtained in acid soln., but it is not homogeneous. (b) under these conditions yields an oily mass, evidently a mixt., insol. in alkalis and in alk. $\text{Na}_2\text{S}_2\text{O}_4$; repeated crystn. from AcOH finally yields a compd. m. $164-5^\circ$, having the compn. of *anthracyltolylcarbiny*l acetate, $\text{C}_{14}\text{H}_9(\text{MeC}_6\text{H}_4)\text{CHOAc}$ (C 84.71%, H 6.41%).

CHAS. A. ROULLER.

New heterocyclic systems. II. Pyrrolidine analogs, in which the nitrogen atom is replaced by phosphorus, arsenic or antimony. GERHARD GRÜTTNER AND ERICH KRAUSE. Charlottenburg. *Ber.* 49, 437-44(1916); cf. *C. A.* 9, 3247.—*Cyclo-tetramethylenephénylphosphine* (a), $\text{C}_6\text{H}_5\text{PPh}$, b_{16-8} $132-3^\circ$, d_4 1.0502, 1.0429, 1.0354, 1.0281, 1.0208 at 0° , 10° , 20° , 30° and 40° , n_D 1.5894 and $n_F - n_C$ 0.02163 at 22.5° , mol. wt. in freezing C_6H_6 162, is obtained in 7-8 g. yield from the Grignard reagent from 50 g. $(\text{CH}_3\text{CH}_2\text{Br})_3$ in 200 cc. Et_2O slowly treated with 25 g. PhPCl_2 in 3 vols. cold Et_2O , distd. in H under 20 mm. up to $340-50^\circ$ (bath temp.) and fractionated *in vacuo* in CO_2 up to 145° ; there remains a yellow viscous residue (see below) about equal in amt. to the phosphine. The latter is an oil of very strong characteristic phosphine odor, does not fume and oxidizes only slowly in the air at room temp., energetically reduces neutral and faintly acid (HNO_3) AgNO_3 . *Mercuric chloride compound*, $\text{C}_{10}\text{H}_{11}\text{PHgCl}_2$, from the components in C_6H_6 , strongly doubly refracting and dispersive rhombohedrons, m. $143-4^\circ$ (decompn.). Additive compds. are also obtained with CCl_4 , C_6Cl_6 , AsCl_3 , SbCl_3 , BiBr_3 , SiCl_4 , PhAsCl_2 , Ph_2AsCl , Et_3SiCl , SnBr_4 , Ph_2SnBr_2 . (a) reacts explosively with MeI at room temp., giving a non-crystallizable oil; with EtI after short warming on the H_2O bath is quant. obtained the *ethiodide*, white to pale

yellow cryst. powder from alc.-Et₂O, m. 122°; *propiodide*, microscopic tables, m. 153-4° on rapid heating, decomp. slightly below the m. p. on slow heating; *sec-propiodide*, pale yellow, apparently somewhat hygroscopic. Iso-AmI and (CH₃CH₂Br)₂ also yield yellowish oils after 2 hrs. warming. *Cyclotetramethylenephénylarsine*, in 17 g. yield from the Mg compd. from 70 g. (CH₃CH₂Br)₂ and 65 g. PhAsCl₂, b₁₅₋₆ 128.5°, mobile oil of faint, not unpleasant odor, does not markedly oxidize in the air at room temp., remains unchanged for months in the light, mol. wt. in freezing C₆H₆ 199-202, d₄ 1.2997, 1.2896, 1.2794, 1.2694, at 0°, 10°, 20° and 30°, n_D 1.6768 and n_F-n_C 0.0234 at 17° Satd. with Cl in CCl₄ it gives the *dichloride*, prisms, m. 120.5°, very hygroscopic, easily sol. in H₂O and alc. with decompn. *Mercuric chloride compound*, from the components in Et₂O, 6-sided leaflets from CHCl₃, m. 160-2°. *Methiodide*, white or very pale yellow cryst. powder from alc.-Et₂O, m. 135-6°; *ethiodide*, pale yellow cryst. powder, m. 85-6°; *propiodide*, needles from PrI, m. 123-4°; *sec-propiodide*, faintly yellowish cryst. powder, m. 113-4° (decompn.); *but-* and *isobutiodides*, oils. *Cyclotetramethylenephénylstibine*, in 15 g. yield from 50 g. (CH₃CH₂Br)₂ and 40 g. PhSbCl₂, oil of unpleasant odor rendered turbid by traces of O, b₁₀₋₁ 156-8°. *Dichloride*, doubly refracting rhombs from CCl₄, m. 150°; *diiodide*, doubly refractive needles from CCl₄, m. 149°. The high-boiling residue obtained in the prepn. of (a) is a viscous oil with the unpleasant odor of tertiary alkylarylphosphines and is permeated with solid particles; it energetically adds Br, alkyl iodides and HgCl₂, forming in the last case a cryst. product. The residues from the arsine and stibine showed similar properties. Mol. wt. detns. in C₆H₆ showed that they were substances of quite high mol. wts. C. A. ROULLER.

Addition of aliphatic nitro compounds to unsaturated compounds. E. P. KOHLER. *J. Am. Chem. Soc.* 38, 889-900(1916).—This work was undertaken for the purpose of prepg. cyclopropane derivs. with a NO₂ group combined with 1 of the ring C atoms by the following series of reactions: $\text{RCH:CHCOR}' + \text{MeNO}_2 \longrightarrow \text{RCH}(\text{CH}_2\text{NO}_2)\text{CHCOR}' + \text{Br}_2 \longrightarrow \text{RCH}(\text{CH}_2\text{NO}_2)\text{CHBrCOR}' \longrightarrow \text{RCH.CH}(\text{NO}_2)\text{CHCOR}'$.

The present paper deals only with the addition of nitroparaffins to PhCH:CHBr (a), but work now in progress shows that under proper conditions aliphatic NO₂ compds. combine quite generally with α,β-unsatd. ketones, many unsatd. esters, unsatd. nitriles and even unsatd. NO₂ compds. MeNO₂ itself does not combine with (a) either when the 2 substances are boiled alone or in ligroin, C₆H₆, alcs., etc.; if a little NHEt₃ or piperidine is added, the combination can be effected in any suitable solvent, but Na alcoholate is the most satisfactory condensing agent. A small amt. of alcoholate is sufficient to cause rapid disappearance of both ketone and NO₂ compd. but the resulting product is a mixt. of complex substances because the compd. formed from 1 mol. each of ketone and Na salt of the NO₂ compd. readily combines with more of the unsatd. ketone; it is therefore necessary to have an excess of NaCH₂NO₂ in soln. Thus, when 15 g. Na in 120 g. MeOH is added with const. shaking to 104 g. (a) and 37.5 g. MeNO₂ in 175 g. MeOH at about 40° as rapidly as possible without sepn. of solid Na compd., cooled, immediately acidified with glacial AcOH and finally cooled in a freezing mixt., there is obtained a max. yield of 92% (av. yield, 88.5%) of γ-nitro-β-phenylbutyrophene (b), needles from alc., m. 103°, does not reduce KMnO₄ in Me₂CO; semicarbazone, plates, m. 165°. (b) dissolves very sparingly in concd. aq. alkalis, more readily in alc. KOH, very easily in alcoholates; the solid sodium salt (c) may be obtained by adding Et₂O-ligroin to the concd. MeOH soln. of MeONa, MeNO₂ and (a), which gives a pale yellow cryst. ppt. containing MeOH; by satg. a cold soln. of MeONa in MeOH with (b) and allowing to evap. *in vacuo* over H₂SO₄, which again gives a product containing MeOH; or by heating (b) in C₆H₆ with the calcd. amt. of Na, which yields 90% of the Na salt as a white microcryst. powder. It dissolves readily

in cold H_2O without color and with very feebly alk. reaction, the soln. soon becoming milky and in about 1 hr. the (c) is completely hydrolyzed to NaOH and (b); the alc. solns. remain clear and colorless and on evapn. *in vacuo* deposit a cryst. Na compd. containing alc.; weak or strong acids, added to (c), or *vice versa*, quant. regenerate (b). Dry (c) slowly added to a little more than 1 equiv. of Br in cold CHCl_3 , poured into H_2O , freed from excess of Br with NaHSO_3 and from CHCl_3 *in vacuo*, yields 2 isomeric γ -bromo- γ -nitro- β -phenylbutyrophenones, sepd. by repeated crystn. from MeOH into needles, m. 90° , and thin plates or flat needles, m. 93° (a mixt. of the 2 begins to m. 70°). Both readily dissolve in NaOMe and these solns. rapidly react with Br to form the same γ , γ -dibromo compound, needles, m. $160-2^\circ$ (decompn.), more easily prepd. by dropping Br into cold solns. of (b) in NaOMe or of (a) and NaCH_2NO_2 in MeOH (yield, 80-5%); solns. in Me_2CO or alc. can be boiled a long time without appreciable change, but in the presence of an equiv. amt. of KI or KCN, 1 Br atom is replaced by H and, with excess of reducing agent, the 2nd more slowly but completely. When a concd. soln. of (b) in CHCl_3 is treated with a little Br, the reaction started by warming or adding a drop of Me_2CO , the soln. cooled and then treated with more Br until the color shows the presence of a slight excess, the product is γ -nitro- β -phenyl- α -bromobutyrophenone, needles from alc., m. 100° ; the mother liquors further yield small amts. of an isomer, thin plates from alc., m. 86° (yield of combined mono-Br derivs., 89%), and of a dibromo compound, prisms or thick needles, m. 105° (yield, 4%). Treated with slightly more than 1 equiv. KI in the least possible amt. of boiling MeOH, the mono-Br compds. give the α -iodo compound, pale yellow needles from alc., m. 123° . Heated with alcoholates, KOAc, KCN and other feebly alk. reagents, the α -Br compds. lose HBr and form a trimethylene deriv. (d), m. 93° . They cannot be further brominated but the γ -Br compd., by the same method used in prepg. the α -Br compd., gives the α , γ -dibromo compound, thin needles from alc., m. 130° ; in boiling alc. with KI it gives chiefly the α -I compd. while with Zn dust 1 of the products is (d); further bromination gives the α , γ , γ -tribromo compound, needles from CHCl_3 , m. 185° . γ -Nitro- β -phenylvalerophenone (e), from (a), NaOEt and EtNO_2 , is obtained quant. as a mixt. of stereoisomers, sepd. by repeated crystn. from Et_2O into very fine needles, m. 72° , and stout needles or plates, m. 100° ; the relative amts. of the isomers vary with the mode of acidification, strong acids and low temps. favoring the high-melting form; either form, converted into the Na salt and back into the ketone, again gives a mixt. of the 2, showing that they are the 2 racemic forms possible because the ketone contains 2 dissimilar asym. C atoms. γ -Bromo compounds, from the calcd. amt. of NaOMe allowed to stand 1 hr. with (a) and EtNO_2 in hot MeOH, cooled and treated with Br, fine needles from alc., m. 170° , and more sol. needles, m. 160° . The ketones in CHCl_3 readily react with Br but, probably owing to the number of stereoisomers formed, give no solid product, but the residue left after removing the solvent reacts with KOAc like the α -Br compds. and yields 2 solid trimethylene derivs. γ -Methyl- γ -nitro- β -phenylvalerophenone, m. 167° , is obtained in 92% yield from equiv. amts. of (a), Me_2CHNO_2 and 5 drops concd. NaOMe soln. in just enough MeOH to keep the ketone in soln. allowed to stand several weeks; it shows no tendency to form a Na salt, and while it easily dissolves in concd. alcoholates the process is accompanied by extensive decompn. and similarly Na in C_6H_6 slowly decomp. it. α -Bromo compounds, diamond-shaped plates, m. 165° , and stout prisms, m. 125° . The above facts, in combination with the observation that (a) and $\text{MeC}(\text{:NO}_2\text{Na})\text{CO}_2\text{Me}$ give a lactone, $\text{PhCH}_2\text{CH:CPh.O.CO.CMeNO}_2$, which with HCl yields a compd. identical with (e)

above, show that the addition of Na nitroparaffins to compds. containing the grouping C:C:C:O is the same as with Grignard reagents and other metallic derivs., the metal going to the O and the remainder of the mol. to the C atom in the 4-position. But,

unless the product is a tertiary NO_2 compd., it immediately rearranges into the NO_2 form.

CHAS. A. ROUILLER.

Catalyses with weak acids. IX. Rates of conversion of the stereoisomeric cinchona alkaloids into their toxines. H. C. BIDDLE. *J. Am. Chem. Soc.* 38, 901-8(1916), cf. *C. A.* 9, 2617.—It has been found (Massey, *Diss. Univ. Cal.*, unpublished) that the conversion of quinine and quinidine into quinotoxine follows the same laws as the corresponding conversion of cinchonine (*a*) and cinchonidine (*b*) into cinchotoxine (*c*), but that under like conditions the conversion rates of quinine and quinidine approach a common value. This raised the question whether the slightly different rates previously observed for (*a*) and (*b*) were real or only apparent; a reconsideration of these rates has shown that the speeds of change to a mean rotational value for the 2 alkaloids under like conditions approach identity within the limits of exptl. error, and furthermore that this mean rotational value probably represents the true rotation of the completely converted, *pure, non-racemized* (*c*). Slight variations in the rotatory value assigned to (*c*) will suffice to cause small, but appreciable, errors in the calcn. of the reaction rates; the detns. of the rotation of (*c*) by Roques (*Compt. rend.* 120, 1170 (1895)) and by B. shows that equiv. solns. of (*c*) are practically identical, irrespective of whether it is derived from (*a*) or from (*b*); they point to the apparent correctness of the hypothesis that the rotation of (*c*) should be the arithmetical mean of those of (*a*) and (*b*); and furthermore, they show that the rotation is not materially affected by considerable variations in the H ion concn. From the work of Hesse (*Ann.* 178, 262(1875)) and of R. it seemed that in the conversion of (*a*) and (*b*) into (*c*) a by-product was formed which imparted to the crude product a rotation lower than that of pure (*c*). Such a side reaction would lead to an apparent increase in the rate of conversion of (*a*) and a decrease in that of (*b*). To get a direct comparison with regard to the simultaneous conversion of the 2 alkaloids under the same conditions, equiv. mixts. of the 2 (each 0.05 *M*) in 1.7 *M* AcOH were heated at 99.4° ($\pm 0.2^\circ$) in sealed tubes exhausted to 20 mm.; the rotation in 0, 4, 6, 23, 25, 52, 111, 335 hrs. was found to be 3.21, 3.11, 3.00, 2.55, 2.55, 2.25, 1.75, 1.00° (Ventzke, for 1 dcm. at 18°), resp. There is thus a continuous fall although the conversion into (*c*) may be considered as complete before the end of 50 hrs. Assuming that the rotation of (*c*) is the arithmetical mean of those of (*a*) and (*b*), this continuous fall must be due to a secondary reaction (see below). Since in the 1st 6 hrs. the fall is only about 0.2° , the error due to this side reaction can be reduced to a minimum by studying the conversions of (*a*) and (*b*) during the early part of the reaction. This was done under exactly the same conditions as above (except that (*a*) and (*b*) were used singly instead of mixed together), and the mean values of K_1 and K_2 were found to be 0.0721 and 0.0734 for (*a*) and 0.0704 and 0.0704 for (*b*), the arithmetical mean of the initial readings of the 2 alkaloids being taken as the rotation of the corresponding (*c*) soln. Confirmatory evidence was obtained by detg. the (*c*) by extn. with Et_2O and resoln. in abs. Et_2O , in which both (*a*) and (*b*) are difficultly sol. The only reasonable explanation for the continuous fall in rotation (see above) is that the optically active compds. are slowly racemized during the protracted heating; this would account for R.'s supposed impurity, for the different rotations of (*c*) given in the literature and for the extraordinary care necessary to obtain a (*c*) of high rotation.

CHAS. A. ROUILLER.

Alkylcyanoacetic acids. JOHN C. HESSLER. *J. Am. Chem. Soc.* 38, 909-16(1916).— *α -Methyl- α -cyanopropionic acid*, obtained in 2.5 g. yield from 8.7 g. of the Et ester allowed to stand overnight in running H_2O with 9 g. KOH in 100 cc. MeOH, $b_D^{25} 132.5^\circ$, *m.* 57° ; *silver salt*; *barium salt*, prisms with 18 mols. H_2O . $\text{Et}_3\text{C}(\text{CN})\text{CO}_2\text{H}$, in 31% yield from 42.5 g. of the ester and 28 g. KOH in 300 cc. MeOH, *m.* 61° (Hesse, *Ann. Chem. J.* 18, 746(1896), gives 57°). *Salts*: *silver*, bulky ppt.; *barium*, needles; *lead*,

flat flakes; *calcium*, needles with 3 H₂O; *strontium*, prisms with 3 H₂O; *cadmium*, flat plates with 3 H₂O; *copper*, bright green rectangles with 3 H₂O. From 50 g. NCCH₂CO₂Et, in 100 cc. alc. and 10.2 g. Na in 250 cc. alc. treated with 80 g. PrI and allowed to stand overnight, is obtained 51.5 g. crude product (a), *b*₂₄ 117–30°; this is shaken in Et₂O with 10% NaOH and the alk. ext. acidified with dil. H₂SO₄ and extd. with Et₂O, giving 24.9 g. *α*-cyanovaleic acid; *silver* and *barium* salts; *ethyl ester*, from the Ag salt and EtI, *b*₇₁₈ 218–9°, *d*₂₅ 0.972. The Et₂O soln. of (a), after extn. with NaOH, yields 17.8 g. of *ethyl α-propyl-α-cyanovaleate*, *b*₂₂₋₃ 129–32°, *d*₂₅ 0.93; *free acid*, rhombic prisms, *m.* 41°, becoming syrupy over H₂SO₄ *in vacuo*; after 5 days it contained 1 mol. H₂O; *silver salt*, seps. with 1 H₂O. In the same way from 50 g. NCCH₂CO₂Et are obtained 20.5 g. *γ-methyl-α-cyanovaleic acid* (*silver salt*, powder; *barium salt*, needles with 2 H₂O; *ethyl ester*, *b*₇₁₈ 223–4°, *d*₂₅ 0.958), and 28.1 g. *ethyl γ-methyl-α-isobutyl-α-cyanovaleate*, *b*₇₁₈ 245–50°, *d*₂₅ 0.915 (*free acid*, *m.* 82°; *silver salt*, bulky ppt.). *Copper δ-methyl-α-cyanocaproate* (cf. C. A. 7, 3506), blue cryst. ppt. with 7 H₂O, turning green *in vacuo* over H₂SO₄; *barium salt*, needles with 2 H₂O; *chloride*, liquid; *anilide*, needles, *m.* 102°. *δ-Methyl-α-isoamyl-α-cyanocaproic acid*, from the ester and KOH in MeOH, needles from C₆H₆, *m.* 74–5°; *ammonium salt*, flakes, 2.9 g. of which dissolve in 100 cc. H₂O at 16°; *silver salt*, ppt.; *copper salt*, green flakes with 3 H₂O; *calcium salt*, rhomboids with 4 H₂O; *amide*, needles from alc., *m.* 152°. *Lead benzylcyanoacetate*, bulky cryst. ppt. with 3 H₂O; *calcium* and *barium* salts, needles with 3 and 6 H₂O; *copper salt*, deep blue ppt. with 5 H₂O which it loses at 65°, turning green, *m.* 105–15° (decompn.); *chloride*, slightly colored liquid, does not distil under 35 mm. at a bath temp. of 290°. (PhCH₂)₂(CN)CO₂H, *m.* 194–5° (Cassirer, *Ber.* 25, 3027(1892), gives 188–9°); *silver salt*, ppt.; *copper salt*, blue ppt. with 1 H₂O, turning green on drying. The *methyl ester*, 6-sided plates from Et₂O-ligroin, *m.* 78–9°, is obtained in 4.9 g. yield, together with 1.6 g. of the acid, when 20 g. NCCH₂CO₂Et in 125 cc. MeOH and 4.07 g. Na in 125 cc. MeOH are allowed to stand with 22 g. PhCH₂Cl 14 hrs. and the fraction *b*₁₈ 195–260° of the product is shaken in Et₂O with 10% NaOH.

CHAS. A. ROUILLER.

Velocity of esterification of organic anhydrides (GUARESCHI) 2.

II. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

FRANK P. UNDERHILL.

The Guthrie lecture. Some problems of living matter. W. B. HARDY. *Proc. Phys. Soc. London* 28, 99–118(1916).—The lecture deals with the phys. aspect of some of the phenomena of living matter. In drawing conclusions the possible effect of instinct or intelligence of the object experimented upon must be considered. Thus in expts. detg. the time lag of increased respiration of a cyclist it was found that the subject always anticipated the application of the load and the acceleration of his breathing commenced before the actual increase in effort instead of after. Many of the long accepted theories of the structure of living organisms were ultimately found to be due to the method of killing the organism and prepg. for examn. Exactly similar structures could be obtained in pieces of gelatin if treated in the same way. The principles underlying growth and development of organisms are outlined, and it is shown that growth depends on the presence in the food of vitamins. Thus in the case of white mice fed on artificial milk containing no vitamins growth ceased, while if 2% of ordinary milk were added to the artificial milk the growth rapidly became normal.

In pure distd. water it was impossible to obtain development of living organisms, but if the slightest trace of tap water were added certain organisms thrive normally. The fact that such small proportions of nutriment containing vitamins are sufficient suggests a parallel between their action and that of a few crystals thrown into a supersaturated soln. of a salt in initiating crystn. of the whole. Many other phenomena are described.

PAUL D. FOOTE.

Origin of the proteolytic ferments of the blood. LEROY H. SLOAN. Univ. Chicago. *Am. J. Physiol.* 39, 9-19(1915).—Polyvalent proteolytic enzymes occur in normal serum of males (dog and human) capable of producing demonstrable amts. of dialyzable digestion products after 40 to 44 hrs. incubation with human placenta. Under pathological conditions (especially wasting disease) these enzymes may be augmented to such an extent as to give a positive reaction within the time specified for the Abderhalden test for pregnancy. Serum from pregnant women and pregnant dogs reacted with dog pancreas and liver as well as with placental tissue, giving dialyzable digestion products within 16 to 20 hours. The increased proteolytic activity of serum during pregnancy is probably in the main due to an increase in the normal polyvalent enzymes rather than to the production of a specific ferment. At present the Abderhalden test for pregnancy is a quantitative, not a qualitative test.

J. F. LYMAN.

Ionic antagonism in sensory stimulation. W. J. CROZIER. Harvard Univ. *Am. J. Physiol.* 39, 297-302(1916).—An antagonistic action of ions is apparent in stimulating the foot of a pithed frog with mixts. of salt solns. C. concludes that in normal stimulation the essential step includes the penetration of the surface layer of the receptor by the stimulant.

J. F. LYMAN.

Mode of action of ultraviolet radiation in injuring living cells, with special reference to those constituting the eye. W. E. BURGE. Univ. Illinois. *Am. J. Physiol.* 39, 335-44(1916).—The effect of ultraviolet radiation on paramecia and egg white is to cause coagulation. The effective region of the spectrum lies between 254 and 302 $\mu\mu$. The eyes of frogs and fish living in tap water were not noticeably injured by 5 to 12 hrs. exposure to ultraviolet radiation, while the eyes of those animals living in solns. containing CaCl_2 , Na_2SiO_3 , or dextrose were made opaque by similar exposure. Abnormal amts. of the salts of Ca and Na_2SiO_3 in the cells of the eyelids and of the cornea increase the effectiveness of ultraviolet radiation in producing eye trouble. Abnormal amts. of Ca salts on the skin also increase the effectiveness of the short wave lengths in sunlight in producing sunburn.

J. F. LYMAN.

Coagulation of blood in the pleural cavity. G. P. DENNY AND G. R. MINOT. Johns Hopkins Med. School. *Am. J. Physiol.* 39, 455-8(1916).—"Blood which has been in the pleural cavity remains fluid not because of any alteration of the elements, but because of previous coagulation and defibrination."

J. F. LYMAN.

Nature of enzyme action. IV. Action of insoluble enzymes. W. M. BAYLESS. Univ. College, London. *J. Physiol.* 50, 85-94(1915); cf. C. A. 7, 3764.—Enzyme action takes place at the interface of contact between the solid enzyme phase and the liquid substrate phase; the catalysts concerned are not in true soln. Supporting evidence was obtained by showing that urease, lipase, emulsin, invertase, lactase, papain, peroxidase and catalase were active in media (usually 70 to 80% alc.) from which they could be filtered off by ordinary filter paper while the filtrates were inactive.

J. F. LYMAN.

Reaction of bile. S. OKADA. Univ. Coll., London. *J. Physiol.* 50, 114-8(1915).—The H ion concn. of gall bladder bile from the dog, ox, cat and sheep varies between 4.7×10^{-8} and 3.4×10^{-8} and may therefore be acid, neutral or alk. In fasting acidity is higher than after feeding. Dog bile collected from the liver during fasting had a

H ion concn. of from 3.9×10^{-8} to 7.2×10^{-9} ; during digestion the H ion concn. was between 2.9×10^{-8} and 1.0×10^{-8} , hence alk. to about the same extent as pancreatic and intestinal juices. Various kinds of foods had no perceptible effect on acidity of liver bile.

J. F. LYMAN.

Effect of isotonic Ringer solution on blood corpuscles. F. H. SCOTT. Univ. Coll. London and Univ. Minn. *J. Physiol.* 50, 128-39(1915).—On diluting blood with isotonic Ringer soln. the compn. but not the vol. of the red corpuscles is changed. Analyses of the dil. sera show that N compds. diffuse from the corpuscles. These consist largely of a protein having pptn. limits similar to the albumins, but partly of non-protein N. The relative vol. of serum and corpuscles cannot be calcd. by comparing the N in the plasma or serum with that found in similar blood diluted definitely with salt solns.

J. F. LYMAN.

Inflammatory action of eel blood and bile on the eye. OBLATH. *Arch. ophthalmol.* 21, 457(1914); *Zentr. Biochem. Biophys.* 18, 347(1915).—Pronounced inflammation of the conjunctiva was produced by penetration of eel blood and gall into the eye. Eel gall caused slight conjunctivitis in rabbits. Eel gall has a hemolytic action which is, however, less than that of eel serum.

H. S. PAINE.

Action of enzymes. E. S. EDIE. *Brit. Med. J.* 1914, 2803; *Zentr. Biochem. Biophys.* 18, 343(1915).—E. proceeded on the hypothesis that pepsin and trypsin unite with protein through a junction by the same side chain, but that the sp. side chains of the digestive enzymes are distinguished by their behavior toward acid and alkali. Upon this assumption pepsin would be expected to combine with albumin in alk. soln., while trypsin would combine in acid soln.; in this case neither of the enzymes would have a digestive action on albumin. Pepsin would behave as the zymoid of trypsin. An excess of pepsin would inhibit the action of trypsin on albumin and an excess of trypsin would inhibit the digestion of albumin by pepsin in acid soln. The results of the expts. are considered to have confirmed this assumption. When pepsin was mixed with an excess of trypsin the action of the former on protein in acid soln. was inhibited. Boiled trypsin inhibited the action of fresh trypsin on fibrin but not its action on caseinogen. It appears, therefore, that trypsin combines with fibrin by side chains which are more resistant to heat than are those by means of which trypsin unites with caseinogen. An excess of pepsin inhibited the action of trypsin on proteins; boiled pepsin no longer had this action.

H. S. PAINE.

Enzyme action. Corrections. K. GEORGE FALK AND KANEMATSU SUGIURA. *J. Am. Chem. Soc.* 38, 921-2(1916).—In the course of the study of lipolytic actions, some of the results of which have been published, the N contents of certain solid preps. were detd. by Kober's aeration method which has since been shown to be unreliable (*C. A.* 10, 1201). These have now been detd. by the heat distn. method. The esterase preps. E II from castor beans (*C. A.* 9, 634) gave 16.2% N for the dried material, whether dialyzed 5 or 20 hrs., and 17.0% N for the ash-free material, instead of 15.7 and 16.3%. The lipase preps. L I gave 16.8% N for the dried material and 17.9% N (instead of 17.0%) for moisture- and ash-free material. The corresponding values for L II are 17.1 and 17.9% (instead of 16.7%), and for L II reprecipitated from NaCl 18.2 and 18.4% (instead of 17.6%). The lipase prep. from soy beans (*C. A.* 9, 1922) gave 15.5% for the dry material instead of 14.0%. The corrected values approximate more nearly the analyses of similar substances described by Osborne and others.

C. A. R.

Nitrogenous constituents of brain lecithin. J. E. DARRAH AND C. G. MACARTHUR. *J. Am. Chem. Soc.* 38, 922-30(1916).—Fresh, finely ground sheep and beef brains were allowed to stand 2 days in Me_2CO , pressed out, the Me_2CO treatment repeated at least

twice more, the dehydrated material dried in a current of air, shaken twice 2-4 hrs with 2 vols. C_6H_6 (some of the extns. were made at 65°), the C_6H_6 evapd. almost to dryness under reduced pressure in CO_2 and the residue dissolved in the smallest possible amt. of Et_2O ; addition of 2.5 vols. $EtOH$ pptd. cephalin; the filtrate was evapd. almost to dryness under reduced pressure in CO_2 , the residue dissolved in a little Et_2O and treated with 2 vols. Me_2CO , which pptd. lecithin and some "white material;" after drying in darkened vacuum desiccators, the ppt. was allowed to stand overnight in Et_2O , when the "white material" sepd. out. The $EtOH$ and Et_2O treatments had generally to be repeated to remove remaining cephalin and "white material." The lecithins so obtained were hydrolyzed by boiling 15-20 hrs. in CO_2 with 3% HCl or 1.6-5.0% aq. KOH . The presence of $NH_2CH_2CH_2OH$ was demonstrated by means of the chloraurate and picrolonate which were found identical with the corresponding compds. prepd. from the synthetic alc. Choline was isolated as the chloroplatinate. In both beef and sheep brain, the choline N is about equal in amt. to that of the $NH_2CH_2CH_2OH$, the 2 comprising 85% of the total N in the lecithin; the other 15% is in the form of unhydrolyzable residue. If lecithin is a single substance (and it probably is not or is much more complex than is usually believed), it probably contains 1 mol. each of the above bases; this associated lecithin mol. is rather firmly combined with a satd. nitrogenous substance which it has as yet been impossible to remove.

C. A. ROULLER.

B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

An improvement of the phenolphthalin reaction for the demonstration of occult blood in feces. J. BOAS. *Deut. med. Wochschr.* 41, 549-50(1915).—The phenolphthalin reagent is prepd. by dissolving 25 g. KOH in 100 cc. distd. H_2O , to which is added 1 g. phenolphthalin (Kahlbaum). This soln. is not entirely colorless. It is heated with addition of metallic Zn until it is colorless. This is accomplished in 1-2 hours. After cooling the soln. is brought to the original vol. and filtered. This soln. keeps several weeks. The feces are extd. with alcohol-glacial acetic acid, adding 5 drops glacial acetic acid to 15-20 g. alc. To 15 drops of the phenolphthalin reagent in a test-tube are added 5-6 drops 3% H_2O_2 and 2 cc. absolute alc. and the mixt. shaken. The feces ext. is slowly run in along the side of the test-tube from the filter in order to obtain stratification. If blood is present in the feces sooner or later a pink to deep red ring is formed. Not more than 2-3 cc. acetic acid-alcohol ext. are needed. The test performed in this manner is very sensitive, but only for the examn. of feces. In order to be applied to the examn. of stomach contents it is necessary to ext. these with a mixt. of glacial acetic acid and ether. Good results are obtained with a glacial acetic acid-alcohol ext. of stomach contents tested with guaiac tincture.

S. AMBERG.

Examination of lumbar puncture fluid in cases of tuberculous meningitis by means of the ninhydrin reaction. E. NOBEL. *Münch. med. Wochschr.* 62, 1786 (1915).—In answer to the remarks of Kafka, N. defends the ninhydrin reaction of the cerebrospinal fluid in cases of tuberculous meningitis. When properly carried out, it is of differential diagnostic value.

S. AMBERG.

Estimates of cholesterol in serum by gravimetric and colorimetric methods. P. G. WYSON. State Hosp., Penn. *J. Med. Res.* 29, 457-64(1913); cf. C. A. 6, 1643.—Colorimetric and gravimetric detns. were made of pure cholesterol, impure cholesterol extd. from serum and impure cholesterol extd. from serum plus a known quantity of pure cholesterol. Known quantities of pure cholesterol subjected to the same process as that employed in the extn. of cholesterol from serum yielded 99.44% according to the colorimetric estimates and 108.56% by wt. Serum to which 1 mg. of pure cholesterol had been added to each cc. yielded an excess of 1 mg. per cc., according to the

colorimetric method and an excess of 1.3835 mg. by wt. In the 17 expts. in which a known quantity of cholesterol was estd. by both methods, the results obtained by colorimetric estn. were uniformly more accurate than the results obtained by wt.

GEO. T. CALDWELL.

Detection and determination of lead in the organism. FAUCONNIER. *Bull. soc. pharm. Bordeaux*, July, 1914; *Ann. chim. anal.*, 20, 126-7(1915); *J. Soc. Chem. Ind.* 34, 1032(1915).—F. proposes the following method: Treat 100 g. (from 20 to 200 g. may be used) of the substance by the $\text{HNO}_3\text{-H}_2\text{SO}_4$ method modified by Denigès, letting it stand 24 hrs. with a mixt. of 90 cc. H_2SO_4 and 10 cc. HNO_3 . Heat until completely decolorized. After cooling the remaining 20 cc. of soln., add 50 cc. H_2O , and neutralize with NH_3 . Dissolve the reddish ppt. in HCl , and pass in washed H_2S . After 24 hrs. filter, wash until the filtrate gives no color with KCNS and treat the filter and ppt. with dil. HNO_3 ; then evap. to dryness, take up in a little H_2O , filter through glass wool and wash until the filtrate has a vol. of 90 cc. Add 3 cc. satd. KCNS , ext. in a separatory funnel with successive portions of ether until the red color is removed and drive out ether by heating on a H_2O bath. Cool and make up to 100 cc. Det. the Pb colorimetrically with Na_2S and KCN soln. F. found in a normal liver weighing 1250 g., 0.0062 g. Pb.; in a brain of 1160 g., 0.0024 g.; kidney of 115 g., 0.00026 g.; placenta of 420 g., 0.000388 g.; in an artichoke of 215 g., 0.0029 g. P. M. GIESY.

Comparative study of aeration and heat distillation in the Kjeldahl method for the determination of nitrogen. K. GEORGE FALK AND KANEMATSU SUGIURA. *J. Am. Chem. Soc.* 38, 916-21(1916).—In the aeration expts., carried out strictly under the conditions stated by Kober to be the most satisfactory (*C. A.* 7, 3981), not only were the results obtained compared with the calcd. values for pure substances wherever possible and with those obtained by heat distn., but every soln. which had been aerated was then submitted to heat distn. With casein, meningitis, tetanus and streptococcus antitoxin preps., castor bean globulin, hexamethylenetetramine, uric acid, glycylglycine, alanylglycine, tyrosine, glycine, alanine and urea, only in the case of the tetanus antitoxin prep. and of the tyrosine were the results obtained by aeration satisfactory, the % of N being increased 0.10-0.27 by subsequent heat distn. For the other substances the results by the aeration method were 0.30-1.97% low; subsequent steam distn. brought them up to values agreeing satisfactorily with those obtained by heat distn. alone. With different proteins, the aeration method alone gave results 0.40-1.50% lower than those obtained by heat distn. The following mixts. were then made up, each with approx. 0.1 g. $(\text{NH}_4)_2\text{SO}_4$, dild. to 175 cc. and containing: (1) varying amts. of NaOH , d. 1.444; (2) 20 cc. concd. H_2SO_4 , 10 g. K_2SO_4 , 0.2 g. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ and varying amts. of NaOH , d. 1.444 and 1.470; (3) 10 g. K_2SO_4 , 0.2 g. $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$, 75 cc. NaOH , d. 1.461, and 10-20 cc. H_2SO_4 . In (1) distn. by the aeration method was incomplete with less than 55 cc. NaOH , in (2) incomplete with 75 cc. NaOH of either concn., and in (3) complete in all cases. C. A. ROUILLER.

Detection of picric acid in urine in presence or absence of biliary pigments. VILLEDIEU AND MANCREAU. *Arch. de méd. et pharm. milit.* 64, 255(1915); *J. pharm. chim.* 12, 366(1915).—To 100 cc. urine add 20 cc. of a satd. soln. of BaCl_2 , shake well and filter. Dissolve the Ba picrate on the filter with 10-15 cc. of boiling H_2O and wash out. To the filtrate add excess of H_2SO_4 (about 5 cc.). After sepg. the ppt., shake out picric acid with 2×20 cc. Et_2O , evap. and take up residue with 2 cc. of boiling H_2O , filter and identify picric acid in the yellow soln. by 3 tests: (1) Mix on watch glass 2 drops of the liquid with 2 drops of 10% soln. of HCl -cocaine and observe silky crystals of cocaine picrate under microscope. (2) To 10 drops of soln. add 2-3 drops of alk. soln. of KCN ; warming produces dark red color. (3) Dil. 10 drops of the soln. with H_2O ,

strains that are easily and rapidly agglutinated by means of immune sera are likewise easily and rapidly pptd. by H^+ , probably of a concn. 3.6×10^{-4} . The H^+ test may sometimes aid in the detn. of *B. typhosus*. However, it can never be a certain test. It cannot be used as a practical method of pptg. *B. typhosus* from contaminated H_2O . It indicates a possible source of error in performing an agglutination test with typhoid bacilli.

JULIAN H. LEWIS.

Enzymes of a cellulose-destroying fungus from the soil, *Penicillium pinophilum*. E. D. CLARKE AND F. M. SCALES. U. S. Dept. Agric., Washington, D. C. *Proc. Soc. Biol. Chem.* 1915; *J. Biol. Chem.* 24, xxxi(1916).—From fungous mats on the surfaces of nutrient solns., "acetondauer" preps. were made from *Penicillium pinophilum*. A modified neutral Raulin soln. was used as a nutrient medium, to which acid-washed filter paper was added as a source of C. This cellulose was attacked in 2 to 3 weeks of growth. Aq. exts. of powdered fungous material showed especially active enzymes like sucrase, emulsin and amidase, while diastase, catalase and lipase were present but not as active. Tests for peptic, tryptic and ereptic enzymes, and also peroxidase, gave negative results but it is not likely that such enzymes would be absent in the living fungus which certainly attacks protein, etc. Most of the enzymes found were studied by quant. methods. The most active prepn. was made from a growth for 3 weeks on inorg. nutrient soln. containing $(NH_4)_2SO_4$ and cellulose as sources of N and C.

A. P. LOTHEROP.

Investigation of the restrictive action of poisons on microorganisms. V. Action of "Hg-chlorphenol," sublimate, antinonin, mycantin and formaldehyde on wood fungi, *Aspergillus niger* and bacteria. C. WEHMER. Hanover. *Chem. Ztg.* 40, 89-91, 106-8(1916).—The object of the work was a better comparison of the action of so-called fungus poisons, and to find the concn. necessary to prevent the development of spores on sterile aromatic gelatin. The fungi used were *Merulius lacrymans*, *Polyporus vaporarius*, *Coniophora cerebella* and *Trametes radiciperda* in pure cultures. *Aspergillus niger* was used as a substitute for mold fungus. The bacteria were not in pure culture. Methods are described and the results tabulated. The conclusions for the conditions of these expts. are that *Merulius*, *Coniophora*, *Trametes* and *Polyporus* were most affected by antinonin, mycantin, raco, and microsol (all containing nitro compds.); of these fungi, *Trametes* was most affected by the other reagents. With *Aspergillus* the Hg compds. were nearly twice as effective as the nitro compds., $HCHO$ closely following the former. Bacteria and yeasts were also much more affected by Hg compds. Cf. C. A. 8, 726, 1336, 1808.

J. H. MOORE.

Biological studies of the intestinal flora of infants. KURT BLÜHDORN. Göttingen *Monatsschr. Kinderheilk.* 13, 297-350(1915); *Zentr. Biochem. Biophys.* 18, 168(1915).—B. studied the influence of albumin and N on carbohydrate fermentation by bacteria, the process of fermentation in the presence of various mixts. of bacteria in varying dilns. of milk was first studied. Bacteria decompd. only a definite amt. of sugar in a given time; the amt. of added sugar was without influence on acid formation. The N content was, however, of determinative influence; bacterial growth also increased with the acid content in the case of increasing amts. of albumin. B. employed various sources of N such as asparagine, nutrose, peptone, plasmon and $(NH_4)_2SO_4$; these sources of N increased the production of acid in varying degree when they were employed in amts. of equiv. N content. Peptone was more effective than plasma and nutrose in producing acid. Urea caused no increase in acid production and a decrease was sometimes observed even when considerable bacterial growth was evident. A comparative expt. with human and cow milks showed that a relatively high degree of acidity was produced by the former. The expts. showed in general that decompn. of sugar increased

with the amt. of N which was available. In a 2nd series of expts. B. studied the fermentation of various carbohydrates. Maltose and lactose were more readily attacked by the intestinal flora of nurlings than was sucrose. Malt ext. produced greater acidity than maltose; this difference is ascribed to the N content of the malt ext. B. tested the influence of various acids on bacterial flora. Lactic acid had the greatest inhibiting action in smaller concns., while AcOH and butyric acid had only a slight action in this respect. The inhibiting action of acids was diminished by addition of peptone. Succinic acid and H_2PO_4 had the slightest inhibiting effect. B. further discusses the pathogenesis of intestinal affections of nurlings.

H. S. PAINE.

Intensification of natural decomposition after death. F. BORDAS AND S. BRUERE. *Bull. Acad. Med.* 75, No. 1(1916); *J. Am. Med. Assoc.* 66, 694.—Decompn. of corpses can be much hastened by lining the grave or ditch with straw to preserve the heat from the microbial fermentation processes. The straw should be well watered with cultures of bacteria that decompose urea. Admission of a little air promotes the decompn.

L. W. RIGGS.

Importance of *Bacterium bulgaricus* group in ensilage. O. W. HUNTER AND L. D. BUSHNELL. *Kansas State Agr. Coll. Science* 43, 318-20(1916).—Several hundred bacteriologic analyses of different kinds of ensilage at all stages of fermentation indicate the importance of this Bulgarian group in the ripening of normal ensilage. Plate cultures upon acidulated glucose agar produced colonies similar in many respects to the common *B. lactis acidii* colonies. This is probably one reason why *B. bulgaricus* has been overlooked by other investigators. A good growth is observed in 1-4 days in glucose broth inoculated directly from a colony, while a litmus milk culture from a similar origin is coagulated only after 2-14 days' incubation. Peptone added to the milk favors their growth, coagulation and acid production being much more prompt. A table is given showing the rate and amt. of acidity developed in plain and in 1% peptone milk; also a chart showing the Bulgarian type to be more than 90% of the total bacteria present.

L. W. RIGGS.

Diastase activity and invertase activity of bacteria. G. P. KOCH. *Soil Science* 1, 179-96(1916).—Enzymes detd. as diastases and invertase are secreted by bacteria in culture solns. in amt. sufficient to be detd. quantitatively. There is considerable variation in the activity of enzymes secreted by bacteria when they are developed in culture solns. of different compn. There seems to be no direct correlation between hydrolytic enzyme secretion and protein decompn. by bacteria. Enzyme activity of different species of bacteria varies greatly. There is no direct correlation between hydrolytic enzyme secretion and the property of the soln. to rotate the plane of polarized light, the % of reducing compds. present, the formation of acid and the number of organisms. Bacteria do not produce a surplus of reducing compds. in the soln.

J. J. SKINNER.

D. BOTANY.

CARL L. ALSBERG.

Recent investigations on the protoplasm of plant cells and its colloidal properties. F. CZAPPEK. *Ann. Missouri Bot. Gard.* 2, 241-52(1915).—Reviewing critically earlier and recent contributions, C. holds that living protoplasm must be considered as a colloidal emulsion of lipoids in hydrocolloidal media, the latter contg. proteins and mineral salts.

E. J. C.

The role and function of mineral salts in plant life. D. M. RABINOVITCH. *Inst. Bot. Univ. Geneva* [11] 8, 24 pp.(1914); through *Expt. Sta. Record* 34, 135.—R. reports a study on the assimilation of nutritive mineral materials by *Raphanus sativus*, also on the influence of $CaCO_3$ and $MgCO_3$ on the development of *Digitalis purpurea*.

The results with *R. sativus*, as shown by analysis after stated periods, are presented in tabular and graphical form. The tests with *D. purpurea* show increasingly injurious results corresponding to an increase of CaCO_3 or of a mixt. in equal proportions of this salt with MgCO_3 , but the increase of injury was much less marked when dolomite was substituted for the mixt. The toxic effect seems to be correlated with the degree of alkalinity.

E. J. C.

Albuminous crystalloids in potato leaves. HELENA HUBERT. *Oesterr. Bot. Z.* 64, 273-7(1914); through *Expt. Sta. Record* 33, 824.—The formation of albuminous crystalloids is plentiful in young leaves of potato plants grown from tubers in darkness and moisture, but much less so in plants grown in light. The crystalloids diminish rapidly in etiolated plants after these are exposed to light. The crystalloids, which appear only in the leaves, are abundant in the intumescences on the leaf surfaces, also in the interior portions of the leaf, when grown under glass, but they disappear with the shrinking of the intumescences.

E. J. C.

Lipase in the germinating coconut. M. L. ROXAS. *Philippine Agr. and Forestry* 3, 33-9(1914); through *Expt. Sta. Record* 33, 426.—The results are given of a study in which R. found that lipase was present both as an enzyme and a zymogen in germinating coconuts. It occurs mainly in the outer part of the haustorium, smaller amts. being found in the water of the coconut and in the inner surface of the endosperm.

E. J. C.

The action of antimoniacal salts on the respiration of plants. W. PALLADI AND G. COHNSTAMM. *Rev. gen. botan.* 25, 539-55(1914); *Expt. Sta. Record* 33, 30.—The authors found that the respiration of etiolated shoot tips of vetch is stimulated by 1% of Sb tartrate, as by other poisons (C. A. 4, 3082), presumably as a defensive reaction against the poison, while the respiration of germinating peas is decreased by that soln. The difference is ascribed to the deficiency of respiratory chromogens in peas, and the consequent lessened absorption of O by them. The normal coeff. of respiration is but little affected in seeds of peas and shoots of vetch by this poison, but in young rootlets of sprouting peas, which normally show the coeff. $\text{CO}_2:\text{O}_2 = 1:2$, the coeff. becomes $\text{CO}_2:\text{O}_2 = 1$, corresponding to a decrease in growth rate. The action of this salt decreases the respiration of dead cells. Seeds poisoned with Sb after freezing give off a decreased amt. of CO_2 .

E. J. C.

Anthocyan in plants. V. GRAFE. *Umschau* 18, 643-6(1914); *Expt. Sta. Record* 33, 824.—This is a discussion of contributions by several authors mentioned regarding the presence, compn., and significance of anthocyanins in plant cells.

E. J. C.

The rate of absorption of various phenolic solutions by seeds of *Hordeum vulgare* and the factors governing the rate of diffusion of aqueous solutions across semi-permeable membranes. A. J. BROWN AND F. TINKER. *Proc. Roy. Soc. London (B)* 89, 119-35(1915).—When dry barley seeds are immersed in solns. of most inorg. acids and salts, sugars, etc., water alone passes into the seed. With certain phenols, fatty acids, and monohydric alcohols, solvent and solute enter the seed together. This property of selective permeability makes the seed valuable in the study of some of the phenomena of osmosis. The following substances were chosen because: (a) the membrane of the barley seed is permeable to them all; (b) some of their physical properties are strikingly diverse while others are practically identical; (c) they have a negligible ionization. The rate of absorption of 0.5 N solns. at 19° was greatest in the case of phenol, and decreased in the order: resorcinol, quinol, pyrogallol, the last being identical with pure water. For solns. of absorption were increased, but < 0.5 N the rate decreases with the concentration of the first order. The rate of absorption was unchanged.

differences in the viscosities, vapor pressures, and osmotic pressures of the solns. were too small to account for the great differences in the rates of absorption, while the surface tension varied widely. The conclusion from the comparison of these phys. properties was that when the osmotic pressures, vapor pressures, and viscosities of a series of permeating solutes were equal, their rates of diffusion across the barley membrane were inversely proportional to their surface tensions. In terms of the Laplace theory of capillarity this implies that the solute mols. have diminished the mutual attraction of the solvent mols. The solvent mols. will, therefore, diffuse more readily over the surface of the barley membrane. These considerations must be confined to solns. of solutes which permeate the membrane, and not extended to osmotic phenomena as a whole, as I. Traube has attempted to do.

H. W. BANKS, 3D.

New Observations on beet and potato tyrosinase. M. GONNERMANN. Rostock. *Chem. Ztg.* 40, 127-8(1916).—Expts. with sheep, chicken, guinea pig and human blood showed that potato tyrosinase is a simple compd. It acts as an oxidase on FeSO₄ and pyrocatechol more vigorously than the beet tyrosinase and has the property of agglutinating blood corpuscles. The beet tyrosinase is combined with a hemolyzing saponin.

J. H. MOORE.

Influence of temperature and light on coloration by anthocyanin. L. v. PORTHEIM. Vienna. *Ans. Akad. Wiss. Wien, Math.-Naturwiss. Klasse* 15, 327-9(1914); *Zentr. Biochem. Biophys.* 18, 307(1915).—Expts. which were performed with numerous plants (seedlings of red cabbage and blossoms of the elder, rose, iris, corn flower, violet, etc.) showed in general that the most intense colorations appeared at the lower temps. Temps. of 15° and up either caused more or less pronounced decolorization or the appearance of a reddish tint. Boiling of pigment exts. of a given plant in distd. H₂O caused the appearance of colors of different intensity and *nuances* than were produced by boiling in 75% alc. The color intensity of the alc. exts. diminished with decrease in temp. and increased with rising temp. Color changes which appeared on diln. of aq. exts. indicated that there is a connection between the concn. and the color of the solns. Aq. and alc. exts. which had been exposed to light exhibited colorations of a more bluish tint than did those which had been kept in the dark; the latter showed more pronounced reddish tints. This modification appeared to be quite as reversible as were those changes which depended upon variation in temp.

H. S. PAINE.

Behavior of tannin in the assimilation organs of Leguminosae during development. A. KOLBE. Göttingen. *Inaug. Diss. Göttingen* 1914, 97 pp.; *Zentr. Biochem. Biophys.* 18, 303(1915).—Certain regularities were observed in the appearance and behavior of tannin in the assimilation organs of Leguminosae. Little or no tannin was detected in the earliest stages in the extremely numerous exptl. objects which were examd. Increase in the amt. of tannin was observed at the beginning of the period of extension of the assimilation organs and even in the 1st stages thereof. The amt. of tannin then decreased; the period at which the max. tannin content was reached was subject to slight variations. Other factors, such as illumination, nutrition and period of the yr. also influenced the formation of tannin; these factors did not, however, modify the general rule that the behavior of tannin is dependent on the stage of development of the assimilation organ in question.

H. S. PAINE.

Fixation of photographs in leaves. H. MOLISCH. Vienna. *Sitzb. Akad. Wiss. Wien, Abt. I* 123, 923-30(1914); *Zentr. Biochem. Biophys.* 18, 304-5(1915).—M. fastened sharply defined negatives of various photographs on the leaves of *Tropaeolum majus* and exposed the plants to direct sunlight for 1 day; in the evening the leaves were subjected to the Sachs I test. Under these conditions the positive of the image appeared upon the leaf. The image was so sharply defined

that individuals could be readily recognized in the case of photographs of persons; it was possible to preserve the photographs. This expt. proves that the formation of starch varies in the most sensitive manner with the intensity of light. M. did not attempt the further expt. of using the leaf as a photographic plate in the camera and producing a negative directly in the leaf. H. S. PAINE.

Anthocyanic substances. O. GERTZ. Lund. *Svensk Bot. Tidskr.* 8, 405-35(1914); *Zentr. Biochem. Biophys.* 18, 306-7(1915).—G. studied numerous plants containing anthocyanin (*Asolla caroliniana*, *Tradescantia discolor*, *Clivia nobilis*, *Fagus sylvatica*, *Pelargonium zonale*, *Cobaea scandens*, etc.) belonging to the most varied divisions of the plant kingdom. Anthocyanin was usually found to be present in soln. in the cell-fluid; it frequently occurs, however, in solid form, e. g., in amorphous bodies of varied shape or crystallized in single crystals as raphides, dendrites and trichites. Sepn. in solid form occurs through supersatn. of the cell-fluid as a result of increased pigment formation, decreased H₂O content (e. g., in pronounced transpiration) or the action of low temps. In addition to substances which consisted exclusively of anthocyanin G. observed others (e. g., proteins and tannins) which were only colored with the pigment. G. succeeded in artificially producing anthocyanic substances by cell plasmolysis.

H. S. PAINE.

Fluorine in the vegetable kingdom. A. GAUTIER AND P. CLAUSMANN. *Compt. rend.* 162, 105-12(1916); cf. *C. A.* 6, 2727, 2900; 7, 2782, 3518; 8, 1451, 2911; 9, 829, 1361.—The authors' object was to det. all plants contained F, whether the F was more abundant in certain parts or organs than in others, the quant. relations of P to F, and the relation of different orders to the F content. In 63 analyses, mostly of food plants, F was found in every case, the amt. ranging from 0.059 to 13.87 mg. in 100 g. of the dried material, the av. being 2.65 mg. F is most abundant in the leaves. Large or small amts. do not seem to be characteristic of any particular order. The skins of the apple and banana contain more than 10 times as much F as the pulp. P was detd. in 36 of the samples and ranged from 8.7 to 1237 mg. in 100 g. of the dried material. A large P content was generally associated with a large F content. The ratio of P to F is more variable in plant than in animal tissues. L. W. RIGGS.

Preliminary notes on the carbohydrates of the Musci. T. G. MASON. *Sci. Proc. Roy. Dublin Soc.* 15, 13-28(1916).—Alc. solns. of 3 varieties of Musci (*Polytrichum commune*, *Thuidium tamariscinum*, and *Sphagnum cymbifolium*) showed the presence of invertase in each case, while the first showed maltase and diastase also. The mosses were boiled in alc. for 10 min. to destroy enzymes and then extd. for 24 hrs. with alc. after first adding CaCO₃ to neutralize the acids present. The residue was then subjected to extn. for 24 hrs. with H₂O, the exts. united and the alc. distd. off. The soln. was then treated with basic Pb acetate and alumina cream, the gums and tannins filtered off and the filtrate (Pb removed with Na₂CO₃) concd. and made up to the required vol., after which the soln. was examd. qual. and quant. The concn. of the soln. browned the levulose present so the sugars were detd. by Benedict's Na-citrate method (cf. *C. A.* 5, 2256). The amts. of sugars for *P. commune* were found to be: 2.17% hexoses (dextrose and levulose), 1.36% sucrose and 1.36% maltose. Plants kept for some time in the dark showed a great decrease (to 0.59%) in the amt. of sucrose and a slight decrease in amts. of hexoses and of maltose. It was shown that sucrose is the first sugar to increase on illumination. It is probable that the hexoses are the chief form in which carbohydrates descend the stem. R. I. SIBLEY.

The exchange of ions between the roots of *Lupinus albus* and culture solutions containing two nutrient salts. R. H. TRUE AND H. H. BARTLETT. *Am. J. Botany* 2, 311-23(1915).—In growing *Lupinus albus* in culture solns. in which the nitrates of Ca, Mg

and K are used in pairs the roots absorb more electrolytes than from the pure solns. The absorption tends to increase in mixts. as well as in pure solns. as the salt content increases. In mixtures of $\text{Ca}(\text{NO}_3)_2$ and KNO_3 the inimical effect of K ions on root absorption is seen in the high ratio of Ca to K required to give max. absorption. The value of a small amt. of K ion is, however, proved by the excess of absorption in the mixt. over that in $\text{Ca}(\text{NO}_3)_2$ alone. The abs. amt. of Ca present in mixts. seems to have great influence since, as the proportion of Ca increases in the greater diln., absorption is increased. In pure solns. the Mg ion is much more favorable to absorption than the K ion in the weaker concns., while the K ion is more favorable in the highest concn. They are absorbed to about the same content at a concn. of $360 \times 10^{-6} N$. Absorption from mixts. exceeds that from either pure soln. except in the weakest concn. See C. A. 9, 2396. J. J. SKINNER.

Some relations of plants to distilled water and certain dilute toxic solutions. M. C. MERRILL. *Ann. Missouri Bot. Gardens* 2, 456-500(1915).—This is a detailed account of work previously briefly presented (C. A. 9, 2103). An historical review is given of the views held in regard to the cause of injury to plants in distd. H_2O . Working with *Pisum sativum* and *Vicia faba* it was found that renewing distd. H_2O of the cultures every 4 days was beneficial. The plants were able to survive longer in renewed than in unrenewed H_2O . Sterilizing the H_2O by boiling every 4 days exercised a beneficial effect upon growth in that medium as compared with growth of those in unsterilized distd. H_2O . The greatest exosmosis was obtained in the case of those cultures in which the distd. H_2O was renewed. There was a readsorption of electrolytes in the cultures when the distd. H_2O was not renewed. J. J. SKINNER.

Electrolytic determination of exosmosis from the roots of plants subjected to the action of various agents. M. C. MERRILL. *Ann. Missouri Bot. Gardens* 2, 507-72 (1915).—A review is given of the subject of excretion from plant roots, exosmosis from living cells, and of excretion from leaves and other tissue. Pea seedlings grew better in distd. H_2O in which exosmosis from the treated plants of the 1st crop had occurred than in fresh distd. H_2O . Peas and beans did not grow as well in H_2O in which pea seedlings had already grown for 21 days as in freshly distd. H_2O . Long exposure of the plants to anesthetic vapors causes marked exosmosis. The exosmosis curves for various org. compounds were found. Marked excretion was produced. The effect of single salts, salts in pairs, and salts plus anesthetics in soln. were ascertained as regards exosmosis produced upon the plants in such solns. Antagonistic relations in the sense that one substance decreased the exosmotic effect produced by another substance were found not to hold. Cf. C. A. 9, 2103. J. J. SKINNER.

Toxicity of galactose for certain higher plants. L. KNUDSON. *Ann. Missouri Bot. Gardens* 2, 659-66(1915).—Working with a nutrient culture soln., galactose proved harmful to vetch (*Vicia villosa*) and peas (*Pisum sativum*) but the other sugars, glucose, lactose, raffinose, sucrose and maltose were beneficial when used in concn. of 2%. Galactose was harmful when used in concn. of 1% and more; below 1% it had no effect. J. J. SKINNER.

Fixation of ammonia by cell albumin. T. BOKORNY. *Biol. Centr.* 35, 25-30 (1915); *Expt. Sta. Record* 34, 30.—B. states that his previous conclusions (C. A. 7, 628) have been confirmed. This supports the view that tobacco smoke causes injury to plants largely through its content of NH_3 , which belongs to that class of compds. which are injurious to living protoplasm when present in very small proportions on account of their ready combination with the albuminous components of the cell. E. J. C.

E. NUTRITION.

PHILIP B. HAWK.

NORMAL.

Vitamines and accessory foods. BORUTTAU. *Ber. pharm. Ges.* 25, 468-86(1915).—An address (cf. *C. A.* 10, 490). W. O. E.

Soy bean in infant feeding. J. F. SINCLAIR. Phila. *N. Y. State J. Med.* 16, No. 2(1916); *J. Am. Med. Assoc.* 66, 841.—The experience of S. leads him to recommend soy beans as food in the treatment of summer diarrhea, various intestinal disturbances, and in marasmus. L. W. RIGGS.

Citrated whole milk method in feeding infants. E. PRITCHARD. *Practitioner* 96, No. 2(1916); *J. Am. Med. Assoc.* 66, 774.—P. regards this method as physiologically unsound, since it allows no latitude for adaptation to the individual's digestive, assimilative, metabolic and secretory activities. If the principles of percentage feeding are understood, a satisfactory food can be synthesized in many ways to satisfy the physiologic requirements of any particular child. Dried milk if properly modified and of good quality has all of the advantages and few of the disadvantages of citrated whole milk. L. W. RIGGS.

Undiluted citrated milk in feeding of infants. R. CARTER. *Practitioner* 96, No. 2(1916); *J. Am. Med. Assoc.* 66, 774.—C. gives undild. sterilized milk in amt. equal to 0.1 of the body wt., insists on clock-like regularity of feeding, and makes the intervals between feeding as long as possible. One grain of $\text{Na}_2\text{C}_2\text{H}_3\text{O}_7$ per ounce of milk is used instead of the generally accepted 2 grains. The milk is sterilized by receiving it in a clean jug, placing the jug in a vessel of water and allowing the water to boil 5 min. L. W. RIGGS.

Effects of commercial glucose when fed to white rats. A. J. CARLSON, L. HEKTOEN AND E. R. LECOUNT. *J. Am. Chem. Soc.* 38, 930-6(1916).—White rats were fed for a period of six months with bread containing a certain amt. of glucose, besides carrots or other vegetables and occasionally meat, while one set of controls was given bread containing cane sugar and another set bread with no sugar. The % increase in body wt. for the 3 sets was 122, 131.8, 123.5, resp.; for some reason, the number of young born in the 1st group was larger than that in the other 2; this probably accounts for slightly lower rate of growth in the former. As the rats were given as much food as they would eat and this was probably more than the minimum required for growth and maintenance, the expts. do not show to what extent the glucose is absorbed and oxidized but in the absence of definite expts. to the contrary it is justifiable to conclude that the greater part of the dextrins and the dextrose in com. glucose are utilized in the carbohydrate metabolism of the body. As to the question of deleterious by-products and contaminations, however, the above expts. seem conclusive. In the 3 groups there was practically no difference in the rate of growth, resistance to infection and in the production of antibody against sheep corpuscles. Postmortem examn. revealed no lesion that could be traced to the diet in any group, although the quantity of glucose consumed per day, covering a period of about $\frac{1}{4}$ the total span of life of the rat, was 2.5-3.5 g. per kg. body wt. The question of palatability does not enter in the use of glucose in bakery products and confections. CHAS. A. ROUILLER.

Resorption of hydrolytic products of proteins by the intestine. I. Investigations of the surviving small intestine perfused with Tyrode solution. TULLIO GAYDA. Turin. *Arch. fisiol.* 13, 83-115(1914); *Zentr. Biochem. Biophys.* 18, 167(1915).—When a mixt. of amino acids obtained from complete hydrolysis of meat was injected into a surviving small intestine (of the cat) which was perfused with Tyrode soln. the liquid which flowed from the mesenteric vein and thoracic duct had a considerably higher

content of total N and amino N than was observed when H₂O alone was injected into the intestine. The liquid which issued from the thoracic duct, moreover, showed traces of proteins (especially when amino acids were injected into the intestine); in no case did the outflowing liquid contain NH₃. The ratio of amino N to absorbed total N was less than the ratio of amino N to the total N of the injected amino acid mixt. This result is due either to selective action in the absorption of the various amino acids or nitrogenous substances which are present in the injected soln. or to the formation of peculiar complexes from the absorbed amino acids (but not, however, to synthesis of proteins). Only a relatively small amt. of the injected amino acids passed unchanged from the intestine into the perfusing nutrient fluid.

H. S. PAINE.

ABNORMAL.

Dietetic treatment of beriberi in the Dutch East Indies. D. J. H. POL. *Norsk Mag. Laegevidenskaben* 77, No. 1(1916); *J. Am. Med. Assoc.* 66, 698.—Large amts. of purée of peas had an unmistakably curative action on beriberi. As much as 150 g. of the purée 3 times a day was required, smaller amts. showing no benefit. Oatmeal had a similar influence, but 125 g. 3 times a day was necessary. Europeans required a little less. A native bean seems also to have a like action. These 3 vegetables evidently contain the substance or substances the lack of which induces the disease. They lose their efficiency with age. Three-year-old beans were quite inert. Details are tabulated of 83 cases covering 33 pages.

L. W. RIGGS.

Nutritive yeast (SCHOTTELIUS) 12.

STILES, P. G.: *Nutritional Physiology*. 2nd ed. Philadelphia: W. B. Saunders Co. 288 pp. \$1.25.

F. PHYSIOLOGY.

ANDREW HUNTER.

The significance of the amount of low molecular glycerides of fatty acids in milk fat of various animals. E. GUTZERR. *Kühn Arch.* 5, 127-38(1914); *Expt. Sta. Record* 33, 803.—The Reichert-Meissl no. of human milk was found to be 2.03. This is in agreement with the findings of Laves (2.5) and Pizi (1.42), but not with Sauvaitre (15.8). The R.-M. no. of the fat in cow, sheep and goat milk is 2 or 2.5 times greater than that of the fat in ass and mare milk, and in the latter the R.-M. no. is 6 times as great as in human milk. Pig and dog milk contain still less of these volatile fatty acids. Accordingly, it is concluded that herbivorous animals require milk with fat which contains a high water-sol. volatile fatty acid content and the omnivorous and carnivorous animals a milk fat with a low one.

E. J. C.

Leucocytosis by modifications of the blood gases and the suprarenals. MARIO CROVINI. Milan. *Arch. farm. sper.* 19, 448-66(1915).—Extirpation of the suprarenal capsules suppresses the leucocyte reaction to CO₂, both quantitatively and qualitatively. The reaction can then be restored by intravenous injection of adrenaline.

A. W. DOX.

The action of sugars on biliary secretion. D. LO MONACO. Univ. Rome. *Arch. farm. sper.* 21, 49-76(1916).—Ingested carbohydrates are without influence on biliary secretion for the reason that they are transformed into glycogen before they can exert a stimulating effect upon the hepatic cell. On the other hand, their injection into the circulation may result in an increased flow of bile. Small doses dilate the blood vessels and stimulate the hepatic cell, while large doses produce exactly the opposite effects.

A. W. DOX.

Nature of muscle recovery. J. PARNAS. Strasburg. *Zentr. Physiol.* 30, 1-18 (1915).—The cause of heat formation is the same as in respiration and the heat forma-

tion in resting muscle is const., while in previously tired muscle it rises at first and then falls to rest value. The abs. quantity of heat production in untired muscle is as great as the thermal equiv. of O consumption, while in the tired muscle it is about one-half as great as the heat equiv. of the combustion of its lactic acid. The O consumption of the tired muscle equals the complete oxidation of its lactic acid to CO_2 and H_2O . Muscle on recovery only sets free as heat about one-half of the energy its oxidative processes liberate. The other half of the energy is used to restore the physico-chem. condition of the tissue, in which it is stored as potential energy. This is, according to Hill, convertible to mechanical energy in full amt. The gastrocnemius of frog stores about 2 cal. per g. of tissue.

F. HULTON.

The influence of the vagus nerve on glycogen formation in the liver and a new method for investigation of the metabolism of the liver in its dependence on the nervous system. M. EROG. Bern. *Zentr. Physiol.* 30, 445-9(1915).—The under-surface of the shell was removed from a turtle and canulas inserted in the right and left umbilical veins. The liver is in 2 parts, connected by bridges of tissue 1 mm. thick. These were cut between ligatures with a hot knife, and the seared edges formed an impermeable crust; this practically gave 2 livers. The vein from the duodenum to the liver was bound off and a canula inserted in the middle vessel from the *bulbus arteriosus*. The right vagus was dissected out and laid on an electrode, while the left vagus was dissected out up to the liver, all visible branches destroyed and the whole region brushed with concd. PhOH to destroy all connections between the 2 vagi. A 1.5% dextrose soln. was perfused through both halves at const. pressure. The vagus was stimulated intermittently and finally a piece of liver was removed from each half. These were boiled 3 hrs. with hot 60% KOH soln. Glycogen was detd. according to Pflüger-Bertrand. There was an increase of glycogen in the stimulated half of 10-14%. E. expects to investigate purine and fat metabolism with this technic.

F. HULTON.

The time of appearance of adrenaline in the suprarenal capsules of the fetus. G. CAVOLORRO. *Atti r. ist. Veneto* 73, II, 1159-61.—The suprarenal capsules of ox, sheep, pig, and human fetuses were extd. with 5 times their wt. of Ringer soln. The presence of adrenaline was tested biologically on the isolated mammalian heart, which is just as sensitive as the frog eye, or strips of arteries, uterus, or intestine, the minimal quantity thus detected being 1:40,000,000. The results showed that adrenaline is formed before the middle of pregnancy. The earliest time of appearance of the hormone was not detd.

D. I. MACHT.

Presence of glycogen in the normal and pathological tissues of the human eye. CONTINO. *La clin. oculist.* 14, 1729(1914); *Zentr. Biochem. Biophys.* 18, 332(1915).—The nature of the distribution of glycogen in the eye of the sheep embryo indicates that its presence in ocular tissues is necessary in order that the differentiation which is characteristic of its later development may be acquired.

H. S. PAINE.

Occurrence of lactic acid in the saliva of infants. G. SALVETTI. Turin. *Riv. clin. pediatr.* 12, 418-24; *Zentr. Biochem. Biophys.* 18, 166(1915).—S. tested the correctness of the observations of Oshima regarding the occurrence of lactic acid in the oral cavity of infants. Freshly secreted saliva collected by means of an app. especially designed for the purpose was used for the expts. The occurrence of lactic acid in saliva appears to be exceptional, inasmuch as it was detected in only 2 out of 30 samples.

H. S. PAINE.

Histology of the uterus mucosa and the occurrence of fatty substances. S. ASCHHEIM. Berlin. *Z. Geburtshilk.* 77, 485-93(1915); *Zentr. Biochem. Biophys.* 18, 333(1915).—The occurrence of large amts. of lipoids in the uterus mucosa is principally

associated with the premenstrual period; the lipoids disappear from the epithelia with menstruation. A. discusses the various views regarding the significance of lipoids in the uterus mucosa.

H. S. PAINE.

Malignant dog struma and the secretory activity of the thyroid. OTTO EWALD. Heidelberg. *Z. Krebsforsch.* 15, 85(1915); *Zentr. Biochem. Biophys.* 18, 162(1915).—The colloid which is found in the lymphatic vessels, etc., of the thyroid is not a true secretion of the latter, but is a decompn. product which is not capable of utilization by the organism.

H. S. PAINE.

Relation between suprarenal secretion and vasomotor function of the splanchnic nerve. E. GLEY AND A. QUINQUAND. *Compt. rend.* 162, 86-8(1916); cf. *C. A.* 7, 3518.—The results of expts. upon dog, cat, and rabbit, with and without ligation of the suprarenal veins, are illustrated by 6 tracings. Contrary to the generally accepted idea, the excitation of the splanchnic vasomotor nerve appears to bring into play only a neuromuscular action, and does not produce its effect by the intermediation of a humoral substance (adrenaline).

L. W. RIGGS.

Function of the thyroid-parathyroid apparatus. E. C. KENDALL. Rochester, Minn. *J. Am. Med. Assoc.* 66, 811-3(1916); cf. *C. A.* 9, 1625, 2673.—According to clinical observations in thyroid disturbances the effects are due to a change in the rate of normal function. The stimulating effect of increased thyroid activity is not felt in any particular set of organs or tissues alone, but is active throughout the body. The stimulating action is intracellular. The method of sepn. and purification of the thyroid constituent containing 60% of I suggests that the I is linked through an amino group, and that purification is effected by the entrance of CO_2 into the compd. in place of the amino group. Instead of diiododihydroxyindole proposed in a previous paper, the more recent work points to a structure represented by H_2CO_2 in which one atom of H is replaced by diiodoindole. It seems probable that the production of $(\text{NH}_4)_2\text{CO}_3$ is responsible for the tetany following parathyroidectomy, and that the function of the parathyroid is to convert $(\text{NH}_4)_2\text{CO}_3$ to urea; while the function of the thyroid is to furnish a catalyzer which regulates the rate of deamination. Further elaboration of this hypothesis will not be attempted until after a quant. study of the factors involved.

L. W. RIGGS.

Effect of chloroform on the factors of coagulation. G. R. MINOT. *Am. J. Physiol.* 39, 131-8(1915).— CHCl_3 added to oxalated blood plasma often causes clotting, due apparently to the destruction of antithrombin by the CHCl_3 , allowing the thrombin present to act on the fibrinogen. Antithrombin could not be recovered from CHCl_3 exts. of plasma or serum. Prothrombin is not converted to thrombin by CHCl_3 .

J. F. LYMAN.

Direct evidence of duodenal regurgitation and its influence upon the chemistry and function of the normal human stomach. W. H. SPENCER, G. P. MEYER, M. E. REHFUSS AND P. B. HAWK. Jefferson Med. Coll. *Am. J. Physiol.* 39, 459-79(1916).—The presence of trypsin and bile in the stomach proves that regurgitation from the intestine occurs. Free HCl does not seem to be necessary for the opening of the pylorus. Regurgitation has for its purpose the defense of the small intestine against irritants.

J. F. LYMAN.

Influence of pancreatic extracts on the production of lactic acid in surviving muscles. G. WINFIELD AND F. G. HOPKINS. *Proc. Physiol. Soc.; J. Physiol.* 50, v(1915).—Pancreas ext. added to autolyzing muscle had an inhibiting action on the formation of lactic acid. The responsible factor is stable toward heat. Commercial preps. of pancreatin even when very old contained the factor. Cf. *C. A.* 9, 2927.

J. F. LYMAN.

G. PATHOLOGY.

H. GIDEON WELLS.

Complement fixation in varicella. J. A. KOLMER. Phila. *J. Immunology* 1, 51-8(1916).—An antibody in the nature of an amboceptor is present in the sera of persons suffering with varicella. This antibody will absorb complement in the presence of an antigen prepared from the cutaneous lesions of this disease. The percentage of positive reactions is small as is also the degree of complement absorption. While immunity principles are in all probability present in the body fluids of persons for years after an attack of varicella, these could not be detected by the complement-fixation tests in this study. All positive reactions were observed during or soon after an attack of the disease and at the time of probable highest concn. of antibodies.

GEO. T. CALDWELL.

Complement fixation in vaccinia and variola. J. A. KOLMER. Philadelphia. *J. Immunology* 1, 59-81(1916).—The sera of rabbits inoculated with cowpox virus yielded positive complement-fixation reactions with salt soln. antigens of cowpox and smallpox viruses in 7 or 8 days after vaccination. The antibody of cowpox virus in the sera of vaccinated animals showed a distinct and close biological relationship to the antigen of variola in complement-fixation expts. Of 13 persons vaccinated with cowpox virus from 7 days to 10 years previously and whose sera yielded negative Wassermann reactions, positive reactions with salt soln. antigens of cowpox virus were observed with 4 or 22%. The serum of one of these 4 persons also reacted positively with a salt soln. antigen of variolous material. The sera of unvaccinated persons reacted negatively with all antigens. Of 17 persons suffering with mild smallpox, the sera of 9 or 60% yielded positive complement-fixation reactions with salt soln. antigens of variolous and cowpox viruses. While the degree of complement absorption was relatively weak in all instances, the reactions were generally stronger with the variolous antigens than with the cowpox antigens. Alcoholic exts. of variolous and cowpox viruses possessed little or no antigenic sensitiveness. These complement-fixation reactions demonstrate the close biological relationship between the antibodies of variola and vaccinia.

GEO. T. CALDWELL.

The fate of various antibodies in the precipitin reaction. F. P. GAY AND RUTH L. STONE. Univ. Calif. *J. Immunology* 1, 83-104(1916).—Previous work has shown that at least certain antibodies can be brought down in the course of a specific precipitin reaction. The method of bringing down antitoxins with the precipitate has been effective in those instances in which the antitoxic serum served as the precipitinogen in the reaction. The authors attempted to reverse the process by producing both antitoxins and precipitins to the diphtheria bacillus in rabbits and horses. The results were negative owing to the fact that precipitins were not produced in these animals. Bacteriolysins and hemolysins when associated either with the precipitinogen serum or with the precipitin serum are not brought down in the formation of the precipitate. Similar negative results were obtained with artificial bacterial agglutinins and hemagglutinins. Expts. on the fate of the fixation antibodies in the precipitin reaction have shown, in general, that when the precipitate is produced by adding serum to its anti-serum the fixation complex is present in the precipitate, but this is not invariable. When bacterial ext. is added to an immune serum the fixation complex seems usually present in the supernatant fluid.

GEO. T. CALDWELL.

Kidney lesions in chronic anaphylaxis. T. H. BOUGHNON. Univ. Ill. Med. School, Chicago. *J. Immunology* 1, 105-16(1916).—Repeated anaphylactic shocks, induced in guinea pigs by injections of egg-white or beef-serum, are able to produce lesions of the kidney that are not produced by acute anaphylaxis nor by the repeated injection

of these proteins in refractory animals. These lesions consist principally of necrosis of tubular epithelium, proliferation of glomerular capillary endothelium and swelling and degeneration of the intima and media of small vessels. Small diffusely scattered areas of round cell infiltration were observed in nearly all cases. The lesions in this series are subacute rather than chronic.

GEO. T. CALDWELL.

Immunity in tuberculosis. G. B. WEBB. Colorado Springs. *J. Lab. Clin. Med.* 1, 414-28(1916).—A review.

GEO. T. CALDWELL.

Tissue cellular protein poisons. J. G. CUMMING. Berkeley, Calif., AND J. S. CHAMBERS, Ann Arbor. *J. Lab. Clin. Med.* 1, 428-38(1916).—Toxic protein fractions can be prepd. from tissue cells of the exsanguinated organs of multicellular animals. These poisons are not only toxic for heterologous species but also for homologous species. The min. lethal doses (for the guinea pig and the rabbit) of the protein poisons here reported are in proportion to the relative body wts. when given by intraperitoneal injection; when given intravenously they are proportionately 25 times more toxic for the guinea pig than for the rabbit. Tissue cellular protein poisons hasten the clotting of blood from the guinea pig, rabbit and dog *in vivo*. The protein poison prepd. from casein differs from these in that it either retards or prevents entirely the clotting of dog blood. Witte peptone does not prevent the clotting of rabbit blood *in vitro*.

GEO. T. CALDWELL.

Studies in anaphylaxis. R. WEIL. Cornell Med. School, N. Y. *J. Med. Res.* 30, 299-364(1914); cf. *C. A.* 8, 740; 9, 1638. VII. **The relation between antibody content and lethal dose in anaphylaxis.**—When guinea pigs are passively sensitized by means of different amts. of heterologous (rabbit) immune serum, the minimal fatal dose of antigen (horse serum) given intravenously is in an inverse relation to the amt. of the previous sensitizing dose. When the uteri of guinea pigs are compared by Dale's method, it is found that the larger the sensitizing dose of immune serum the smaller is the amt. of antigen required to produce a muscular contraction. The conclusion is drawn that the minimal anaphylactic dose is in an inverse ratio to the degree of sensitization of the guinea pig. In general, the relative amt. of the minimal anaphylactic dose permits of an inference as to the amt. of antibody possessed by the guinea pig. VIII. **The function of circulating antibody and the avidity of cellular antibody.** Circulating antibody protects a sensitized animal to a certain extent from the anaphylactic effect of an intravenous injection of antigen. The degree of protection is not quant. proportional to the amt. of antibody in the circulation but is considerably less than this. The uterine prepn., which is taken to exemplify the condition of all the cells of the body, may be desensitized by the intravenous injection of antigen, whereas the circulating antibody of the same guinea pig remains unsatd., as is evidenced by the fact that the blood effectively sensitizes a normal guinea pig. The conclusion is drawn that the avidity of cellular antibody for antigen is considerably greater than that of circulating antibody. If sensitized guinea pigs are previously given large amts. of antibody intravenously their cells are not desensitized by an amt. of antigen, given subcutaneously, which suffices completely to desensitize the control animals. At the same time their circulating antibodies are satd. to such an extent as to preclude the possibility of passively sensitizing normal guinea pigs with their blood. Circulating antibody protects fixed antibody from antigen, when the latter is introduced by a route permitting of slow absorption. It seems evident that in the usual process of disease this mode of protection must be in some degree effective. IX. **The relation between partial desensitization and the minimal lethal dose in anaphylaxis.** An isolated uterus which has been partially desensitized by the addition of small amts. of antigen fails to respond except upon the administration of very large amts. of antigen. The same condition holds true of the living animal. A guinea pig which has been par-

tially desensitized by the injection of antigen can be killed only by the use of much larger quantities than are required for the unaltered sensitized control animals. The increased dose of antigen necessary to elicit an anaphylactic response is due to an altered condition of the antibody. It is suggested that the presence of antigen depresses the reactivity of the antibody in the cells, necessitating the use of much larger amts. in order to produce a response. Complete desensitization is shown to depend upon the same general process, with the difference that the reactivity of the antibody is entirely abolished by the great excess of antigen. X. The persistence of intracellular antigen as a factor in immunity. When a guinea pig is sensitized by the intraperitoneal injection of a large amt. of the serum of a rabbit immunized against horse serum it becomes possible by Dale's method to det. the persistence of sensitization to horse serum over a period of 15 days. The degree of sensitization gradually diminishes. At the same time there is a gradual development of sensitization toward rabbit serum. Coincidentally, the presence of circulating antibodies towards rabbit serum is demonstrated in the serum by using it passively to sensitize normal guinea pigs. These data are interpreted to indicate that both antigen (rabbit serum) and antibody thereto, coexist for some time in the cells of a guinea pig immunized by large doses of a foreign serum; and that the blood at the same time contains free antibodies. The suggestion is made that the persistence of antigen in the cell is a factor which contributes materially to the resistance of animals sensitized to massive doses of antigen. XI. The share of intracellular antigen in immunity and in desensitization. This section is devoted to a theoretical consideration of the data presented in the preceding sections of this article. XIV. The relation between precipitin and sensitizin. *J. Immunology* 1, 1-18(1916).—The term "anaphylactic antibody" has been replaced here by the word "sensitizin." No distinctions are at present known between the substance responsible for active and that for passive sensitization, so that both are covered by this term. Ppts. produced by a combination of horse serum and of the serum of a rabbit immunized against horse serum induce passive sensitization toward horse serum when injected intraperitoneally into a guinea pig. The same results hold for ppts. produced by cryst. egg albumen and the serum of a rabbit immunized thereto. Marked relative excess or deficiency of either factor in this reaction produces a ppt. which fails to sensitize passively. The sensitizing antibody is not merely adsorbed or carried down mechanically with the ppt. The precipitin is identical with the sensitizin. If an immune serum is heated at 70° for 1½ hr., it loses its pptg. power, while its sensitizing value is but slightly impaired. The admixt. of antigen in excess inhibits pptn. but affects sensitization in much slighter degree. The Na₂CO₃ ext. after heating sensitizes but has no pptg. effect upon antigen. High diln. of the antibody may markedly delay the precipitin reaction while not affecting passive sensitization. The data show that various agencies and conditions which inhibit pptn. may impair sensitization to only a moderate or very slight degree. XV. Equilibrium in precipitation reactions. Equilibrium in combination. *Ibid* 1, 19-34.—When horse serum is mixed in proper proportions with the serum of a rabbit immunized thereto, and the resulting ppt. is removed by centrifugalization, the supernatant fluid is found to contain both antigen and antibody. The same results are obtained with raw egg albumen and the serum of a rabbit immunized thereto. When purified cryst. egg albumen is used as antigen, the results are entirely different. If this antigen is mixed in graded proportions with the serum of a rabbit immunized thereto, and the resulting ppts. are removed by centrifugalization, the supernatant fluid never contains both antigen and antibody. Either one is present alone. It is shown by absorption expts., using cryst. egg albumen, raw egg albumen and their respective antisera as factors, that raw egg albumen contains more than one antigen and that the antiserum thereto correspondingly contains more

than one antibody. It has not been found possible to induce cross-pptn. by mixing the sera of different rabbits immunized against cryst. egg albumen. This succeeds when raw egg albumen is the antigen. Antigen and pptg. antibody do not coexist in the same fluid without undergoing union and pptn. The theory that they do so coexist is based on the use of a mixed antigenic substance such as horse serum, which actually contains numerous antigenic substances. XVI. Equilibrium in precipitation reactions. Dissociation. *Ibid* 1, 35-46.—Ppts. contain both antigen and antibody as shown by the fact that they sensitize both actively and passively. If ppts. are treated with salt soln. in the incubator, the exts. are found to contain a small amt. of antigen but no antibody. If ppts. are extd. with solns. of Na_2CO_3 , antigen is readily demonstrable in the exts. Precipitin cannot be demonstrated but antibody is demonstrable in large amts. by the method of passive sensitization. Extn. with trypsin and with leucocytes yields both precipitin and precipitinogen. While extn. of ppts. yields both components, the procedure may deprive the antibody of its pptg. function. To what factor this change is to be ascribed cannot be positively stated. It is possible that the antigen and the antibody in the ext. are not actually dissociated but are in soln. in combined form. XVII. The coexistence of antigen and antibody in the body. *Ibid* 1, 47-9.—It has been shown that antigen and antibody may coexist in the same fluid in the test-tube in reactive form. It is known that fixed antibody may attack fresh antigen. It is, therefore, quite in accordance with observations on immune reactions in the test-tube to maintain that antigen and antibody may coexist in the blood and in the cells of the living animal and that, even in combination with antigen, the antibody is still capable of reacting with fresh antigen.

GEO. T. CALDWELL.

Hemolysin production by the streptococci. H. W. LYALL. Brooklyn. *J. Med. Res.* 30, 515-32 (1914).—The production of a potent hemolysin in broth cultures is dependent on the nature and proportions of enriching substances, the reaction of the medium and the time of incubation. The hemolytic titer does not afford any absolute criterion of virulence. The hemolysin appears to be closely associated with the bacterial bodies and not to be in soln. It is destroyed by a temp. of 56° for 30 min. It disappears within 48 hrs. at incubator temp. Normal sera of sheep, guinea pig, rabbit, cow and man contain appreciable amts. of antistreptolysin. Salvarsanized sera possess a markedly increased inhibitory power toward the hemolytic action of streptococci. Dextrose inhibits hemolysin production.

GEO. T. CALDWELL.

Influence of febrile conditions on inoculation agglutinins. H. L. TIDY. Brit. Hosp., Netley. *Lancet* 1916, I, 241-2.—After the fifth day of marked pyrexia a positive agglutination reaction to *B. typhosus* is a proof of typhoid fever as reliable for inoculated as for uninoculated persons. The inoculation agglutinins are diminished or entirely removed by febrile conditions. It is possible that they are converted into agglutinoids. In certain cases they may return but usually do not do so. Immunity conferred by inoculation may be affected at the same time as the inoculation agglutinins.

GEO. T. CALDWELL.

Fat intoxication. O. WELTMANN. *Wiener klin. Wochschr.* 27, 971 (1914); *Expt. Sta. Record* 33, 69.—Continued exptl. feeding of fats produced hemolysis and the presence of a lipid-like substance in the blood. As this did not occur with the incorporation of fatty acids, such as from 1 to 2 g. of oleic acid, it is concluded that the mechan. digestion of fats in the intestinal tract produces hemolytically active end products which under certain conditions, such as injury to the intestinal membrane, may pass into the blood.

E. J. C.

Investigation of the specificity of serum reactions after the introduction of different groups into proteins. K. LANDSTEINER AND H. LAMPL. Vienna. *Zentr. Physiol.* 30,

329-30(1915).—The authors produced, by the use of antigens formed by the action of mono-, di- and tri-chloroacetyl, valeryl, anisyl and cinnamoyl chlorides on protein, immune sera that were specific; specificity was more pronounced in some cases than in others. They also immunized with compds. of horse serum and diazo derivs. of aniline, sulfanilic acid, *p*-aminobenzoic acid and atoxyl. The types of immunity were distinct and gave specific precipitin reactions.
F. HULTON.

Renal tests with lactose. W. WECHSELMANN. Berlin. *Berl. klin. Wochschr.* 53, 84-5(1916).—Since Selager introduced the intravenous injection of lactose as a test of the kidney efficiency, it has been tried by a large number of people, most of whom found it objectionable because of the violent reaction which follows its use. Such symptoms as chills, fever, and vomiting ensued. W. finds that this is the result of the lactose being infected. If the sugar is made absolutely sterile all after-reactions are eliminated. Such a sterile prepn. can be bought on the market in ampoules containing 2 g. each. The contents of an ampoule are mixed with 20 cc. of freshly distd. H₂O and injected intravenously.
JULIAN H. LEWIS.

The natural resistance of the pigeon to the pneumococcus. PRESTON KYGA. Univ. Chicago. *J. Infect. Dis.* 18, 277-92(1916).—In the pigeon, a species insusceptible to the pneumococcus, the infecting organisms are rapidly withdrawn from the general blood stream and localized in the liver and the spleen. In both these organs the ultimate localization of the pneumococcus is within a type of fixed phagocyte (the hemophage) common to both organs, and having for its normal function the destruction of red corpuscles. This phagocytic destruction of the pneumococci by hemaphages is so extensive and so rapid as actually to constitute an important, if not indeed the determining, factor in the establishment of this instance of natural immunity.
JULIAN H. LEWIS.

Supposed acid intoxication of diabetic comas. E. P. POULTON. *Proc. Physiol. Soc.; J. Physiol.* 50, 1(1915).—H⁺ ion concn. in 8 cases of diabetes mellitus, detd. by the oxyhemoglobin dissociation curve of the blood, is not sufficient to account for diabetic coma; hence acid intoxication should not be applied to explain the pathology of the condition.
J. F. LYMAN.

Experimental production of hemolytic splenopathies and myelopathies by means of specific antisera. A. BONOME. *Atti r. ist. Veneto* 73, II, 195-259(1913).—An anatomical-pathological study. Intravenous injections of hemolytic sera in dogs and rabbits produce changes in hemo-lymphoid organs, liver and kidneys, comparable to the lesions in hemolytic spleno-myelopathies in man.
D. I. MACHT.

Lymphocytosis and injury to the eye. FRANK AND HECK. *Arch. Ophth.* 89, No. 3(1915); *Zentr. Biochem. Biophys.* 18, 349(1915).—Lymphocytosis, which ensues in a relatively large number of long-standing cases of injury to the eye, is not considered as an anaphylactic manifestation on the part of the blood.
H. S. PAINE.

Origin of long-sightedness and senile cataract. F. SCHANZ. Dresden. *Arch. Ophth.* 89, No. 3(1915); *Zentr. Biochem. Biophys.* 18, 330(1915).—S. emphasizes the significance of light in causing a modification of the structure of the proteins (transformation of readily sol. into more difficultly sol. proteins). He discusses his own earlier work and that of Chaluppecky.
H. S. PAINE.

Anaphylaxis and the eye. M. ZADE. Frankfurt a/M. *Arch. Ophth.* 89, 459(1915); *Zentr. Biochem. Biophys.* 18, 349(1915).—Anaphylactic cornea expts. with guinea pigs showed that these animals may be rendered anaphylactic by intracorneal sensitization and intraperitoneal re-injection. Single intracorneal injection of horse serum produced more or less pronounced corneitis; secondary corneitis was also observed, while in many cases the eye was free from irritation on the day following the

injection. Egg white (1:3 and 1:10) was tolerated in the cornea of the guinea pig without irritation. Local re-injection after intracorneal sensitization did not produce anaphylaxis. Subcutaneous sensitization and ocular re-injection with egg white did not cause local reaction; secondary corneitis was sometimes observed when pure horse serum and toxin-antitoxin mixt. were employed. This was a severe, diffuse, parenchymatous corneitis with formation of new blood vessels which cleared almost completely after several weeks; it was probably of anaphylactic nature. A poison (artificial "anaphylatoxin") with severe tissue-imparting action toward the rabbit cornea was prepd. by digestion of active guinea-pig serum with starch. H. S. PAINE.

Cholesterol sclerosis. A. V. KNACK. Mannheim and Hamburg-Barmbeck. *Arch. Path. Anat.* 220, 36(1915); *Zentr. Biochem. Biophys.* 18, 164(1915).—The human suprarenal cortex shows gradual degenerative changes in atherosclerotic affection (histological analogy to sclerosis due to feeding) which are apparently dependent on the content of fatty substances, this content being unusually high in atherosclerosis. The cells of the *zona fasciculata* show the greatest change. Such degeneration processes are also existent in non-atherosclerotic, especially toxic-infectious, affections, but are likewise dependent on the presence of fatty substances. A more pronounced degree of sclerosis of the aorta was observed with rabbits in the case of egg and milk feeding than in the case of exclusive cholesterol feeding. Modification of the suprarenals in the case of increased introduction of cholesterol is explained by coincident impairment of the cortex cells so that these are no longer capable of eliminating the fatty substances; cortex cells are destroyed and are replaced by an accumulation of cholesterol. H. S. PAINE.

Mechanism of rabic immunization. II, III. CLAUDIO FERMI. Univ. Sassari. *Centr. Bakt. Parasitenk., Abt. I Orig.* 76, 349-55(1915); *Zentr. Biochem. Biophys.* 18, 348(1915). II. Immunizing power of rabic saliva and salivary glands, i. e., rabic virus isolated from nerve substance.—The rabic virus of the salivary gland has no immunizing power. III. Immunizing power of the rabic nerve substance of animals (chickens, ducks) the normal nerve substance of which is free from immunizing power.—The nucleoprotein of the entire cerebral substance of normal animals has lyssicidal power; this is not true, however, of the nucleoprotein of the white and gray substance taken separately. The nucleoprotein of the yolk and testicles has no lyssicidal action. H. S. PAINE.

Abderhalden reaction. PARODI AND VIDONI. Genoa. *Sperimentale* 68, 427-40; *Zentr. Biochem. Biophys.* 18, 190(1915).—P. and V. tested the sera of patients suffering from mental affections with respect to placenta and thyroid. Varying results were obtained with the sera of non-pregnant individuals, even when the Abderhalden technic was rigorously followed. In many cases the sera gave a positive ninhydrin reaction without concurrent action of substances containing protein; in other cases the sera of non-pregnant individuals gave at times positive results with placenta ext. The Abderhalden reaction is apparently not strictly specific in indicating pregnancy. The behavior of sera toward thyroid ext. also varied and was independent of thyroid protein. The reaction is capable of disclosing interesting properties of sera, but the difficulty of the technic is a great hindrance to its ready application. It is worthy of note that the reaction with placenta ext. was positive in the case of certain disorders of the sexual organs and that a strong positive reaction toward thyroid ext. was obtained in the case of an epileptic suffering from myxedema. H. S. PAINE.

Immunization toward dysentery with toxin-antitoxin mixtures. BR. BUSSON. Vienna. *Wiener klin. Woch.* 1915, 853; *Zentr. Biochem. Biophys.* 18, 353(1915).—Rabbits may be effectively immunized toward Shiga-Kruse dysentery poison with free toxin and also with under-neutralized toxin-antitoxin mixts. H. S. PAINE.

Action of tumor autolysates in the treatment of malignant neoplasms. RICHARD BAUER, ROBERT LATZEL AND EMIL WESSELY. Vienna. *Z. klin. Med.* 81, 420-37 (1915); *Zentr. Biochem. Biophys.* 18, 310(1915).—The authors give a brief survey of the literature and describe in detail the technic of prepg. autolysates, especially from operated mammary carcinomas; the results of intravenous injection of autolysate in cases of inoperable carcinoma and sarcoma are also discussed. No anaphylaxis was observed in the symptom complex of cases with fatal issue subsequent to autolysate injection. The metabolism of a series of carcinoma patients was studied before and during autolysate treatment with reference to introduction and elimination of N; the autolysates caused increased albumin elimination and often negative N balance.

H. S. PAINE.

Aminolytic enzyme in the stomach contents in carcinoma. J. HALPERN. Heidelberg. *Mitt. Grenzgeb.* 28, 709-17(1915); *Zentr. Biochem. Biophys.* 18, 342(1915).—An enzyme which produced cleavage of monoamino acids with formation of NH_3 and formic acid was detected in the gastric juice of patients suffering from gastric carcinoma; this enzyme does not occur in normal gastric juice and is probably a secretion product of the cancer cells. It is not certain whether the enzyme occurs in other affections.

H. S. PAINE.

Blood obtained by puncture of vein best for serodiagnosis. M. PARVU. *Arch. mal. coeur* 8, No. 12(1915); *J. Am. Med. Assoc.* 66, 775.—P.'s extensive research has shown that the antibody content is always highest in the blood obtained by puncture of a vein, positive results in testing for antibodies being obtained by such puncture when blood from the ear or finger is constantly negative. Serum in venous blood contains the max. of antibodies, alexins and hemolysins. The blood must be allowed to clot naturally. The 10 or 12 hrs. which this requires allows time for the leucocytes to yield up to the serum all their lysins and antibodies. Blood should never be centrifuged or defibrinated for serodiagnosis; otherwise the leucocytes keep alive and retain the antibodies. This is easily shown by testing the serum for antibodies, alexins and lysins at different stages of the coagulation process.

L. W. RIGGS.

Clinical significance of the diazo reaction and the urochromogen reaction in lung tuberculosis. O. SCHUMM AND E. QUERNER. Hamburg, Ependorf. *Mitt. Hamburg Syattskrankenanstalt.* 14, 133-55(1913).—Neither reaction is of great value in the diagnosis of lung tuberculosis.

C. J. WEST.

The coagulation of *Bacillus enteritidis* an aid in the diagnosis of typhoid fever. G. SEIFFERT. *Münch. med. Wochschr.* 63, 1753-4(1916).—In cases vaccinated against typhoid fever or against typhoid fever and cholera combined, the serum agglutinates typhoid bacilli, making this of but little value for the diagnosis of an existing typhoid. Serum of such cases does not agglutinate *B. enteritidis* and serum of persons having had typhoid fever several years previously only relatively rarely. During an attack of typhoid fever the serum agglutinated *B. enteritidis* and typhoid bacilli in 45.5% of the cases. The titer of agglutination of *B. enteritidis* is 1:50-1:200. This fact may aid in the diagnosis of typhoid fever.

S. AMBERG.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Exanthemata due to mercury mistaken for effects of salvarsan. W. WECHSEL-MANN. *Münch. med. Wochschr.* 62, 1638-40(1915).—In cases treated simultaneously with Hg and salvarsan great care must be exercised in attributing a skin affection offhand to salvarsan, since skin eruptions due to the administration of Hg are not infrequent. The differential diagnosis is considered; it is particularly to be noted that salvarsan symptoms do not lead to peeling of the skin, to formation of vesicles or to fever

of any duration. In a case having undergone a combined inunction and salvarsan treatment with peeling of the skin, the urine showed the presence of Hg more than a month after cessation of treatment while As could not be found. It may be possible that salvarsan aids in the production of a Hg exanthem. S. AMBERG.

The resistance of *Leptodactylus ocellatus* (Argentine frog) toward curare, and some points on the general physiology of muscles. M. CAMIS. Univ. La Plata. *Arch. farm. sper.* 21, 3-48(1916).—This animal presents a remarkable resistance to curare, paralysis resulting only after doses 10-20 times greater than those required for the same response in the European frog. Doses of 0.005-0.01 g. do not diminish the excitability of the gastrocnemius muscle in 1 hr. The same resistance was noted toward nicotine, but not toward veratrine. The paralysis produced by large doses of curare is not accompanied by abolition of nervous excitability, and terminates generally with the death of the animal. The analytical method, which is based on the detn. of time of stimulation, permits the recognition in the nerve region of the sartorius of two irritable substances. The data suggest the possibility that the special behavior of *Leptodactylus* depends on the absence from its muscles of the receptive substances for curare. This confirms the doctrine of the receptive or β -substance. A. W. DOX.

Vaso-constrictive actions of serum on the coronary vessels of the mammalian heart. H. YANAGAWA. London. *J. Pharmacol.* 8, 89-100(1916).—The previous work of Cushny and Gunn (*C. A.* 8, 175) was extended to the study of other proteins and colloids, and also to det. which constituents of serum are responsible for vasoconstriction in the coronary arteries of perfused hearts of cats and rabbits. Cat and horse serum produced coronary constriction with reduction in rate and force of the heart-beat. 5% soln. starch and dextrin containing Ringer salts, 1% glutin and 4% gum arabic first dialyzed and then modified with Ringer salts had no effect. Some of these solns. were very viscous, indicating that increased viscosity of the perfusion fluid has little influence on the heart and vessels. 1% peptone (Witte) and a satd. soln. of agar-agar previously dialyzed and then treated with Ringer salts, dilated the coronary vessels and increased the force and beat of the heart. Dialyzed horse serum constricts the vessels so that the globulin portion is inefficient. The constrictor efficiency of serum and egg-white protein is lost if they have been pptd. by salts or EtOH, but the proteins which are not pptd. by boiling and those sepd. by Hardy and Gardner's method with acetone-ether continue to act. The effect of these proteins on coronary flow is similar to that of dil. alkali, but when alkali is used, the change in H^+ concn. which is necessary to cause this action is far greater than that developed when serum is added to Ringer soln. Therefore the action cannot be explained by the serum changing the alkalinity of the perfusion fluid. It is also pointed out that considerable difficulty has been met in distinguishing the action of serum as such from that of epinephrine by perfusion through the frog limbs, or the mammalian organs, but there can be no such difficulty in the case of the rabbit heart, for here serum causes vaso-constriction, while epinephrine almost invariably causes pronounced vaso-dilatation.

P. J. HANZLIK.

Quinine and atophan in inflammation of frog mesentery. YASUO IKEDA. Cambridge, Eng. *J. Pharmacol.* 8, 101-7(1916).—Previous investigators have shown that both drugs possess antiphlogistic actions. I.'s object was to ascertain whether a combination of the two drugs would give a synergistic action in the same direction. The method of Cohnheim (*Arch. path. Anat.* 40), which consists of the microscopic study of the migratory power of leucocytes in the vessels of the frog mesentery, was used. Quinine-HCl has no effect on migration in doses of 1.25 mg., or less; the effective dose begins at 1.56 mg. for a frog of 15 g.; up to 2.5 mg. no permanent inhibition was obtained, but in some animals the circulation was severely affected. The effective dose of atophan ranges

from 6.25 to 12.5 mg. per frog; 75 mg. completely inhibited the migration without depressing the circulation. When quinine and atophan are combined in such small doses as $\frac{1}{3}$ of the max. ineffective dose, they act powerfully, inhibiting the migration of leucocytes more than much larger doses of quinine alone, suggesting in this respect a synergism between the two drugs.

P. J. HANZLIK.

A study of urinary nitrogen and sulfur partition in a case of rheumatoid arthritis treated with intravenous injections of radium salts. JACOB ROSENBLOOM. *Am. J. Med. Sci.* 149, 718-22(1915).—The intravenous injection of 100 micrograms of Ra element produced an increase in the amt. of N excreted in the urine, but had no constant effect on the percentage excretion of urea N, ammonia N, uric acid, amino acid N, creatinine N and undetd. N was observed. It caused a marked increase in the amt. of total urinary S and of neutral S. This effect on the N and S metabolism lasted for about 3 days following the injection.

TULA LAKE HARKEY.

Mode of action and use of emetine in entamebiasis. RANDOLPH LYONS. *Am. J. Med. Sci.* 150, 97-109(1915).—Emetine exerts its specific effects only on those entamebas within reach of the circulation. The method of its elimination from the body is not definitely known. Subcutaneously and locally, emetine has been shown to be practically specific in pyorrhea alveolaris.

TULA LAKE HARKEY.

Removal by caffeine of some digitalis arrhythmias. WILFRED M. BARTON. *Am. J. Med. Sci.* 150, 352-8(1915).—All irregularities of the heart beat which are brought about by digitalis tend to be removed by caffeine. The action appears to be due to the increase in irritability of the conduction system produced by the caffeine, which antagonizes and finally overcomes the depressing effects of digitalis upon the auriculo-ventricular bundle.

TULA LAKE HARKEY.

The influence of cocaine on the stimulation of the psychomotor region and the cortex of the cerebellum. G. BIKELIS AND L. ZBYSZWESKI. *Lemberg. Zentr. Physiol.* 29, 3-4(1914).—The authors stimulated parts of the cerebellum, covered with filter paper wet with a 5% and a 10% cocaine soln. and found that the cocaine caused no depression or only a slight depression of the threshold of stimulation. This is just the opposite of its effect on the cerebrum.

F. HULTON.

Influence of oil of chenopodium on intestinal contractility. W. SALANT AND C. W. MITCHELL. *Bur. Chemistry. Am. J. Physiol.* 39, 37-53(1915).—Oil of chenopodium (1 to 5000 and 1 to 10,000 solns.) diminishes frequency as well as force of contractions in isolated intestine of rabbits. With intestine from carnivorous animals there is usually a rise of tone followed by a steady decline, rhythmic contractions finally ceasing. Recovery occurred in Locke soln. Relatively large intravenous doses of oil of chenopodium are required to inhibit peristalsis in intact rabbits, due perhaps to the presence of substances antagonistic to the drug. Caffeine, BaCl_2 and pilocarpine have a true antagonistic effect. Oil of chenopodium acts on the nerve endings as well as on muscular structures.

J. F. LYMAN.

Influence of heavy metals on the isolated intestine. W. SALANT AND C. W. MITCHELL. *Bur. Chem. Am. J. Physiol.* 39, 355-74(1916).—Zn malate solns. (0.0001 N) caused depression of tonus and decrease of amplitude within 3 mins. The same concn. of Ni acetate sometimes caused primary stimulation usually followed by recovery and stimulation. Zn is more toxic than Ni as shown by the greater injury produced and by the subsequent response to BaCl_2 and pilocarpine.

J. F. LYMAN.

Effect of nicotine upon the reflex action of some cutaneous sense organs in the frog. IRENE HOWAT. *Univ. Kansas. Am. J. Physiol.* 39, 447-54(1916).—Nicotine injected into the dorsal lymph space of frogs in small doses caused a loss of skin reflexes,

forced breathing, fibrillar twitching and constriction of the pupils. In large doses it caused an inhibition of respiratory movements, tetanus contraction of the front legs, and sometimes a slight stiffening of the whole body, followed by relaxation and loss of muscle tonus. Continued doses resulted in the development of tolerance, increased irritability of skin reflexes, loss of wt. and discoloration of the skin. The toxic dose varied from 6 to 27 minims of 1% soln. per 10 g. frog. J. F. LYMAN.

Action of barium chloride on the vascular system. Antagonistic action of nicotine and curare. E. P. CATHCART AND G. H. CLARK. Glasgow Univ. *J. Physiol.* 50, 119-27(1915).—BaCl₂ in decapitated rabbits produces a marked rise of blood pressure which is inhibited by nicotine and restored by a subsequent injection of curare. The antagonistic action of nicotine and curare observed by Langley (*C. A.* 8, 3078) for skeletal muscle thus holds good for the involuntary muscle of the arterioles. BaCl₂ probably does not act directly on the contractile substance. BaCl₂ and adrenaline do not act on identical parts of the muscle. J. F. LYMAN.

Action of lead on the cardio-vascular apparatus. P. D. SICCARDI. *Atti r. ist. Veneto* 73, II, 323-86(1913).—*A priori* changes in the cardio-vascular apparatus may explain most of the manifestations of saturnism or lead poisoning. Vasomotor crises might account for lead colic; vascular changes (hypertension, sclerosis, and atheroma) may produce chronic nephritis; disturbances in cerebral circulation may explain encephalitis. S. studied extensively the effect on blood vessels, effect on blood pressure, and effect on the heart. Vascular effect was studied on isolated vessels *in vitro* in Ruiger soln. and *in situ* by perfusion of various parts. In all excized surviving arteries including the coronary, lead always produced a progressive and marked vaso-constriction, proportional to the dose of the drug (neutral Pb acetate). In perfusion experiments, constriction was everywhere produced, but the renal and hepatic arteries were contracted more than the musculo-cutaneous vessels. Washing the vessels *in vitro* and perfusion treatment arrest but do not overcome the effect of the poison except after very small doses of lead which acted only a few minutes. Washing with minute doses of atropine in physiol. saline quickly relaxes the lead spasm. The constriction by Pb and relaxation by atropine are probably due to direct action on smooth muscle of the arteries. The Pb soon becomes fixed in the endothelium and muscle cells, as proved by the microscope, hence the persistence of the effect. The effect on blood pressure (in dogs) varies with the quantity of Pb and rapidity of injection. Very small doses produce a slight rise in pressure; larger doses produce depression. The greater the velocity of injection, the greater is the fall in pressure. *Effect on the heart:* Very small doses diminish cardiac activity; larger doses produce stand-still in diastole. By washing, the heart can be revived after minimal doses, but not after larger ones. Even minimal doses permanently weaken the myocardium. This explains the fall in blood pressure. The weakening of the heart is not explained entirely by interference with coronary circulation. It is observed also after atropinization. Adrenaline revives the heart. The effect on blood pressure is not due to direct action on the vagus, depressor or vasomotor center. All of the circulatory phenomena are due primarily to the affinity of Pb for the smooth muscle of the arteriæ and the muscle fibers of the heart.

D. L. MACHT.

Anaphylaxis in ophthalmology. RADOS. *Arch. Ophth.* 89, No. 3(1915); *Zentr. Biochem. Biophys.* 18, 349(1915).—This is essentially a polemic against v. Szily and Arisawa (*C. A.* 8, 173, 2573). H. S. PAINE.

Pathology of the blood in chronic lead poisoning. SCHNITZER. Offenbach a/M. *Deut. Arch. klin. Med.* 117, 127-55(1915); *Zentr. Biochem. Biophys.* 18, 186(1915).—Pb causes impairment of both the blood corpuscles and bone marrow; sp. injury

of the latter is produced and this injury appears to be proportional to the amt. of Pb which is introduced. The effect of Pb poisoning extends even to the leucoblastic tissue.

H. S. PAINE.

Influence of hypertonic solutions on blood pressure. KARL RETZLAFF. Berlin. *Z. exp. Path.* 17, 192-9(1915); *Zentr. Biochem. Biophys.* 18, 336-7(1915); cf. *C. A.* 10, 213.—R. injected 3 cc. of strongly hypertonic solns. of NaCl and other Na salts (in addition to K, Ca and Mg salts) into rabbits which had been subjected to venesection. An amt. of hypertonic salt soln. equal to only a relatively small proportion of the blood thus removed was sufficient to restore blood pressure to approx. its original value. Perfusion expts. with the frog aorta on the one hand and vol. measurements of the cat heart with simultaneous blood pressure measurement (in order to test the influence of hypertonic salt solns. on the heart) on the other hand showed that the observed increase in blood pressure is due to cardiac action.

H. S. PAINE.

Action of intraperitoneally injected epinephrine. D. LAPPONI. Rome. *Gazz. osped.* 34, 693; *Zentr. Biochem. Biophys.* 18, 163-4(1915).—Numerous expts. with rabbits and dogs showed that intraperitoneal injection of 0.0005-0.005 g. epinephrine causes an increase in blood pressure which persists for more than 1 hr.; this effect was particularly pronounced in the case of dogs in which blood pressure had been diminished by previous blood-letting. Intraperitoneal injections of epinephrine which were repeated daily in increasing amts. (0.5-5.0 mg.) were well tolerated by the animals, even when they were continued for several mos. (83 injections). Necrosis did not occur and calcification with aneurysmal dilatation (such as is often observed in the aorta of rabbits which have received intravenous injections of epinephrine) was not observed.

H. S. PAINE.

Influence of bile acids on heart action. EDMUND NOBEL. Vienna. *Z. exp. Med.* 4, 286-301(1915); *Zentr. Biochem. Biophys.* 18, 182(1915).—In spite of extreme impairment of the contractility of the cardiac muscle after injection of bile and large amts. of the salts of bile acids conduction of stimuli remained practically normal until the death of the animals (dogs).

H. S. PAINE.

Strontium salicylate. M. A. BLANKENHORN. Cleveland. *J. Am. Med. Assoc.* 66, 331(1916).—Expts. on 20 patients at the Lakeside Hospital showed Sr salicylate to have the same av. toxic dose as Na salicylate, producing the same gastric symptoms, and to be in no way superior to other salicylates. Owing to its sparing soly. it is less convenient to administer.

L. W. RIGGS.

Strontium salicylate versus sodium salicylate. H. A. HARE. Phila. *J. Am. Med. Assoc.* 66, 757-8(1916).—H. criticizes Blankenhorn's statements (preceding abstract) and points out the superiority of the Sr compd. (cf. following abstract).

L. W. RIGGS.

Strontium salicylate versus sodium salicylate. TORALD SOLLMANN. Cleveland. *J. Am. Med. Assoc.* 66, 758(1916).—Reply to Hare (cf. preceding abstract).

L. W. RIGGS.

Therapeutic value of the hypophosphites. W. MCK. MARRIOTT. Baltimore. *J. Am. Med. Assoc.* 66, 486-8(1916).—A history is given of the previous work with hypophosphites, 17 references to literature being included. M. has carried out a series of expts. to det. whether or not hypophosphites are utilized in the body. By standard metabolism methods with 4 men it was proved that from 79 to 91.5%, av. 86%, of the intake of NaH_2PO_2 was eliminated in the urine; cf. Forbes, *et al.*, *C. A.* 9, 1072. M. summarizes as follows: "There is no reliable evidence that hypophosphites exert a physiologic effect; it has not been demonstrated that they influence any patho-

logic process; they are not foods. If they are of any use that use has not been discovered."

L. W. RIGGS.

Alliaceous odor produced by iron cacodylate. D. W. MONTGOMERY. San Francisco. *J. Am. Med. Assoc.* 66, 491-2(1916).—When given by the mouth or hypodermically the cacodylates may taint the breath, skin and urine with a strong garlicky odor. M. suggests a method by which the drug may be split in the body so as to yield cacodyl.

L. W. RIGGS.

Experiences with the Kiutsi-Malone urinary test for pregnancy. I. S. CUTTER AND MAX MORSE. Univ. Nebraska. *J. Am. Med. Assoc.* 66, 559-60(1916).—The method of Malone (cf. *J. Am. Med. Assoc.* 64, 1651) was followed throughout. In 24 cases known to be pregnant, 17 gave definitely positive results. Of 5 non-pregnant controls, 4 gave negative reactions. Out of 11 males one gave a positive reaction. The authors point out various theoretical objections to the method and conclude that the test as at present conducted cannot be safely depended upon as a diagnosis of pregnancy, owing to the nonspecificity of the reaction and the frequency of errors.

L. W. RIGGS.

Systemic poisoning with bismuth. W. H. HIGGINS. Richmond Med. Coll., Va. *J. Am. Med. Assoc.* 66, 648-50(1916).—The history of a case of Bi poisoning and a report of a post mortem by Mayer and Baehr of a similar case are given. As the literature records 65 cases of Bi poisoning with 24 fatalities, greater care should be taken in its use.

L. W. RIGGS.

Action of digitalis on peripheral blood vessels. I. V. GOLOVINSKII. *Russ. Vrach.* 14, No. 30(1916); *J. Am. Med. Assoc.* 66, 850.—Digipuratum administered by the method of Kravkov (cf. *C. A.* 8, 2756), or that of Fröhlich (cf. *C. A.* 9, 1511) in doses that may have a therapeutic action does not affect the lumen of the peripheral vessels of the regions examd., while toxic doses cause dilatation. The increased blood pressure from digitalis is thus due to increased cardiac activity.

L. W. RIGGS.

Elimination of picric acid in urine. M. MURAT AND J. DURAND. *J. pharm. chim.* 13, 18-23(1916).—M. and D. studied the effect of self-ingestion of 0.20, 0.50 and 1 g. of picric acid, examg. the total urine collected in 24 hrs. Nine tests for picric acid were employed (cf. *C. A.* 9, 3268; 10, 69, 621), including the pink color test with NaNO_2 , $\beta\text{-C}_{10}\text{H}_7\text{OH}$ and Et_2O , formation of a rose-colored ring with tartaric acid and FeSO_4 , etc. The following conclusions are reached: (1) Picric acid is little toxic. Doses of 1 g. or less are very well supported. With 1 g. a slight fatigue was felt, but the temp. remained normal and no special functional, intestinal, gastric or hepatic reaction was observed. (2) The dark brown color of urine after ingestion of picric acid is not characteristic, as it is also found frequently in true icterus. (3) Elimination begins towards the 6th hr. and proceeds regularly during the following days. With 0.2, 0.5 and 1 g., it lasts, resp., to the 4th, 6th and 12th days. At these limits the more delicate tests are still sensitive, e. g., the rose-red ring. (4) The minimum dose necessary to produce the false icterus seems to be 0.2 g. An icterus caused by such a dose is easily detected, especially if the dose is repeated. (5) In the cases of true icterus, all preceding tests are negative. Of 100 cases examd., only 2 showed picric acid. Wool is turned maroon or dirty green and never gives the isopurpurate test. (6) Picric acid may be identified by the tests indicated, even if 8 days have elapsed after suspected ingestion.

S. WALDBOTT.

The history of structural chemistry and of its association with scientific pharmacology. GORDON SHARP. Edinburgh. *Pharm. J.* 95, 756-7(1915).—The contributions by "the Briton and the Teuton" are recorded; the fundamental work of Crum, Brown and Fraser (1867) is emphasized.

S. WALDBOTT.

Further studies in nicotine tolerance. CHARLES W. EDMUNDS AND MAURICE I. SMITH. Ann Arbor, Mich. *J. Lab. Clin. Med.* 1, 315-20(1916).—The conclusions are that the livers of all dogs possess some power to destroy nicotine and that the destroying agent is probably an enzyme. It is possible that this enzyme may be increased in quantity by the const. use of the alkaloid but these expts. do not furnish any support for this theory. The main difficulty appears to be that under normal conditions the destroying power of different livers varies so much in strength that it is almost impossible to state that it has been increased by treatment. H. G. W.

Hexamethyleneamine as a urate solvent and diuretic, and its effect on the reaction of urine. PAUL J. HANZLIK. Cleveland, Ohio. *J. Lab. Clin. Med.* 1, 321-32(1916).—A résumé is given of the chemistry and the behavior of various solvents toward uric acid and urates; very remote possibilities are indicated of chances of success of so-called urate solvents under conditions of the body. Urate or uric acid soly. is a matter which is concerned largely with the degree of reaction (H-ion concn.) and the concn. of fluids. There is no available evidence in the literature to show that $(\text{CH}_2)_6\text{N}_4$ can influence these favorably. Recent and reliable evidence shows definitely that $(\text{CH}_2)_6\text{N}_4$ *per se* in small quantities, or therapeutic doses, imparts to urine no demonstrable urate solvent qualities. Slight and practically negligible uric acid solvent effects are imparted to urine by excessive doses of $(\text{CH}_2)_6\text{N}_4$ and in this, the effects of the common alk. diuretics are pharmacologically and economically superior. There is no evidence that $(\text{CH}_2)_6\text{N}_4$ can dissolve urate calculi. H. G. W.

The action of choline on the isolated mammalian heart and its antagonistic action toward adrenaline. G. CREVOLTO AND A. SACCHETTO. Univ. Padoa. *Atti ist. Veneto* 74, 315-7(1915).—The expts. were done in order to det. the action of choline on the isolated mammalian heart and to interpret the antagonistic action of adrenaline. Isolated rabbit hearts circulated with Ringer-Locke soln. according to Langendorff's method were used. The choline was introduced with a Pravaz syringe. The minimal dose of choline necessary to stop the heart permanently is 0.02 g. per kg. Non-toxic doses produce variable effects depending on the amt. used but always produce a gradual decrease in the amplitude of the cardiac excursions, decrease their frequency and cause a slight dilatation of the ventricle. The action of choline is almost completely lacking if the animal was previously atropinized. When adrenaline is injected with choline the result is somewhat variable. If the dose of choline is strong in comparison with the adrenaline the result differs from that obtained with choline alone in that the dilatation of the ventricular cavity is much greater and more persistent. However, by using the proper proportions of both, the effect of the adrenaline can be almost completely compensated. If a strong dose of choline is injected and followed with adrenaline the effects of the former are observed but the return to normal is quicker. The antagonism of the 2 compds. is thought to be purely physiological and is independent of any chem. reaction that they may undergo *in vitro*.

E. J. WITZEMANN.

Physical properties of dental cements. PAUL PORTSCHKE. Milford, Del. *J. Ind. Eng. Chem.* 8, 302-9(1916); cf. *C. A.* 9, 3289.—“The object of this paper is to present a method for detg. the crushing strength of dental cements; a study of various factors relating thereto; the results obtained on 40 commercial dental cements, representing the silicate, Zn-oxyphosphate, and Cu types; and finally the utility of the app. described in this paper, for the study of the various properties of dental cements is discussed.” The following summary is given: “(1) In order to establish the fitness of a dental cement, it is necessary to consider, individually and collectively, its various physical, physiological and chem. properties. The compn. of a dental cement has no definite relation to its ultimate properties, nor can *a priori* conclusions be drawn with

reference to the effect of a given constituent in a dental cement. This must be arrived at experimentally. (2) A method for detg. the crushing strength of dental cements is described in detail. The conditions under which the tests are made have been standardized so as to conform, as nearly as possible, to mouth conditions. (3) Crushing strength is of fundamental importance in establishing the relative value of commercial dental cements with respect to their ability to resist masticatory pressure. Tests conducted under saliva have an added significance, in that the effect of the saliva is incidentally detd. (4) Forty commercial dental cements were tested and found to vary considerably in crushing strengths. Retrogression in strength under saliva occurred in a large % of the cements tested. There is no relation between germicidal efficiency and resistance to saliva in the case of the Cu cements. Those showing retrogression in strength in saliva may show either high or low germicidal efficiency. (5) Several properties of dental cements, of importance in applied dentistry, may be studied with the aid of the app. described in this paper." Future papers are promised.

L. W. RIGGS.

I. ZOÖLOGY.

R. A. GORTNER.

A study of the relation of the chemical composition of hen eggs to the vitality of the young chick. L. J. CROSS. Cornell Univ. *Thesis* 1912, 16 pp.; *Expt. Sta. Record* 32, 86-70.—C. attempted to det. the relation of the vitality of the chick to the chem. compn. of the egg, and to control the compn. of the egg. The results are summarized as follows: The work on the coloring of the parts of the eggs by feeding dyes to the hen indicates that the fat found in the albumen region of the incubated egg is derived not wholly from the yolk, but from another source, the albumen itself. The % of fat in the yolk of the weak chick is in some cases less and sometimes more than in the yolk of the strong chick. The weak chick is equally as rich in P as the strong chick. The P content of the egg varies but little. There is no increase in the P content of the egg when the hen is fed inorg. P. Hens on range do not produce eggs different in compn. from those in the barnyard. There is variation in the eggs of different hens in the content of protein and in the content of fat, but the eggs produced by each individual are quite const. in compn. The sum of the % of fat and of protein in eggs varies but little. In feeding a ration high in fat, or a ration high in protein, there is no material change in the characteristics of the hen as regards the amt. of fat and protein in the egg. There seems to be no relation between the protein or fat content of the egg as regards its hatching power or the vigor of the young chick. E. J. C.

Resting metabolism of insects and its dependence upon temperature. TAGG ELLINGER. Copenhagen. *Int. Z. phys.-chem. Biol.* 2, 85-94(1915); *Zentr. Biochem. Biophys.* 18, 312(1915).—E. studied the resting metabolism of *Culex annulatus*. Earlier detns. of the respiration of the insect are very strongly influenced by the increased metabolism due to muscular work. The temp.-raising metabolism of *Culex* is identical with that found by Krogh for various cold-blooded vertebrates. E. concludes that the curve observed in the case of vertebrates and invertebrates is generally applicable to cold-blooded animals.

H. S. PAINE.

Toxins of the Araigneae and particularly of the Tégénariae. R. LEVY. *Compt. rend.* 162, 83-6(1916); cf. *C. A.* 6, 1935; 7, 650.—In addition to its hemolytic properties arachnolysin produces a general intoxication which may be fatal. This toxin was recovered from the eggs of several species of *Epeiridae* and from *Theridion lineatum*. The eggs of *Tégénaria atrica* yield a toxin and an hemolysin quite different from arachnolysin. The latter can hemolyze the corpuscles of the drake and hen, which are not acted upon by the toxin of the former. A maceration of the eggs of *T. atrica* in physio-

logic saline containing 10 eggs per cc., is inactivated by standing 10 min. in a drying oven at 60-62°, while arachnolysin requires 6-8 hrs. at 62°. Both toxins are inactivated by the addition of HCl. Inactivated *T. atrica* toxin is not reactivated by the same means as arachnolysin toxin; the former is regarded as a simple toxin and the latter as complex. These toxins react differently with mice and with rabbits. Eggs of *T. parietina* were examd. for toxins but none found. L. W. RIGGS.

A theory of nerve conduction. A. G. MAYER. Washington. Carnegie Inst. *Proc. Nat. Acad. Sci.* 2, 37-42(1916); cf. *C. A.* 9, 1349.—An attempt was made to prep. a strictly neutral distd. water for use in dilg. the sea water, in order to det. the true effects of the Na, K, and Ca cations without the disturbing effects of the H and OH ions. A concn. of 6×10^{-8} OH in sea water is a maximal stimulant for nerve conduction, but becomes a depressant if its concn. be further increased. Expts. were made upon 71 specimens of *Cassiopea xamachana* and the results shown in tables and by curves. M. suggests that adsorption may play a fundamental role in nerve conduction, and that the only cations which are necessary to the reaction are the adsorbed Na, K, and Ca, the rates of nerve conduction being proportional to the concn. of these adsorbed ions. H and OH ions are not adsorbed but act independently as accelerators or depressants according to their concn. The mechanism of conduction according to M.'s theory is illustrated by diagrams. L. W. RIGGS.

12. FOODS.

W. D. BIGELOW AND F. F. FITZGERALD.

A new preservative. O. LÜNING. *Z. Nahr.-Genussm.* 30, 466-7(1915).—In examg. a marmalade for preservatives L. found *m*-cresilic acid, which reacts very similarly to salicyclic acid. The question of its effect upon health is brought up.

L. D. ELLIOTT.

Glucose in preserves made from preserved fruits. C. F. MUTTELET. *Ann. fals.* 8, 132-5(1915).—Fruits are commonly preserved with sucrose and glucose. Heretofore preserves made from fruits to which glucose had been added have had to be labeled so as to declare the presence of glucose. Analyses of 18 samples of preserved fruits from representative French manufacturers show that glucose from 6.13 to 38.47% is used in these products. In view of these analyses, the Dept. for Suppression of Frauds ruled (April 8, 1915) that glucose in jellies and marmalades made from preserved fruits shall not be considered an adulteration when the products are labeled to show they are made from preserved fruits. H. R. SMITH.

The utilization of waste oranges. W. V. CRUSS. Calif. Agr. Expt. Sta., *Bull.* 244, 157-79(1914).—In Calif. from 5 to 20% of the orange crop is rejected owing to slight defects in shape, color or size, or to slight injury to the skin. These waste fruits are used in the manuf. of marmalade, candied peel, bottled pulps and sirups, various liquids and beverages and chem. prepn.s., such as exts., oils and citrates. Examn. of these products showed that those prepd. by chem. or mechan. means were generally of good quality, while those involving some fermentation process were generally bad. The prepn. of orange juice, orange wine and orange vinegar were investigated in the Zymological Lab. of the Univ. of Calif. *Orange juice*: It is recommended that the freshly expressed juice be allowed to defecate until it becomes fairly clear. To prevent fermentation during this period and to check the development of a bitter flavor, a moderate amt. of $K_2S_2O_8$ should be added to the juice, immediately after crushing. The defecated juice should be immediately and pasteurized, or pasteurized in barrels and kept un- bottle it. Sterilization should take place at

180° to 185° F., at which temp. the flavor is not appreciably affected. *Orange vinegar*: The fresh juice should be treated with 4 to 6 oz. of $K_2S_2O_8$ per 100 gal. of juice (= 0.025%) and the juice allowed to stand for 24 hrs. or more, after which it is drawn off and fermented with pure yeast. Immediately after fermentation it is drawn off from the yeast and stored in well-filled closed barrels or tanks until it is convenient to turn the juice into vinegar. One-fourth of its vol. of strong vinegar is then added to prevent the growth of wine flowers and promote vinegar fermentation, which should take place in containers allowing a good exposure to the air. *Orange wine*: The fresh juice is defecated with $K_2S_2O_8$ to prevent fermentation for a short time. The clear juice is then fermented with pure yeast and filtered. The wine may be kept in well-filled bottles without pasteurization.

E. J. C.

Recent experiments on the storing of grapes in various gases. G. DALMASSO. *Rivista viticoltura, enologia ed agraria* [5] 21, 217-9(1915); *Bull. Agr. Intell.* 6, 993-4. —A few yrs. ago Sannino carried out some expts. on the storing of grapes in inert gases, with the object of preventing their drying up or turning moldy. The grapes, however, while retaining for a certain length of time a good appearance externally, acquired a taste which showed that some fermentation had taken place, rendering them unfit for the table. D. has repeated the expts., first with inert gases, such as CO_2 and deoxygenated air, then with active gases, such as ozonized air and O, but with no better results. With CO_2 , both in the diffused light of the lab. and in the darkness of the cellar, alcoholic and butyric fermentation took place. With deoxygenated air, after 53 days alcoholic fermentation set in with liberation of CO_2 . With ozonized air and with O the color kept better, but fermentation set in as in the case of the deoxygenated air. In practice, therefore, though this method prevents the formation of mold and preserves the appearance of the grapes, it is not to be recommended, for in less than 2 months the compn. and taste of the fruit is much altered.

E. J. C.

Manufacture and use of unfermented grape juice. G. C. HUSMAN. U. S. Dept. Agr., *Farmers' Bull.* 644, 16 pp.(1915).—This publication states briefly the way in which unfermented grape juice is made and preserved, both for commercial and domestic use, as well as the fundamental processes and principles involved. Practical suggestions are offered. The subject is dealt with under the following headings: Compn. of the grape, analyses of grape must, causes of fermentation, methods of preventing fermentation, flavor and quality of grape juice, home manuf. of grape juice, valuable appliances for home use, com. methods of making must, and the use and food value of unfermented grape juice.

E. J. C.

The caffeine content of Java tea. J. J. B. DEUSS. *Chem. Weekblad* 12, 938-43 (1915).—A comparison of the modified method of Romburgh and Nannings and the refractometer method for the detn. of caffeine in Java tea. The accordance of both methods is satisfactory. There is no relation between the caffeine content of tea and the altitude of the plantations. The detn. of caffeine in tea as a means to its valuation is justified only in the case of adulteration with tea already extd. or by the addition of leaves other than tea. A caffeine content of less than 3% is sufficient indication of adulteration in the case of Java tea.

J. T. FLOHL.

Antihemolytic power of tea leaves. MAGGIORA AND FERRON. Padua. *Gass. osped.* 1914, No. 65; *Zentr. Biochem. Biophys.* 18, 199(1915).—A new method which depends upon the detection of an antihemolytic substance (with respect to saponin) is proposed for the identification of tea leaves. Boil 1 g. of the tea leaves under examn. for 10 min. in 100 cc. H_2O , filter hot, conc. the filtrate in a porcelain dish on a H_2O bath and dissolve the residue in 30 cc. of a 2% Na citrate soln. at 50°. After cooling and deposition remove several cc. of the clear liquid with a pipet and filter, add 2 cc.

washed calf blood corpuscles in 1% suspension (in physiol. NaCl soln.) to 0.2 cc. of the filtrate, shake slightly, add the saponin after 5 min., shake again and det. the result after standing 3 hrs. at 37° and 12 hrs. at room temp. Genuine tea leaves exhibit antihemolytic power in greater or less degree. When the test gives negative results or results which are not definitely positive the suspicion is justified that the leaves are not genuine tea leaves or that they have been exhausted or poorly preserved or sophisticated in some manner.

H. S. PAINE.

The examination of spices. C. ARRAGON. *Mill. lebensm. Hyg.* 6, 160-3 (1915).—A continuation of previous work (*C. A.* 9, 1945). The detn. of pentosans in spices by the Tollens method (treatment with HCl, distn., and detn. of furfural by phloroglucinol in the distillate) sometimes gives valuable information as to their purity. The following percents of pentosans, calcd. on the dry spices, are reported: White pepper (Muntok) 3.4, (Singapore) 3.9; black pepper (Batavia) 7.9, (Java) 8.8-9.1. (Telichery) 7.8-8.2; long pepper, 6.0; Cayenne pepper, 12.7; cinnamon (Ceylon) 14.3-14.5, (China) 9.4-9.5; nutmeg, 2.5; Bombay mace, 5.7-6.0; cloves, 8.9-9.6; Spanish anis, 7.3; Star anis, 11.8-12.2; Japan anis (*I. religiosum*), 10.4; cumin, 7.1; coriander, 13.7-13.9; cardamom seed (Ceylon) 6.4-6.9, (Malabar) 4.5; ginger (Japan) 5.0, (Bengal) 6.4.

H. S. BAILEY.

White pepper. M. S. SALAMON AND W. M. SEABER. *Chemist Druggist* 88, 146-7 (1916).—Whole white pepper from various sources gave crude fiber as follows: Penang (limed) 5.5, Penang (unlimed) 4.9, Singapore 4.2 and 4.4, Muntok 4.2 and 3.5, Siam (decorticated in London) 1.5%. Ground "home decorticated" samples gave the following figures: "Best white" 1.0, others 2.6, 2.6, 3.0 and 3.2%.

C. O. EWING.

Chemical composition of Hungarian flower honeys. S. WEISER. *Kisérlet Közlém.* 18, 365-6 (1915).—Analytical data are given regarding a number of samples of honey made from several different flowers.

E. H.

The mineral constituents of honey. KAPPELLER AND A. GOTTFRIED. *Ber. Naturhist. Untersuch. Amt. Magdeburg* 1913, 15, 16.—The analytical data presented show that the ash of honey contains from 10 to 58% of P_2O_5 .

E. J. C.

Sugar-honey. Artificial honey. FR. G. SAUER. *Pharm. Ztg.* 60, 798-9 (1915).—Further directions are given for the inversion of sucrose with lactic acid and the prepn. of artificial honey.

W. O. E.

A simple colorimetric method for the determination of free reducing sugar and total carbohydrates in miscellaneous food materials. A. BERNHARD. *Diss. Brooklyn Polytech. Inst.*, June, 1915; *Sugar* 17, No. 11, 41-2 (1915).—B. uses the color reaction produced by heating dextrose in alk. soln. with picric acid with the formation of picramic acid. Grind the sample (2-5 g.) in a mortar with H_2O , transfer to a 100 cc. cylinder, dil. to the mark and shake thoroughly. Sat. the soln. with picric acid (1-3 g.), shake, allow to stand a few min. and filter. Pipet 2 cc. of the clear, protein-free filtrate (contg. 0.4-1.2 mg. sugar) into a narrow, graduated test-tube, add 3 cc. 20% Na_2CO_3 soln., heat in a boiling water bath for 10 min. and dil. to 10 cc. with warm water. Compare in the Hellige colorimeter with standard picramic acid solns. The standard picramic soln. is made by heating 0.2 g. picramic acid and 0.4 g. anhydrous Na_2CO_3 with 60 cc. H_2O in a casserole, cooling and making up to a vol. of 1000 cc. with H_2O . The wedge of the colorimeter is filled with this soln. To varying amts. of a 0.1% soln. of anhydrous dextrose are added 2 cc. satd. picric acid soln. and 3 cc. 20% Na_2CO_3 soln. in a long, narrow test-tube graduated at 5 and 10 cc. The tubes are heated from 10 to 15 min. in a boiling water bath, made up to 10 cc. with hot H_2O , thoroughly mixed and immediately compared with the wedge of picramic acid in the colorimeter. Tables are given showing colorimetric readings with

amts. of dextrose and lactose. For the

detn. of the total carbohydrate, including starch, a sample of the material is hydrolyzed according to the method of the A. O. A. C. The soln. is nearly neutralized, made up to 250 cc. and an aliquot clarified with basic Pb acetate and dry Na_2CO_3 . Dil. 5 or 10 cc. to 100 cc. with satd. picric acid soln. Use 2 cc. for the detn. For milk and milk products, 1 cc. of milk or a weighed sample if a dry prepn. is used, is made up with H_2O to 100 cc., dry picric acid added, the whole shaken and filtered. The usual quantity (2 cc.) is used. A table is prepd. for lactose as previously described for dextrose. A comparison of the method with other methods shows results with a variety of food materials to be in excellent agreement.

A. G.

Starch determination by method of Baumert and Bode. A. HUIZINGA. *Chem. Weekblad* 13, 198-205 (1916).—Duplicate detns. according to the method of B. and B. sometimes vary 1.2% when 3 g. samples are used. This variation may be due to 2 causes: (1) reducing substances may be formed during the heating in the autoclave; (2) a portion of the starch may be rendered insoluble during the cooling of the soln. in the autoclave. The mixt. should therefore be filtered as soon as possible after cooling, and even then the results will be low.

P. J. DONK.

The acidity of meal. TH. VON FELLEBERG. *Mitt. lebensm. Hyg.* 6, 145-50 (1915).—Lüers and Adler (*C. A.* 9, 2284) pointed out errors in the Kreis-Arragon method for the detn. of acidity in malt and barley; also that the acidity was due partly to inorganic phosphates formed by enzymatic action. The method proposed by L. and A. has several drawbacks, due to the difficulty in titrating phosphates with phenolphthalein in the presence of indefinite amts. of Ca, Mg, Fe, etc., and the loss of volatile acids during heating with EtOH. The following method gives more exact and concordant results on meals: Rub to a thin paste 10 g. meal in 20 cc. H_2O , add 80 cc. more H_2O , 1 cc. 10% CaCl_2 soln. neutral to phenolphthalein, 0.5 cc. 2% phenolphthalein and 5 cc. 0.1 *N* NaOH (more if needed to make alk.). Titrate back to neutrality with 0.1 *N* HCl, allow the soln. to settle a min., then add another drop of phenolphthalein to be sure it is neutral, and a drop of NaOH, which should restore the red color. The relation of the NaOH to HCl should be detd. in 100 cc. of H_2O containing 1 cc. of 10% CaCl_2 , and the acidity expressed in terms of cc. 0.1 *N* NaOH required to neutralize 100 g. of meal. Feed meals, as shown by several expts., give low results by this method, as the acid does not all go into soln. in the cold. If the meal is rubbed up in 100 cc. of boiling H_2O , 1 cc. of CaCl_2 soln. being also added, then quickly cooled and titrated as in the preceding method, the true acidity can be detd.

H. S. BAILEY.

Acidity in wheat flour. L. A. FITZ. *Oper. Miller* 20, 36-8 (1915); *Expt. Sta. Record* 33, 64.—Analyses made by J. W. Calvin and Leila Dunton at the Kansas Expt. Sta. are reported. Judging by the results with different millings of the same grain, high acidity is apparently an unreliable test for unsoundness in flour. The acidity is in part at least attributed to phosphates and amino acids normally occurring in flour.

E. J. C.

Sodium chloride and ash determination in bread. A. M. KNOTTNERUS. *Chem. Weekblad* 13, 205-9 (1916).—A direct method for the detn. of NaCl by extn. with acid, and the detn. of ash from the same sample after titration. Add 100 cc. of 0.1 *N* HCl and 100 cc. 0.1 *N* HNO_3 to each of two 10 g. samples of finely powdered, dry bread and shake thoroughly. Let stand a short time, and filter. Wash with distd. H_2O , dry and ignite. Neutralize 10 cc. of the filtrate with NH_4OH and add a few drops of AcOH, then titrate with AgNO_3 according to Mohr. The added NaCl can be calcd. after correcting for the 0.1 *N* HCl used and for the Cl ordinarily found in flour. The total ash is the sum of the NaCl found and the ash of the extd. residue. The ash free from added NaCl is the sum of the ash of the extd. residue and the NaCl ordinarily found in flour.

P. J. DONK.

The physical chemistry of bread. LORENZ. *Chem. Ztg.* 37, 783(1913); *Expt. Sta. Record* 33, 162.—From the studies of the structure of both fresh and stale bread L. concludes that as the loaf ages the structure of the starch granules is modified and the starch gives up its water content to the protein part of the loaf. He regards the fresh loaf as an unstable form and the modified starch granules as a permanent characteristic of stale bread.

E. J. C.

The microscopic determination of the quantity of foreign materials in powders. A. MAURIZIO. *Mitt. lebensm. Hyg.* 6, 156-60(1915).—A review of various microscopic methods for the quant. detn. of the constituents of different materials. While in special cases as the analysis of paper such methods may yield approx. results, there is little hope of detg. even roughly the quantity of the different constituents in mixts. like compound flours or stock feeds.

H. S. BAILEY.

Milk investigations—value of rosolic acid-alcohol test. L. BAHR. *Z. Fleisch. u. Milchhyg.* 24, 228-33, 251-6, 370-6, 398-406, 472-7(1914); *Expt. Sta. Record* 33, 115.—Milks from 105 cows examd. with the rosolic acid-alc. test (*Expt. Sta. Record* 26, 87) gave a positive reaction in about 16%. This was especially true in those cases in which the titer against *N* alkali was somewhat below normal. The reaction probably depends on the presence of secondary or tertiary phosphate. The majority of milks giving a positive test contained many bacteria, leucocytes and fibrin. A few tests made with methylene blue indicated that this substance had no relation to the number of bacteria present in the milk.

H. A. LEPPER.

Composition of grain, flour and milling offals of four varieties of Irish wheat. H. HUNTER. *Dept. Agr. and Tech. Instruction for Ireland J.* 15, 550-62(1915).—Tables are given of analyses showing the usual detns. on Red Fife, White Queen, White Stand Up and Square Head Master wheats.

H. A. LEPPER.

Ash content of canned vegetables. A. F. MORGAN. *J. Home Econ.* 7, 72-7 (1915).—The ash content of peas canned by different methods was found to be less than that of the corresponding fresh peas. Calcd. to H_2O -free basis 46.1% less was found in peas bleached and canned by the usual high pressure process, 50% less in those blanched and canned by the standard home process and 22.6% less in those unblanched and canned by the latter process. The % of extn. of P_2O_5 in each case is rather higher than the total mineral extn.

H. A. LEPPER.

Specific gravity and solids in tomato pulp. W. D. BIGGLOW AND F. F. FITZGERALD. Nat. Canners Assoc., *Bull.* 7, 3-15(1915); cf. *C. A.* 9, 2405.—Various methods for detg. sp. gr. in tomato pulp are compared and a method suggested involving the use of a centrifuge. It is believed to give accurate results. Methods of controlling concn. to definite vol. are discussed. Tables are included giving in parallel columns the sp. gr. and percent solids in pulps of various density.

E. J. C.

A new centrifugal method for the determination of fat in cocoa and cocoa products. W. D. KOOPER. Leipzig. *Z. Nahr.-Genussm.* 30, 453-61(1915).—A rapid method for the detn. of fat in cocoa products involving the use of Neusal reagent. A special app. is described.

L. D. ELLIOTT.

The determination of fat in cocoa and chocolates by the extraction method. W. D. KOOPER. Leipzig. *Z. Nahr.-Genussm.* 30, 461-6(1915).—K. finds that several factors affect the amt. of ext. obtained by the usual Soxhlet method. A small thimble will tend to give lower results, due to the closer packing of the sample. A faster circulation of ether results in an increased amt. of ext. Investigation as to the cause of the variation showed that there was present in the ether soln. a slight amt. of non-fatty matter which gradually settled out as the ether was distd. off. Upon drying the ext. at 103°, the fat assumed a milky appearance, or a crusty deposit formed on the

bottom of the flask. To purify the fat, the ext. is dried to const. wt., the wt. of fat + impurity obtained, after which 50 cc. of ether are added. The impurity remains undissolved and the ether soln. of purified fat is decanted through a filter into a tared flask, and the ext. dried and weighed as usual. A large amt. of residue from a number of detns. was collected and identified as theobromine. On a number of cocoa and chocolate samples, the av. amt. of theobromine extd. by the 3.2 l. of ether passing through the sample in the extrn. period of 16 hrs. was 0.34% for chocolate, and 0.52% for cocoa.

L. D. ELLIOTT.

The composition of milk as affected by increase of the amount of calcium phosphate in the rations of cows. A. LAUDER AND T. W. FAGAN. *Proc. Roy. Soc. Edinburgh* 35, 195-202 (1914-15).—The addition of Ca phosphate to the rations did not increase the amt. of P_2O_5 in the milk. The extra Ca phosphate did not affect an increase in the percentage of fat, ash, or solids-not-fat. No definite effect on the yield was observed.

E. J. C.

The refraction of milk serum. L. KISS. *Kisérlet. Köszlem.* 17, 24-34 (1914); *Expt. Sta. Record*, 33, 715.—The refraction of the $CaCl_2$ serum of milk dild. with water and preserved with CH_2O or $K_2Cr_2O_7$ was studied. It was found that the refraction of the $CaCl_2$ serum falls after the milk is dild. with water. For each 1% of water added up to 10% the refraction drops approx. 0.25° . Of the preservatives recommended for keeping milk samples only CH_2O has an inappreciable influence on the refraction. On the other hand if 0.1% $K_2Cr_2O_7$ is employed the refraction rises from 0.3 to 1.1° and with 0.05% $K_2Cr_2O_7$ from 0.1 to 0.65° . The calcn. of the sp. gr. with Wiegner's formula from the refraction of the $CaCl_2$ serum yielded very good results. E. J. C.

Catalase and reductase determination in cow milk in practice and the relation between catalase and reductase on the one hand and the specific gravity, fat, and acidity on the other. A. STETTER. *Milchw. Zentr.* 43, 369-81 (1914); *Expt. Sta. Record* 33, 414.—The morning and evening milk from 2 dairies was examd. fairly regularly during the year 1913 for sp. gr., fat content, reductase and acidity. The cows were fed chiefly hay and various concentrates, with beet tops and leaves during the fall months. No relation was found to exist between the catalase and reductase figures and the sp. gr. and fat content of milk. On the other hand, a high acidity degree almost always pointed to a high reductase content. No correlation was found between acidity and the catalase figures, as milk with a high acid value often showed a normal catalase figure. It often occurred that the catalase and reductase figures of the morning and evening milks were alike but, generally speaking, the figures for each were highest in the evening milk. The catalase figure varied considerably from day to day and the reductase test also showed very marked variations. In most instances a milk which decolorized (reductase test) in 15 min. also had a high acid value. Although a high catalase and reductase figure lead to a suspicion of pathological milk, still one must be cautious when pronouncing a condition pathological on the basis of these tests.

E. H.

Some physiologic and biochemical observations on milk. W. T. CARSTARPHEN. *Va. Med. Semi-Mo.* 20, 319-26 (1915); *Expt. Sta. Record* 34, 164.—This article is a summary and digest of recent exptl. data regarding the nutritive value of milk. The work reviewed has to do chiefly with the lime, Fe and P content of milk. A bibliography is appended.

E. J. C.

Further observations on the presence of antibodies for *Micrococcus melitensis* in the milk of English cows. S. L. CUMMINS, C. J. COPPINGER AND A. L. URQUHART. *J. Roy. Soc. Med.* 7, 36-41 (1914); *Expt. Sta. Record* 33, 84.—In a series of two gave positive results and one of these was found

to agglutinate *M. melitensis* in dilns. varying from 1:250 to 1:1000 at different times. The milk of this cow was also investigated for opsonins and deviating substances, and it was found that "the milk, whey, and blood serum of the cow behaved toward *M. melitensis* in a manner comparable to the body fluids of animals suffering from, or immunized against, this organism. Due allowances were made for differences in concentration of 'antisubstances' and degrees of immunity." E. J. C.

Fat content of Swiss Emmenthaler cheese. R. BURRI. *Milchw. Zentr.* 43, 556-8 (1914); *Expt. Sta. Record* 33, 81.—Analyses of 641 samples of Swiss Emmenthaler cheese show that the av. fat content in the dry matter ranges between 45 and 50%, although some samples test as low as 40%. E. J. C.

Fat content standards for Danish types of cheese. ORLA-JENSEN. *Milchw. Zentr.* 43, 540-2 (1914); *Expt. Sta. Record* 33, 81.—This article discusses the fat content of various types of Danish cheese. E. J. C.

Methods of making some of the soft cheeses. W. W. FISK. New York Cornell Sta., *Circ.* 30, 41-62 (1915).—Methods of making pot, baker's and cottage, Neuschâtel, cream and club varieties of soft cheese are described on the basis of tests carried on for several yrs. at the station. Field data, analyses, and a bibliography of 28 references are included. E. J. C.

Experiments in cheese-making from milk of different fat contents. A. V. LUND. *Beretning fra der Kgl. Veterinaer-og Landbohøjskoles, Laboratorium for Landøkonomiske Forsøg* 86, 5-47 (1914); *Bull. Agr. Intell.* 6, 988-90.—In Denmark various classes of cheeses are distinguished by the proportion of fat to albuminoid content (the cheese coeff.). Investigations were made to det. this ratio for fresh and stored cheeses, the coarse and fine division of the curd, cheeses made from pasteurized and unpasteurized milk, the milk of Jersey cows, etc. The conclusions are: (1) The coeff. can be accurately estd. from the fat % of the cheese milk and conversely the fat % can be calcd. from the coeff.; the factor in the case of milk from Danish cows is $37\frac{1}{2}$ ($\frac{9}{10} \times 100$). (2) The coeff. of the different kinds of cheese known commercially as whole milk, $\frac{1}{2}$, and $\frac{1}{4}$ whole milk, and skimmed milk cheeses are distinct enough to allow of the various kinds being distinguished by this means. In spite of considerable variations in the coeff. of the same sort of cheese, it has been found that the minimum for a whole milk is higher than the max. of a $\frac{1}{2}$ whole milk and similarly for the other types. (3) Such factors as whether the milk is pasteurized or not and whether the curd is coarsely or finely divided exert some influence on the coeff., but not enough to modify the conclusions in 2. (4) Length or method of storing has little effect on the coeff. as detd. by analysis. (5) As the coeffs. are merely exptl. figures they cannot be used as type values but may serve as guides for the detn. of the latter. (6) The yield of cheese can be roughly estd. when the amount of fat and albuminous substances in the "cheese milk" is known. (7) Cheeses from the milk of Jersey cows have higher coeffs. than those from the milk of ordinary Danish cows, yet the coeffs. of the former were relatively too low, owing to the large amt. of albuminous present. (8) The factor $37\frac{1}{2}$, given in (1), cannot be used in case the milk comes from Jersey cows, a factor 30 ($\frac{9}{10} \times 100$) being necessary. (9) The milk of Jersey cows gave a much larger cheese yield than ordinary milk due to the larger fat and albuminoid content. (10) A single examn. showed no characteristic difference in quality between cheeses made from Jersey or Danish milk. (11) Any given "cheese milk" can be altered by the addition of skimmed milk or whole milk (or even cream) in such a way as to obtain the desired coeff. in the cheese to be produced. H. A. LEPPER.

The significance of solanine as potato poison. DROST. Hanover. *Pharm. Zentralhalle* 56, 311-2 (1915).—Solanine in potatoes occurs chiefly in the outer parts,

which may contain as much as 70% of the total amt. The total amt. did not increase during storage and germination. The formation of solanine by the action of molds and bacteria, especially *B. solaniferum. colorabile*, could not be verified. The solanine content of potatoes even under favorable conditions is so small that illness after the eating of potatoes cannot be attributed to that alkaloid but is more probably due to the action of yeasts and bacteria.

C. O. EWING.

Ash manna: Production in Italy; composition; adulteration. G. MAROGNA. *Ann. stas. chim. Agr. sper. Roma* [2] 7, II, 77-145 (1915); *Bull. Agr. Intell.* 6, 835-6 (1915).—The manna-producing ash, represented by many species or varieties, is cultivated only in Sicily, and chiefly in the vicinity of Palermo and Cefalù, covering about 13,800 acres. The product goes mainly to S. and Central America; part of the crop is used in Sicily for the extrn. of mannitol. M. has collected and analyzed a number of genuine samples of manna, to try to fix limits within which the compn. may vary. The data are summarized in a table. M. describes in the original his method of manna analysis and the means of detecting the most common adulterants.

F. W. SMITHER.

Examination and judging of egg noodles by means of specific serums. F. GÖTHER. Hamburg. *Z. Nahr.-Genussm.* 30, 389-99 (1915).—The presence of egg in noodles may be detd. quant. by means of a specific serum. It is also possible to distinguish between a product containing egg white and egg yolk by the same means, the serum employed in each case being obtained from rabbits injected with the particular portion of the egg sought. *Preparation of the serum:* Beat up the entire contents of an egg, pour into a sterile cylinder and dilute with an equal vol. of glycerol. This suspension will keep indefinitely in an ice box. Immediately before injecting, dilute the glycerol suspension with 9 vols. of physiological salt soln. Inject rabbits intravenously with this soln. using 5 cc. for each injection and repeating the operation 4-5 times at 5-7 day intervals. Bleed the animals, heat the serum for 30 min. at 56° and preserve by the addition of 0.1% of diaphtherin. The serum should produce a pronounced turbidity when 0.1 cc. is introduced into a test tube containing 2 cc. of a 1/10,000 or 1/20,000 diln. of whole egg in physiological salt soln. *Detn. of egg substance in noodles:* Grind the sample so that it will pass through a 0.3 mm. mesh sieve. Introduce 4 g. of the powder into a 100 cc. volumetric flask, fill almost to the mark with sterile physiol. salt soln., shake until the mixt. is uniform, and allow to stand in a refrigerator overnight. Make up to mark with physiol. salt soln., mix thoroughly and filter through a dry filter rejecting the first 30 cc. of filtrate. Introduce 4 cc. of the filtrate into a special tube, the lower, or closed portion of which is constricted and graduated into divisions of 0.001 cc. each, the upper portion of the graduated section flaring at a small angle until it meets the upper or main portion of the tube. Prepare a 1-5 diln. of the serum in physiol. salt soln. and add 1 cc. to the contents of the tube. Mix carefully, place in an incubator at 37° for 1 hr. and then centrifuge for 5 min. in a machine giving 3000 r. p. m. Compare the vol. of the ppt. in the tube with ppts. obtained from noodles of known egg content treated in exactly the same way. G. prepd. noodles containing, resp., 0.0, 10, 25, 50, 75 and 100 g. of egg substance per lb. (German) of flour and obtained, resp., 0.0, 4, 11, 18, 29.5 and 32.5 cu. mm. of ppt. Of 20 commercial samples 65% showed no egg and the remainder the following number of g. of egg substance per lb.: less than 10 g., 20%, 10-25 g., 10%, 25-50 g. 5%. In order to test separately for egg white and egg yolk the procedure is the same except that egg white and egg yolk, resp., are substituted for whole egg in prepg. the serum. The serums are specific for the substances in question and do not react with other proteins.

A. F. SEEKER.

Sucrose content of potatoes in relation to age and treatment with liquid air. H. I. WATERMAN. *Chem. Weekblad* 13, 122-7 (1916); cf. *C. A.* 10, 131, 357.—W. found

that the change of starch (in old potatoes into sucrose during drying at 40° is greater than in the case of newly grown ones. Sucrose increase during drying at 40° in old potatoes was 3%; in newly grown potatoes, 0.7%. W. succeeded in destroying the power of conversion of starch into sucrose through the application of very low temp. Potatoes were submersed in liquid air for 5-10 min. and it was found that after drying at 40° practically no sucrose increase could be found. J. T. FLOHL.

Chemistry of flesh foods. II-IV. Composition and nutritive value of the retail cuts of mutton and lamb. *Trans. Proc. New Zeal. Inst.* 47, 569-72(1914).—This is a continuation of previous work (cf. *C. A.* 7, 658). A carcass of a mutton and one of a lamb were dressed and sepd. into retail market cuts. A table is given of analyses, showing the chem. compn. of the boneless meat of these cuts. It was found that the constituents (mineral salts and meat bases) which give flavor to cooked meat show little difference in the various cuts. The relative market prices charged for the various cuts are not governed by the relative food value or palatability of the meats.

H. A. LEPPER.

The ripening of meat. H. KREN. *Wiener Tierärztl. Monatschr.* 1, 585-9(1914); through *Expt. Sta. Record* 33, 460.—Analytical data are reported regarding samples of meat kept in cold storage from 1 to 8 days. The results indicate that the ripening of meat depends upon the hydrolytic cleavage of the protein. E. J. C.

Essence of chicken. Essence of beef. FR. G. SAUER. *Pharm. Ztg.* 61, 56-7 (1916).—Directions are given for the prepn. of these gelatin-like products.

W. O. E.

Preservation of meat. A. GURINI. *Clin. vet. (Milan) rass. pol. sanit. e ig.* 37, 669-78, 711-24, 764-82, 799-825(1914).—This article includes some analyses showing the compn. of fresh and preserved meats. E. J. C.

The adulteration of preserved beef with horse meat. G. ISSOGLIO. *Ann. r. accad. agr. Torino* 57, 204-13(1914); *Expt. Sta. Record* 34, 113.—Methods are given for the detection of horse meat in canned beef. E. J. C.

Meat flour. F. BAUMANN. *Konserv. Ztg.* 16, 97, 98, 101-2, 105-6(1915); *Expt. Sta. Record* 34, 163.—In this summary and digest of exptl. data B. describes the method of prepn. and the properties of flour made by drying and milling lean meat. The fact is emphasized that it is necessary to use meat contg. as little fat as possible, as the best safeguard against rancidity, and to remove most of the water. In addition, it has been found advisable to use about 3% of NaCl as a preservative. Meat flour prepd. in this way is said to possess a good odor and taste. Due to its high protein content it is a valuable food. It is also well digested. E. J. C.

Durra (*Sorghum vulgare*) as a substitute for wheat in bread-making. A. CASSELL. *Agricoltura coloniale* 9, 217-27(1915); *Bull. Agr. Intell.* 6, 983-4.—Durra flour is of excellent quality, being fine, soft, smooth, with a white color inclining to pink. The resultant loaf from good wheat flour 75% and Durra 25% was well risen, light, with a smooth, brownish yellow, hard, friable crust, adhering completely to the crumb; this latter was uniform in color, light, elastic, with numbers of small round eyes uniformly distributed, while its flavor was excellent, and superior to that of other bread made from wheat with the addition of rice, rye, or potatoes. Analysis of a sample of this bread gave in %, starch 50.79, ash 1.66, fats 0.44, protein 8.33, H₂O 35.23, and fiber (by difference) 3.55. Comparative analyses of Durra with other cereals are given. Durra is a complete food containing a sufficient amt. of protein and a large quantity of starch. Its grain yields less bran than wheat and consequently more flour (about 79%). It lends itself better to bread-making and mixing with wheat than maize flour. The ratio of protein in Durra bread to maize bread is 7 to 4. H. A. LEPPER.

Chemical analyses of maize and oats cultivated in Eastern Republic of Uruguay. J. Prug y Nattino, Republica Oriental del Uruguay, Ministerio de Industrias. Inspeccion de Ganaderia y Agricultura, *Boletín* 14, 29 pp.; *Bull. Agr. Intell.* 6, 1332-3. —Tables are given of analyses of maize and oats grown in the Eastern Republic of Uruguay.

H. A. LEPPER.

Chemical analyses of forage plants of Spain. R. SÚAREZ Y BERMÚDEZ. *Separate*. Madrid. *Langa y Compania* 1912, 94 pp.—Analyses are given of *Brachypodium pinnatum*, *Phragmites gigantea*, *Bromus rubens*, *Aphyllantes monspeliensis*, *Crocus sativus*, *Urtica urens*, *Arthrocnemum macrostachyum*, *Chenopodium album*, *Salsola vermiculata*, *Atriplex halimus*, *A. rosea*, *Kochia prostrata*, *Amaranthus albus*, *Roemeria hybrida*, *Glaucium corniculatum*, *Moricandia arvensis*, *Carrichtera velle*, *Malcomia africana*, *Biscutella laevigata*, *Conringia orientalis*, *Anthyllis cytisoides*, *Ononis tridentata*, *O. viscosa*, *Hedysarum humile*, *Onobrychis saxatilis*, *O. eriophora*, *Coronilla minima*, *Lupinus angustifolius*, *Vicia cracca*, *Zygophyllum tobago*, *Tribulus terrestris*, *Lithospermum fruticosum*, *Teucrium chamaepitys*, *Crucianella maritima*, *Xanthium strumarium*, *Silybum marianum*, *Andryala ragusina*, *Sonchus crassifolius*, *Artemisia herba-alba*, and *A. glutinosa*.

E. J. C.

Bulbs of very doubtful value as food. D. I. MURPHY. U. S. Dept. Com., *Commerce Reports*, No. 4, 61(1915).—Chem. analysis of bread prepd. from a mixt. of $\frac{1}{2}$ wheat flour and $\frac{1}{4}$ powdered tulip or crocus bulbs showed that the nutritive value of the wheat was lessened by the admixture. Among the objections made to the use of these bulbs as a food is the fact that the poisonous narcissus bulb may easily be mistaken for them.

E. J. C.

Uses of sorghum grain. C. R. BALL AND B. E. ROTHGEB. U. S. Dept. Agr., *Farmers' Bull.* 686, 16 pp.—Analyses of 268 air-dried samples gave the following: H_2O 9.52, protein 13.01, fat 3.29, carbohydrates 70.95, fiber 1.53 and ash 1.70%.

H. A. LEPPER.

The food value of *Stizolobium pachylobium* beans. H. S. SHREWSBURY. *Rept. Dept. Agr. Barbados* 1913-4, 27-8; *Expt. Sta. Record* 34, 262.—No evidence was found of the presence of cyanogenetic or other poisonous glucosides, saponins, fats, alkaloids, vegetable ptomaines or toxalbumins in this bean grown in Trinidad. The nutritive properties are principally due to a high content of carbohydrates and proteins. The value is less than that of soy beans chiefly because of the absence of fat.

H. A. LEPPER.

Mistletoe. ANON. *Calif. Sta. Report* 1915, 32-3.—Usual feedingstuff analyses of the whole plant, leaves and stems and branches of mistletoe are reported. The figures show a comparatively high nutritive value.

H. A. LEPPER.

Contributions to the chemistry of the soy bean. PAUL D. HAHN. *S. African J. Sci.* 12, 124-6(1915).—Analyses of a large white variety of Manchurian bean, 3 yrs. old, and a small black variety grown locally, are resp.: water, 4.80, 11.35%; albuminoids 34.07, 29.50%; oil, 17.68, 11.60%; ash, 4.23, 4.97%. On first sample only, crude fiber, 11.17%. Analyses of the ash of both samples and of the pods, hay and leaves are also given.

P. B. DUNBAR.

Investigations concerning nutritive yeast (Nährhefe). M. SCHOTTELIUS. *Deut. med. Wochschr.* 41, 817-9(1915).—Nutritive yeast contains protein 51, ash 7, fat 3, N-free extractives 28 and water 8%. The caloric value of 1 kg. nutritive yeast corresponds to that of 3.3 kg. beef of moderate fat content. Rough feeding expts. on 9 inmates of a jail with doses increasing from 30 to 75 g. per day led to a very moderate gain in wt. in 5 cases; 2 remained stationary and 2 lost wt. Of the controls 2 gained, 1 remained stationary and 6 lost wt.

S. AMBERG.

The utilization by the animal organism of yeast cultivated in solutions of sugar and inorganic salts. W. VÖLK. *Z. Spiritusind.* 38, 235(1915); *Expt. Sta. Record* 34, 165.—Analytical data are given showing the compn. of yeast grown in a soln. of sugar and inorg. salts. Feeding expts. with a dog are also described, the results of which indicated that the coeffs. of digestibility for protein, fat and carbohydrate were 85, 34.1, and 54.5%, resp. W. concludes from these data that artificially cultivated and brewery yeasts are equally valuable food materials and may be used occasionally to replace meat in the diet.

E. J. C.

Utilization of rice straw. N. NOVELLI. *Gior. risicolt.* 5, 147-54(1915); *Expt. Sta. Record* 34, 72.—The av. digestible nutrients of rice straw are given as protein 1, fat 0.44, and carbohydrates 28.63%. Ensiled rice straw has been found to be a desirable feed material.

E. J. C.

Importance of *Bacterium bulgaricus* group in ensilage (HUNTER) 11C. Lime seed (TRÉPANY) 27. Determination of arsenic in beverages (VUAFLART) 16. Furnace for crude fiber incineration (PICKEL) 1. Apparatus for digesting crude fiber (PICKEL) 1.

Chocolate manufacture. J. GLOOR. *Can.*, 165,675, Oct. 26, 1915. Processes of manufacturing chocolate by the application of friction for the roasting, cooking and pulverizing of the cocoa-beans or nuts, with or without the simultaneous caramelizing of the sugar.

Preserving meat. MONVOISIN, BARRAT, ET ROBIN. *Brit.*, 22,669, Nov. 17, 1914. A process of preserving meat or fish consists in (1) sterilizing the meat superficially by chem. or physical means, such as SO_2 or ultraviolet rays, immediately after the slaughter of the animal; (2) treating in a vacuum at the lowest possible temp. in order to cool the meat and, if necessary, remove the antiseptic employed in the first step; (3) drying in a current of dry hot sterile air, which may have been sterilized by means of ultraviolet rays.

14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

The production of mineral waters in 1914. R. B. DOLE. U. S. Geol. Survey. *Mineral Resources of U. S.*, 1914, Pt. II, 175-219 (separate, published Aug. 20, 1915).

E. J. C.

Changes in the chemical composition of potable waters by javellization. Its detection. CH. O. GUILLAUMIN AND VIENNE. *J. pharm. chim.* 12, 377-87(1915).—A recent war order prescribed the addition of 1 to 3 or more mg. of active Cl per l., sufficient to be recognized by the KI starch test 30 min. after treatment. G. and V. show that absorption within 30 min. is slow, and is complete only if the water is very impure. Ordinarily, a positive test need not indicate complete sterilization. Cl absorption becomes const. at 50 mg. per l. when acting during 6 hrs. On this basis, the coeff. of Cl absorption is found as follows: To 200 cc. of filtered H_2O add 10 cc. of dil. hypochlorite (1 g. of active Cl per l.). After 6 hrs. add 3 cc. of 10% KI soln., then 20 drops of AcOH , later 100 cc. of 8% $\text{Na}_2\text{S}_2\text{O}_3$ soln., then starch paste, and titrate back with 0.01 N I till blue. A parallel detn. is made on the same vol. of distd. H_2O , and the difference in the 2 vols. of I soln., expressed in mg. of Cl and referred to 1 l., is the desired coeff. This method even detects previous javellization, since the coeff. diminishes by the exact amt. of Cl introduced previously. The effect of javellization on the ni-

trites of water, using Dane's reagent (50 cc. H_2O + 0.5 cc. of 0.1% alc. indole soln. + 1 cc. H_2SO_4) is also studied, and a *coeff. of permanganic oxidation* of javellized water is discussed. Plain wood affects Cl absorption; pitch-lined barrels should be used, and the water should be renewed frequently. S. WALDBOTT.

Experiments in water softening with zeolite-like substance. R. N. KINNAIRD. *J. Am. Water Works Assoc.* 3, 242-4(1916); see *C. A.* 10, 501. E. H.

Note on the bacteriotoxic action of water. R. GREIG-SMITH. *Proc. Linn. Soc. N. S. Wales* 39, 533-7(1914); *Expt. Sta. Record* 33, 188; cf. *C. A.* 9, 1796.—Expts. in which suspensions of *B. prodigiosus* and *B. typhi* were added to tap water, boiled and unboiled, and filtered through a Chamberland filter, showed that, as a rule, the growth of the organisms was retarded, especially in the case of the boiled water. The conclusion is reached that "ordinary tap water contains substances of the nature of bacterio-toxins, the toxicity of which is increased by boiling." E. H.

Oxygen determination according to L. W. Winkler. II. G. BRUHNS. *Chem. Ztg.* 40, 45-6, 71-3(1916).—A continuation of previous work (cf. *C. A.* 10, 235), in which the effect of the presence of Fe salts in H_2O is investigated. The following modifications of W.'s process are recommended: (1) The use of $MnSO_4$ soln. (1:1) instead of $MnCl_2$, (2) $NaOH$ - KOH soln. (1:1:2) without KI instead of $NaOH$ soln. with or without KI, (3) both solns. to be used from dropping bottles instead of with pipets, (4) the addition of KI soln. or crystals only after the Mn oxide has settled, (5) the use of moderately dil. HCl (1:1) or H_2SO_4 (1:3) instead of fuming HCl , (6) removal with a pipet of a definite portion from the flask and titration of the remainder in the flask with standard $Na_2S_2O_3$ soln., (7) the O content to be expressed in cc. N soln. per 100 cc. H_2O ("%on") or per l. ("Ln"), (8) removal of dissolved interfering substances (nitrite, org. substances) by addition of crystd. $KHCO_3$ after the Mn oxide has settled, shaking, decanting and washing, if necessary, (9) the use of H_2SO_4 , a soln. of $NaHSO_4$ or $KHSO_4$, or a soln. of Na_2HPO_4 in HCl instead of H_3PO_4 , (10) in the presence of Fe^{++} salts the O equiv. must be detd. and added, or the O detd. in the H_2O after removing Fe^{++} salts with $KMnO_4$. J. H. MOORE.

An interesting example of the surface pollution of a deep-well water. JOHN W. HILL. *J. Am. Water Works Assoc.* 3, 184-91(1916); *Eng. Contr.* 44, 386(1915).—Two test wells, each 120 ft. deep, were located 250 ft. apart. One containing signs of pollution was found to be 12 ft. from an abandoned privy into which water had been pumped. Pollution traveled down 120 ft. LANGDON PEARSE.

The development of rapid sand filters in Ohio. PHILIP BURGESS. *J. Am. Water Works Assoc.* 3, 175-83(1916); *Eng. Contr.* 44, 337-9(1915).—The art of filtration is reviewed. In 1915 1,940,000 people were served in Ohio or 38.3% of the state, with 449,690,000 gals. daily capacity. The use of lime in softening and filtration is growing, on account of the sterilization. B. concludes it is possible to treat even a badly polluted river water by rapid filters and with a sterilizing process make a very safe water. LANGDON PEARSE.

The waterworks operator's interest in epidemiology. M. F. BOYD. *J. Am. Water Works Assoc.* 3, 236-8(1916); *Eng. Contr.* 44, 475(1915).—Observation of typhoid conditions is urged, with addition of sterilization plant for emergency use. LANGDON PEARSE.

Composition of rainfall at Montevideo, 1909-12. J. SCHRÖDER. *Rev. Assoc. Rural Uruguay* 44, 381-91(1915); *Expt. Sta. Record* 34, 15.—Chem. exams. of the rainfall at the Agronomic Inst. of Montevideo (Sayago) for the whole of 1912 and for parts of 1908 and 1911 are reported. The total rainfall during 1912 was 1,504 meters

(59.21 in.), supplying 7.713 kg. of combined N per hectare (6.86 lbs. per acre), of which 3.68 kg. was ammoniacal N and 4.033 kg. was in the form of nitrites and nitrates. The rainfall of 24 months represented by the whole of 1912 and parts of 1908 and 1911 contd. 13.71 kg. of N per hectare, or 6.855 kg. annually. The amt. of NaCl brought down by the rainfall of 1912 was 87.9 kg. per hectare, and for 24 months named 165 kg.

E. J. C.

The utilization of the constituents of city sewage. PAUL FISCHER, Fürstentum-Spree, AND E. R. BESEMFELDER. Charlottenburg. *Chem. Ztg.* 40, 224-5 (1916); cf. *C. A.* 10, 239, 1066.—Discussions.

J. H. MOORE.

Economic possibilities of sludge. A. V. DE LAFORTE. *Report Prov. Bd. of Health of Ontario* 1915; *Can. Eng.* 29, 710-11(1915).—Sludge from Imhoff tanks has no commercial value as fertilizer or fuel. Extn. of grease with steam would not pay. The value of destructive distn. to recover grease, gas, NH_3 , etc., is not yet definitely settled.

LANGDON PEARSE.

The disposal of infectious sewage. P. SCHMIDT. *Intern. Z. Wasservers.* 1915, Heft 5, 39-40; *Wasser. u. Abwasser* 10, 171-2(1916).—The cesspool and pail systems are often resorted to in times of war. The latter is the more dangerous from the standpoint of infection on account of the frequent contact necessary. Cesspools should be well lined with concrete and should be fly-proof. Where conditions permit the content may be discharged into streams. The disinfection of fecal matter at the bed-side diminishes the possibility of infection from such a source.

ARTHUR LEDERER.

Sewage treatment works for Altamont Y. W. C. A. camp. H. W. TAYLOR. *Eng. News* 74, 1219-20(1915).—To handle a population of 200 with a flow of 30 gals. per capita daily, a small Imhoff tank, sprinkling filter with 2 nozzles, and secondary tank serving as dosing chamber to 3 sand filter beds were built. The effluent passes into 2000 ft. of absorption tile. The plant is operated about 4 months every year. The cost was \$1470.

LANGDON PEARSE.

Sewage farming at Nottingham, England. ANON. *Eng. Contr.* 44, 482-3(1915).—The sewage is distributed by open concrete carriers over 1923 acres, of which in 1914 708 were cultivated. 964 acres are in pasture on which cattle and sheep are fattened for market. The net profits in 1914 were \$2987.70.

LANGDON PEARSE.

The generation of hydrocyanic acid gas in fumigation by portable machines. H. D. YOUNG. *Calif. Sta., Circ.* 139, 8 pp.(1915).—This circular describes 2 portable machines for the generation of HCN for fumigation and reports a study of the accuracy of the machine method as compared with pot generation.

E. J. C.

Sewage sludge as fertilizer 15.

Purifying feed water. H. H. RALPH. *Brit.*, 21,552, Oct. 26, 1914. Feed-water is purified by heating in a vessel situated within the boiler and connected with the feed pump by a coiled pipe. The H_2O deposits its impurities in the channel at the bottom of the vessel and then passes into the boiler through openings fitted with flap valves. Provision is made for blowing out the sediment.

Softening water. OELWERKE STERN-SONNEBORN AKT.-GES. *Brit.*, 22,362, Nov. 11, 1914. Water is softened by being treated with Na_2HPO_4 at a high temp., preferably the b. p. The boiling may be continued for several mins.

Softening and treating water. H. HELLER. *Brit.*, 22,361, Nov. 11, 1914. Water is treated so as to prevent formation of boiler scale, by softening it with Na_2HPO_4 removing the ppt., and adding tannin or other vegetable ext. which prevents adhesion

of scale in the boiler. The tannin may be added outside the boiler, and the ppt. formed be removed; or the addition may be made to the H_2O in the boiler.

Removing iron and manganese from water. R. MEDITSCH. Aust., 70,822, Dec. 27, 1915. The process is dependent upon the use of previously formed reaction products as catalyzers. A portion of the H_2O , together with the reaction products just forming, is withdrawn from the reaction chamber, mixed with other known freshly forming reaction products serving to remove Mn, such as sol. or insol. Mn compds., and conducted into the current of H_2O under treatment, whereupon the entire mass is led to the reaction or contact chamber, or through a filter.

Preventing corrosion. M. REGAN. Brit., 22,289, Nov. 10, 1914. A compn. for preventing corrosion of engine boiler plates and tubes is prep'd. by boiling together 1 qt. of H_2O , 3 lb. powdered whiting, 0.5 lb. soda, 0.5 soap powder, and 0.25 lb. borax. The compn. is applied to the surfaces with a brush as a water paint or may be added to the H_2O in the boiler.

Treating sewage. W. JONES and JONES & ATTWOOD. Brit., 22,737, Nov. 19, 1914. In purifying sewage by aerating it in presence of bacterial sludge, the sewage is supplied continuously to the treatment tank, and the upper layers overflow into a second tank, in which the liquid is quiescent and from which the sludge is returned to the first tank.

Sewage. W. JONES and JONES & ATTWOOD. Brit., 22,736, Nov. 19, 1914. In purifying sewage by aerating it in presence of bacterial sludge, the tank containing the sludge is gradually filled with sewage, and the aeration is carried out during the filling, so that the purification is completed shortly after filling. The contents are allowed to remain quiescent, and the upper layers of liquid are then drawn off. When a number of tanks are employed, the valves for supplying air and sewage and for discharging the liquid are operated in sequence by automatic means, such as float valves, or a water-clock or other time-piece operating pneumatic or elec. devices, so that the operation is continuous.

15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

The humification of the constituents of plant organisms and the effect of natural agents upon it. A. TROUSKY. Univ. Petrograd. *Selskoye Khosiaistvo Liesovodstvo* 247, 575-605(1915); through *Bull. Agr. Intell.* 6, 1453-4(1915).—The processes of decompn. of the different constituents of plant organisms and of various mixts. of these constituents were studied separately. Lignin, proteins, starch, chlorophyll, tannic substances, phlobaphenes, some fats, and gums are the direct sources of the humus formed from plant residues on the surface of the soil; cellulose, hemicellulose, mono- and di-saccharides, glucosides, organic acids (including amino acids) do not give rise to humus under these circumstances. The transformation of fungi into humus was experimentally verified. All the organic constituents utilized by microorganisms for their nutrition may become indirect sources of humus. Typical black humus is rapidly formed only when all the following constituents together take part in its formation: lignin, proteins, pigments and tannins; in a greater length of time it may also be formed by the mixt. of lignin and proteins and also by the latter alone. A certain correlation is observed between the artificial and the natural formation of humus, in that in natural surroundings humification is restricted to those organic compds. which readily undergo a similar transformation under the influence of very active chem. agents. Humus cannot be always identical in its chem. compn.

W. H. FAY.

The nitrifying powers of soils as indices to their fertility. C. B. LIPMAN. *Proc. Soc. Prom. Agr. Sci.* 35, 73-9(1914); through *Expt. Sta. Record* 34, 218(1916).—It is concluded that the nitrifying power of a soil is one of the prime factors in detg. its productive power. W. H. FRY.

The physiology and distribution of denitrifying thiosulfate bacteria. A. GEHRING. *Centr. Bakt. Parasitenk., Abt. II* 42, 402-38(1915); *Expt. Sta. Record* 33, 23-4.—After briefly reviewing the work of others bearing on the subject, G. reports the results of his studies on the physiology and distribution in soils of the anaerobic denitrifying S bacteria found by Lieske (cf. *C. A.* 9, 640). These bacteria were found in various silty soils, in composts, cultivated soils, forest soils and peats. The numbers were constant at different depths in peat and cultivation soil, but varied greatly in the different soils examd., increasing with an increasing C content. Those found in cultivated soil were only about $\frac{1}{4}$ as powerful in their action as those in the compost, forest soil and peat; G. thus distinguishes two races. Nitrate decompn. increased both in the soil and in nutritive soln. with increasing thiosulfate and nitrate supply. The nitrate could not be replaced by other compds. as source of O, nor could the thiosulfate be replaced by S-free compds. as the energy source for the bacteria in question, although other S compds. could be substituted. Carbonate and bicarbonate were equally effective in supplying the C. Through the addition of thiosulfate to the soil, a strong denitrifying action was induced, not as strong, however, as that brought about by the addition of organic matter. An addition of bicarbonate also increased the denitrification in the soil. G. believes his expts. explain many of the results obtained by Thalau on the influence of sulfites, thiosulfate and S on vegetation. C. F. MILLER.

Antagonism between anions as affecting soil bacteria. III. N fixation. C. B. LIPMAN AND P. S. BURGESS. *Centr. Bakt. Parasitenk.* 42, 502-9(1915).—This is one of a series of articles (cf. *C. A.* 9, 499, 1649, 2281) pertaining to the influence of alkali salts on the natural bacterial flora of the soil. The following conclusions are drawn from the investigation in which a light, sandy soil was used: "Very slight, perhaps questionable, antagonism between anions occurs for the nitrogen-fixing flora of the sandy soil used when Na_2CO_3 and NaCl are mixed, whether one or the other is used as a const. factor. The same is true when NaCl and Na_2SO_4 are combined provided the first named salt is the const. toxic factor. It is not true when Na_2SO_4 is used as the const. toxic factor. No antagonism obtains between Na_2CO_3 and Na_2SO_4 , no matter how the salts are combined and no matter which of them is used as the const. toxic factor. The concns. at which N fixation ceases are lower when the salts are mixed than when they are used singly. The N-fixing flora differ totally in respect to antagonism between anions from the ammonifying and the nitrifying flora of the same soil. The resistance of these N-fixing flora, however, to salt effects is far greater than that of the other flora named." C. F. MILLER.

The fixation of potash by soil bacteria. S. KYROPOULOS. Univ. Göttingen. *Z. Gärungsphysiol.* 5, 161-6(1915).—The examn. of soil cultures under varying conditions for the growth of soil bacteria, with the addition of varying amts. of potash, gave no analytical evidence of the fixation of appreciable amts. of potash by the bacteria. This finding was confirmed by analytical detns. on liquid cultures. A. W. DOX.

Investigations on the absorption of ammonia by the soil. L. PINNER. *Kühn Archiv.* 6, 153-238(1915).—After giving a rather exhaustive critical discussion of the literature on the subject of absorption, P. reports the results of expts. he carried out to det. the absorptive power of soils for NH_3 . Fourteen soils of various textures and taken from widely separated localities were used in the work and in each case, the NH_3 absorbed was detd. by 2 distinct methods which yielded fairly concordant results. Although

no relation was found to exist between either the mechanical or chem. compn. of the soil and the absorption values, the hygroscopic capacity of related soils varied directly with the amt. of gas absorbed. The soils absorbed from 10 to 38 cc. of NH_3 per g. Isotherms constructed from the absorption values of NH_3 by soils resemble those obtained with charcoal and the same gas. The gas was absorbed to a great extent under low pressure, the increase becoming less and less with rise of pressure. While the greater part of the gas was taken up in a few minutes, a stationary condition was reached only after several hrs. Although the absorption of soils still containing hygroscopic moisture was greater than that of the dried material, it was not as great as the sum of the absorption values of the dried soil and water. The greater part of the gas was lost shortly after the soils were removed from the NH_3 atm., but a considerable part (one-tenth of the total) was retained after 24 hrs. exposure to the air and also after the soil was heated at 105° for 4 hrs. Only a loose relationship was found to exist between the NH_3 absorbed from solns. of NH_4Cl and NH_4OH even when similar soils were compared. The writer concludes that it is very difficult to formulate a theory generally applicable to absorption phenomena in soils because of the large number of factors involved. He believes the surface-tension theory of Freundlich offers the best explanation.

C. F. MILLER.

The nitric nitrogen of the black soils of the arid regions of Russia. N. M. TOULAIKOV. *Besentchuck Agr. Expt. Sta., Selskoye Khosiaistvo Liesovodstvo* 247, 35-65 (1915); through *Bull. Agr. Intell.* 6, 797-9(1915).—Nitrification is studied in relation to seasons, cultural methods, manuring, and crops.

W. H. FRY.

Studies in the drying of soils. M. A. KLEIN. *J. Amer. Soc. Agron.* 7, 49-77 (1915); *Expt. Sta. Record* 33, 810.—The object of this investigation is to study the effect of drying the soil on its chem. and biological condition and on plant growth. Two soils were used in this study, one low and one high in organic content. It is shown that drying a soil previous to planting has a beneficial effect on plant growth. The factor which causes this beneficial effect is influenced by the organic matter in the soil. H_2O -sol. matter is increased in the soil of low organic content while the opposite is true with the soil of high organic matter. The drying of the soil had little effect on the available K, Ca, or P in the soil. The bacterial activity as measured by the CO_2 production is increased by a previous drying of the soil. The CO_2 production is very low in the dry soil, ceasing after 7 days. The soil kept moist for 35 days after drying assumes its normal condition. The nitrifying power of the soil was increased by a previous drying. The dry soil showed a reduction in NO_3 as in the CO_2 production.

J. J. SKINNER.

Chemical and biological notes on cherry orchard soils. A. HARVEY AND C. H. HOOPER. *The Gardeners Chronicle* 57, 308-9(1915); *Bull. Agr. Intelligence* 6, 1067.—The investigation was made to det. the difference between those soils which are known to be favorable and those which are unfavorable to the growth of cherries. The poor soils were somewhat lower in plant food, especially K. These differences were small. The chem. analysis points to no particular feature. It is concluded that pollination had more influence in fruit production than the soil.

J. J. SKINNER.

Weathering in the podzol soils from central Norrland. OLOF TAMM. *Bull. Geol. Inst. Univ. Upsala* 13, 183-204(1915).—From a detailed chem. study of the rocks, soils, and humus substances of this region, the following conclusions are drawn: (1) The chem. compn. of unweathered soils in central Norrland (with the possible exception of clays, which were not examd.) appears to be very uniform. (2) The chem. and mineralogical character of layers weathered by the action of humus (Rohhumus), known as bleached-earth (Bleicherde) are also very much alike, when the occurrences

are typical. (3) The chem. processes which are active in the weathering by humus may comprize soln., but not transformation of the minerals. Apatite and the dark minerals such as biotite and hornblende are the most readily sol.; the feldspars are attacked only to a quantitatively unimportant extent. Kaolinization could not be demonstrated, even where the feldspars were relatively strongly attacked. (4) An estimation of the magnitude of the change of the original material in the process of bleached-earth formation shows that about 7.5% of the original bases are dissolved.

E. T. WHERRY.

Experimental data on podzol formation. V. P. SMIRNOV. *Esheg. Geol. i Min. Rossi* 14, 206-10(1912); *Zhur. Opytn. Agron.* 15, 228-9(1914); through *Expt. Sta. Record* 33, 814(1915).—In expts. with a sandy podzol soil 2 glass tubes 5 cm. in diam. were filled with the soil in its natural stratification, and distd. water, distd. water containing CO_2 , and a soln. of NH_3 were allowed to percolate through the soil for 24 hrs. The filtrates contained different amts. of leached-out org. and inorg. constituents, the smallest amt. being in the distd. water containing CO_2 and the most in the NH_3 soln. These results, together with preliminary analyses of the soil layers, led to the conclusion that the cementing material of the subhorizons of podzol soil consists of org. matter and colloidal silica. In the tube treated with NH_3 a brown ring appeared between the lower subhorizon and the subsoil, which is thought to be an orstein formation.

W. H. FRY.

Red soils and phosphatic manuring in the state of Sao Paulo, Brazil. J. ARRÊ. "Luiz de Queiroz" College. *Boletim agricultura*, Series 15, 535-55(1914); through *Bull. Agr. Intell.* 6, 1042-4(1915).—Soil analyses and expts. upon the absorptive capacities of red soils for P_2O_5 are given.

W. H. FRY.

The fertilizer requirements of the soil. F. MÜLLER. *Landw. Jahrb. Schweiz.* 29, 119-34(1915).—M. has compiled tables showing how the numerous expts. carried out in Switzerland during the past 20 years, support the principle of Wagner according to which the compn. of the first hay cutting is used as an indication of the fertilizer requirement of the soil. Wagner found that the hay should contain 2% K_2O and 0.7% P_2O_5 ; if it contains less of either, the soil is deficient while if it contains more there is already an excess present. It is stated that this method of detg. the needs of a soil gives much more consistent as well as more significant results than the parallel plot method.

C. F. MILLER.

Seaweed as a source of potash for agriculture. A. A. MOFFATT. *Trans. Highland Agr. Soc. Scotland* [5] 27, 281-6(1915); *Expt. Sta. Record* 34, 26.—Seaweed from the coast of Ireland and Scotland contains in its fresh state about 80% moisture. Three methods of treatment to utilize it as a fertilizer are described. Burning the seaweed to a loose ash is the most practical method. More K from a given quantity of seaweed is secured by carbonizing the air-dry material in retorts or ovens. By this method the substance swells and forms a porous charcoal from which the salts can be readily dissolved. A number of by-products are obtained; the NH_3 is recovered as $(\text{NH}_4)_2\text{SO}_4$ from the H_2O used for purifying the gas by-products.

J. J. SKINNER.

Composition and use of certain seaweeds. JAMES HENDRICK. *J. Board Agr.* 22, 1095-1107(1916).—Attention is called to the shortage of potash due to the supply from Germany being cut off. K and I have long been obtained from kelps of Scotland and the U. S. has pointed out recently the high K content of Pacific coast kelps. Analyses are given of seaweeds of *Fucus* and *Laminaria*. The stems in all cases contained more K than the fronds and less I on the average, and *Laminaria* was much richer than *Fucus*. Dried *Fucus* contained on the average 3-4% K_2O ; *Laminaria*, 10%. None

of these weeds carries as much K as the Pacific coast kelps. A few varieties of seaweed are used as stock food and occasionally as human food. R. O. E. D.

Notes on the chemical composition of karroo ash. CHARLES F. JURITZ. *S. African J. Sci.* 12, 133-42(1915).—Karoo ash (burned sheep manure) has an av. compn. of 9.85 K₂O, 21.81 CaO and 2.86% P₂O₅. A table of analyses of the unburned manure is added. W. H. FRY.

Rock phosphate in New Zealand. B. C. ASTON. *J. Agr.* 10, 495-509(1915); *Bull. Agr. Intell.* 6, 1460-2.—The most important deposits recorded are at Milburn, Otayo and on Bounty and Antipodes Islands. J. J. S.

The utilization of coffee pulp as fertilizer for tropical crops. R. D. ANSTAD. *Tropical Life* 11, 124-6(1915); *Bull. Agr. Intell.* 6, 1457-8.—Waste from coffee products on coffee farms furnishes a good fertilizer when composted and when leaching is prevented. It was used to advantage as a bedding for cattle. Dry coffee pulp contains about 85% org. matter, 0.8 P₂O₅, 2.4 K₂O, 0.6 CaO and 2.6 N. As a fertilizer it was improved by reinforcing with bone meal or P₂O₅. J. J. SKINNER.

The cultivation of seaweed in Ireland and its use as fertilizer. G. H. PETHY-BRIDGE. *J. Dept. Agr. Tech. Instruction for Ireland* 15, 546-9(1915).—Two classes of seaweeds are used as fertilizers in Ireland, the first belonging to genus *Laminaria* which grow in deep water, and the second to genus *Fucus* whose habitat is between tide marks. By the cultivation of seaweed "is meant the provision of suitable anchorages, generally large stones, in localities where these are naturally absent." It is stated that the weeds are only used locally by the farmers owning the beds and are seldom sold. No analytical data are given. C. F. MILLER.

The production of phosphate rock in 1914. W. C. PHALEN. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 41-56. E. J. C.

The solubility of the phosphoric acid of basic slag in water saturated with carbon dioxide. J. G. MASHAUP. Kijkslandbouw proefstation te Groningen. *Verslagen van Landbouwkundige Onderzoekingen der Kijkslandbouwproefstations* No. 17, 97-135 (1915); through *Bull. Agr. Intell.* 6, 1308-10(1915).—The soly. of P₂O₅ is studied in connection with the ratio slag:water, simultaneously with the soly. of the CaO, continuous extns. being employed. W. H. FRY.

Displacement of potassium and phosphoric acid contained in certain rocks by some substances employed as fertilizers. G. ANDRÉ. *Compt. rend.* 162, 133-6 (1916).—The trituration of glauconite in the presence of water in contact with CaCO₃, NaCl, NaNO₃, (NH₄)₂SO₄, and CaSO₄ liberated quantities of K of the same order of magnitude as those given by microcline. NaCl, and especially NaNO₃, had a more energetic effect than they have on feldspar. The action of CaCO₃ and CaSO₄ is more marked than on feldspar. The max. displacement of K was obtained with (NH₄)₂SO₄. Apatite treated somewhat similarly gave negative results with (NH₄)₂CO₃ and nitrates. On the other hand, K₂CO₃ displaced a certain amt. of P₂O₅. W. H. FRY.

Speed of solution of compounds of potassium, aluminum, and iron of natural phosphates by mineral acids. I. A. V. KAZAKOV. *Is Resul't. Veget. Opytov. Lab. Rabot* 9, 21-45(1913); *Expt. Sta. Record* 34, 220(1916).—A review of the fundamental principles underlying the speed of chem. phenomena in general and of the soln. of solids in particular and a review of the literature bearing on the subject are followed by a report of expts. to det. the role of concn. of the solvent, duration of the reaction, degree of pulverization of the phosphate, preliminary roasting of the phosphate, and rapidity of introducing the solvent on the speed of dissolution of K, Al, and Fe of 4 differ-

ent natural phosphates. The solvents used in different concns. were H_2SO_4 , HCl , and H_3PO_4 . The results are graphically reported. W. H. FRY.

Mechanical enrichment of natural phosphates in calcium phosphate. A. V. KAZAKOV. *Is Resul't. Veget. Opylov Lab. Rabot* 9, 46-56(1913); *Expt. Sta. Record* 34, 220-1(1916).—Expts. on 6 series of typical natural phosphates are reported, the object of which was to det. the effect of grinding and sifting into 2 fractions and of roasting on the P_2O_5 content of the 2 fractions. The phosphates were ground to a size of 0.5 mm. or less in diameter and were sifted into 2 fractions, below and above 0.08 mm. The greatest difference in P_2O_5 content of the 2 fractions was obtained with the first phosphate series, containing an av. of 16% P_2O_5 ; the fine-grained fraction contained 24% P_2O_5 and the coarse-grained fraction 13%. Another series showed only a small difference, and a 3rd series no difference. The 6th sample, containing from 26 to 27% phosphate, showed results opposite to those obtained with the first sample, the coarse-grained fraction being the richer in P_2O_5 . The theory underlying this phenomenon is explained. After a preliminary roasting of the first series of phosphates it was found that the fine fraction contained the more P_2O_5 . W. H. FRY.

Preparation of the phosphate extracted by sulfurous acid from Viatka phosphate. V. P. КОЩЕТКОВ. *Is Resul't. Veget. Opylov Lab. Rabot* 9, 1-20(1913); *Expt. Sta. Record* 34, 220(1916).—These expts. of the dissolving tests of the included action of H_2SO_3 on the P_2O_5 of phosphorite and the pptn. of the H_2SO_3 soln. by (1) evapn. of the soln. to dryness, (2) elimination of excess SO_2 by boiling, (3) pptn. of the phosphate with lime. It was found that passing a current of SO_2 through phosphate suspended in water almost completely dissolved the P_2O_5 . The addition of H_2SO_4 to the water in an amount hardly sufficient to decompose the CaCO_3 of the natural phosphate was found to increase the dissolving power of H_2SO_3 for P_2O_5 . After evapn. to dryness the residues contained from 22 to 24% of P_2O_5 , of which 57 to 80% was sol. in citric acid. Boiling the soln. resulted in the pptn. of about half of the phosphate dissolved, which contained from 23 to 36% P_2O_5 . The other half of the dissolved phosphate was pptd. by milk of lime, the product containing from 16 to 26.5% P_2O_5 , of which from 86 to 94% was sol. in citric acid. W. H. FRY.

Sewage sludge as fertilizer. ANON. *J. Bd. Agr.* 22, 235-8; *Bull. Agr. Intell.* 6, 1033-6(1915).—The article briefly reviews the results of expts. carried out by various investigators in different parts of England to det. the value of sewage sludge as a fertilizer. Expts. at Rothamsted showed that removal of the grease does not increase the ease of decompn. Most of the expts. lead to the conclusion that the N and P_2O_5 in the sludge are present in a non-available form, and it is suggested that in the future attention should be directed to methods of rendering the sludge more available to plants. C. F. MILLER.

A new method of preserving liquid manure. SCHMOEGGER. *Westpreussische Landw. Mitt.* 20, 34(1915); *Bull. Agr. Intelligence* 6, 1308.—The process is based on the principle that lactic acid bacteria are able to develop in liquid manure and preserve it if a certain amount of sugar be present. For the preservation of 100 tons of liquid manure, 0.5 ton of sugar is needed (3.1 tons of sugar beets). The ferment, which is used to a large extent in Germany for preserving potatoes, is *Bacillus cucumeris fermentati*. Expts. are being carried out on farms to det. the practicability of the method. C. F. MILLER.

Composition of liquid manure as shown by agricultural investigations in southern Switzerland. C. DUSSEKRE. *Ann. agr. Suisse* 16, 83-8(1915); through *Expt. Sta. Record* 34, 24(1916).—The average of 23 analyses of typical liquid manure shows that

the fertilizing elements are present in the proportion of 100 parts N to 285 parts K to 4 parts P_2O_5 .
W. H. FRY.

The composition and value of liquid manure. J. HENDRICK. *North of Scotland Col. Agr. Bull.* 19, 29 pp. (1915); through *Expt. Sta. Record* 34, 23 (1916).—The results of analyses of 35 samples give an av. compn. as follows: water 98.21, solids 1.79, total N 0.204, ammoniacal N 0.179, P_2O_5 0.029, K_2O 0.462, CaO 0.019%. Field expts. on hay land and clover are reported.
W. H. FRY.

External and internal phases of the action of attenuated acid gases and smoke on plants. H. WISLICHENUS. *Mitt. Sachs. Forstl. Versuchsanst. Tharandt* 1, 85–175 (1914); *Expt. Sta. Record* 33, 629.—This article reports the results obtained by repetition under more favorable conditions (cf. C. A. 9, 2961) of former expts. and also of later work to det. the influence on vegetation of gases at great dilns. Very dil. H_2SO_4 was found to be markedly injurious only when the leaves or needles of the plants were assimilating, the extent of the injury being proportional to this activity. Light intensity and assimilating activity are the principle conditions influencing the action but others are discussed as modifying factors.
C. F. MILLER.

The influence of radioactive earth on plant growth and crop production. H. H. RUSBY. *N. Y. Bot. Garden* 16, 1–23 (1915); *Bull. Agr. Intelligence* 6, 1318–9.—Expts. were made with radioactive material supplied by a producing company. The material as tested consisted of the powdered rock, after the extn. of radium, mixed with an ordinary fertilizer. The compn. of the fertilizer used is not given. Good results were secured by the mixt., which caused increased production of given house plants, garden vegetables and field crops.
J. J. SKINNER.

A new dipping fluid. J. C. BRÜNNICH AND F. SMITH. *Queensland Agr. J.* 3, 161–3 (1915); *Bull. Agr. Intell.* 6, 1071–2.—The investigation was made to secure a substitute for tallow and tar in As dipping fluids. Bone oil, a by-product in the manuf. of bone charcoal was found to be suitable. It is readily emulsified by boiling with alkali. Spraying expts. against ticks with bone oil at the rate of 1 gal. to 400 gals. of As soln. proved efficient. The bone oil is heated with $\frac{1}{4}$ its weight of NaOH. After 15 min. a dry mixt. of As and NaOH is stirred into the oil in small portions. On cooling H_2O is added.
J. J. SKINNER.

The addition of soft soap to lead arsenate for spraying purposes. D. R. EDWARDES-KER. *J. Southeast. Agr. Col. Wye* 1913, 359–62; *Expt. Sta. Record* 33, 538.—The methods of prepg. solns. of soft soap and lead arsenate suspensions were studied. The addition of 1% soap soln. to lead arsenate does not cause an appreciable increase in the amt. of sol. As. H_2O was best used to make up the solns. of $Pb(CH_3CO_2)_2$ and Na_2HAsO_4 when homemade soap solns. are used.
J. J. SKINNER.

Composition of rainfall at Montevideo (SCHROEDER) 14.

Phosphates. E. STOPPANI and V. VOLPATO. *Brit.*, 100,034, Jan. 21, 1916. Natural phosphates are ground and mixed with 6% or more of an alkali or alk.-earth oxide, carbonate, sulfate, or other salt, the mixt. being calcined but not fused, a temp. of 600° being mentioned. The material is hydrated, preferably while still hot, by adding H_2O . The product is assimilable by plants; it is sol. in organic acids.

Emptying superphosphate chambers. H. W. HALL. *Brit.*, 22,645, Nov. 17, 1914. A superphosphate chamber is made of Fe with a thin lining of masonry, prepared wood, or dried superphosphate, and is arranged on tilting bearings so that it can be set in inclined positions to allow the advance and return movements of the motor-

driven rotary cutter to be effected by gravity. The rails are disposed out of reach of the cut superphosphate, and a gas exit is provided. The cutting machine is transported to other chambers by a trolley on rails. If there is room behind the chamber, the cutting machine may leave the chamber without reversing its direction.

16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

History of brandy. P. MARTELL. *Z. Spiritusind.* 39, 77(1916).—A short review. L. W. HAAS.

Determination of total tartaric acid as well as the alkaline earth tartrates, potassium hydrogen tartrate and free tartaric acid in wine. R. KUNZ. *Arch. Chem. Mikros.* 8, 51-61(1915).—The method is based on the peculiar fact (which K. is not yet able to explain) that tartaric acid may be completely pptd. as K H tartrate by means of EtOH in the presence of excess of KCl and a certain amt. of free HCl. *Total tartaric acid:* Evap. 50 cc. of wine in a porcelain dish after addition of exactly 3 cc. 0.5 N HCl and 2 cc. 20% KCl soln. to 10 cc. on a water bath, add 100 cc. 96% (by vol.) alc. under violent stirring and let stand for 12 hrs., filter, wash ppt. thoroughly with alc., return ppt. to dish, dissolve in hot water and titrate with 0.1 N NaOH as usual. *Potassium hydrogen tartrate:* Evap. 50 cc. of wine in a weighed dish to exactly 10 g., add 100 cc. of 96% alc. and continue as above. *Free tartaric acid:* To the total filtrate from the K H tartrate detn. (in an Erlenmeyer) add 2 cc. 20% KCl soln. and mix well; after 12 hrs. add exactly 2 cc. 0.5 N HCl, filter and treat ppt. as under total tartaric acid. *Alk. earth tartrates:* Total tartaric acid minus the sum of K H tartrate and free tartaric acid gives the amt. of tartaric acid, which must be taken as combined with the alk. earths. The method is shown to give trustworthy results even in the presence of larger quantities of free malic, lactic and succinic acids and especially of K H malate.

L. W. HAAS.

The colorimetric determination of pentoses and methylpentoses in wine. F. SCHAFFER. *Mitt. Lebensm. Hyg.* 6, 163-7(1915).—S. mentioned in a previous article (cf. C. A. 9, 1364) the value of the detn. of pentoses and Me-pentoses in wine analysis, and that these could be detd. colorimetrically. A wine containing more than 3% of sugars must be fermented 2-3 days after diln. with 2 or 3 vols. of H₂O before detg. the pentoses and Me-pentoses, but in dry wines they can be detd. without further treatment. 100 cc. of the sample are concd. to 35 cc., the residue made up to 50 cc. with water, 22 cc. of pure, concd. HCl (d. 1.19) added, and refluxed under a well cooled condenser 2 hrs., then made up to 100 cc. with H₂O, and as rapidly as possible 92-93 cc. distd. off. (Cork stoppers must be avoided.) The distillate is dild. to 100 cc. with water, and 5 cc. taken for the following colorimetric test: To 5 cc. of the soln., in a test tube, about 0.2 g. of pure resorcinol and 10 cc. of chem. pure concd. HCl are added, the tube closed with a rubber stopper carrying a 35-cm. air condenser, and after heating in a boiling water bath for 10 min., cooled quickly. The pentosan content is detd. by comparison with standards, made by distg. and treating known amts. of pure arabinose, the same as the sample, or from a soln. of "Papiertrot B. conc. der Chem. Gesel. in Basel." 0.1 g. of this dye dissolved in 1 l. of H₂O, and dild. 7.5 times for use, gives a color equal to 0.1% of pentosans. The methylpentosans (rhamnose) are detd. in a similar manner, using 5 cc. of distillate, a small amt. of vanillin, and 10 cc. of concd. HCl, and heating as for pentosans, but for 5 min. only, then quickly cooling and comparing the blue soln. thus obtained with a standard containing 0.1 g. "Indigo carmine dry powder Merck" dissolved in 1 l. H₂O. For use dil. with 5.5 vols. of H₂O, which gives a color equal to 0.1% of

rhamnose. Both of these standard dye solns. keep well in the dark. Of 200 natural wines none gave a value less than 2 for the factor arabinose/rhamnose. With skin wines and pomace wines, the factor ran from 0.5 to 1.0. H. S. BAILEY.

The practical application of improved methods of fermentation in California wineries during 1913 and 1914. F. T. BIOLETTI AND W. V. CRUESS. *Calif. Sta. Circ.* 140, 14 pp.—Wineries in several districts of the State using the ordinary spontaneous method of fermentation were compared with wineries in the same regions employing small amts. of SO_2 to check wild yeasts, followed by the application of pure selected wine yeast of the "Burgundy" variety. The tests covered 22 wineries for 2 seasons. During the hot fermenting season of 1913, many of the spontaneously fermented wines "stuck" with unfermented sugar, became high in volatile acid, and badly attacked with "tourne" bacteria. Wines in the same districts, made from the same types of grapes and fermented with the pure yeast and SO_2 , were perfectly sound and kept well. The 1914 season was cooler and the spontaneous fermentations were better than in 1913, but still under these favorable conditions the wines fermented by the improved methods gave sounder wines than resulted from the spontaneous fermentations. The volatile acid is used as an index of the stability of a new wine. Av. loss in SO_2 during fermentation was 63.6% of that added. A blend of spontaneously fermented wines increased rapidly in volatile acid when incubated, while a blend of wines made with pure yeast and SO_2 remained practically constant in volatile acid on incubation. W. V. C.

Dealcoholized wine. S. CARROLINI. *Italia agricola* 52, No. 5(1915); through *Bull. Agr. Intell.* 6, 980-2(1915).—A description (with cut) is given of G. Ciapetti's process. The operation of depriving wine of its alc. is carried out in such a way as not to cause loss of any of its other valuable constituents; this is accomplished by a fractional distn. under relatively low pressure. The very small quantities of esters and other compds. which give perfume to wine are sepd. at 25 to 30°, the ethyl alc. is then distd. off at 50 to 55°, after which the flavoring fraction is again mixed with the remaining wine. In this way a wine of less than 1% alc. by vol. is obtained which contains all other components of wine in a slightly increased quantity with the exception perhaps of some of the volatile acids. The lack of these is remedied by the addition of CO_2 , which, together with a small quantity of sugar (about 3%) in the case of a very dry wine, renders it very palatable. Another advantage of this process is that the alc. obtained at low temp. and in partial vacuum is of great purity, being free from higher alcs. L. W. HAAS.

Determination of arsenic in beverages. L. VUAFLART. *Ann. fals.* 8, 414(1915).—The reagent of Bougault (10 g. NaH_2PO_4 dissolved in 10 cc. water, made up to 200 cc. with concd. HCl allowed to settle and decanted) may be employed in the detn. of As in beverages. The manipulation is simple and the sensibility sufficiently delicate to detect one mg. of As per l., using a 250 cc. sample. In the case of beer and wine it is necessary first to separate the As from the larger part of the org. material, to concentrate in a ppt. and to purify the latter. H. A. PIPER.

Soft resins in sulfured and unsulfured hops in cold and in open storage. G. A. RUSSELL. U. S. Dept. Agr., *Bull.* 282, 19 pp.(1915).—A large sample of Californian hops was used for these investigations. The green hops were divided into 2 lots, one of which was sulfured during the drying process. The dry sulfured and unsulfured hops were again divided into lots for analysis and for storage (wrapped in burlap). At the end of the 1st, 2nd and 3rd years samples of the stored hops were analyzed. The following conclusions are drawn: Sulfuring and cold storage retard changes in the physical characteristics of hops; a combination of the 2 factors is more effective than either factor alone. The moisture content of sulfured and unsulfured hops held in cold

storage increased first and then remained practically constant; in open storage it varied according to existing weather conditions. The soft resins diminished from year to year with all samples, the hard resins at the same time increasing and approaching a uniform value at the close of the third year. Both sulfuring and cold storage retarded the decrease in soft resins. The total resins in all samples varied from year to year, and in the third year they became materially less than those of the original sample. The low total is probably due to the formation of products insol. in the solvents used (petroleum ether and Et_2O). The color, odor and taste of the soft resins are of very little value in detg. quality and are not indicative of any changes that may have taken place therein. The acid value in general decreased in the sulfured hops in cold and open storage and increased in the unsulfured hops. The ester value in general increased in all the samples of hops. Sulfuring apparently favors the formation of esters and this factor in combination with open storage appears to be the least effective in retarding the formation of esters. The sapon. value in general increased in all samples. The unsulfured hops showed the least change, especially those held in open storage. The I value in general increased in all samples. It was most pronounced in the 2nd year and in the 3rd year was uniform in all samples. Sulfuring in combination with open storage appears to cause a uniform rate of increase in the I value from year to year. The sulfured hops in open storage showed the least variation in changes in the chem. values of the soft resins. During the period of storage at least some of the components of the soft resins underwent rearrangement, this having been most marked during the first year, after which it decreased to such an extent that thereafter comparable values for the chem. constants were readily obtained.

L. W. HAAS.

Drying of potato slop. G. FORTH. *Z. Spiritusind.* 39, 9-11(1916).—The cost of drying original potato slop is very high. With corn slop of the same concn. the cost is the same, but drying of this is more economical, because dried corn slop has a feed value about double that of dried potato slop. By drying the residue obtained by decantation, filtration and pressing out the total cost of drying may be reduced by 70 to 90%, but this process involves a loss of 45 to 55% of dry substance. F. arrives at the conclusion that the problem to dry potato slop in an economically, satisfactory way is not yet solved and that there is little chance to solve it in the future.

L. W. H.

Coatings for cement vats. W. V. CRUESS. *Calif. Sta. Rept.* 1915, 31.—The tests were made to find a suitable coating for the interior of cement wine tanks. A melted mixt. of equal parts rosin, beeswax, and paraffin gave the best results. Gilsonite applied in soln. in CS_2 or melted with ceresin wax was very satisfactory.

W. V. C.

Extermination of grain pests by "globol." J. F. HOFFMANN. Berlin. *Z. Spiritusind.* 39, 11(1916).—"Globol" is to be employed in the same way as CS_2 and aniline oil, but in slightly larger proportions. "Globol" may be used in liquid ($\text{C}_6\text{H}_5\text{Cl}$) and solid ($p\text{-C}_6\text{H}_4\text{Cl}_2$) form. Liquid "Globol" is more effective than solid "Globol."

L. W. HAAS.

The utilization of waste oranges (CRUESS) 12.

Removing fermentation scum during air-yeast manufacture. R. REIK. Aust., 70,615, Dec. 10, 1915. The scum is drawn off by suction and returned under the surface of the vat liquor.

Removing fermentation scum during air-yeast manufacture. F. WULF AKT-GES. Aust., 70,639, Dec. 10, 1915. The foam is vaporized by blowing into the fermenting and aerated wort, fine, uniformly divided jets of air.

Fermenting tanks. F. ROGERSON. *Brit.*, 22,820, Nov. 20, 1914. A fermenting tun formed of ferroconcrete is lined with damp-proof cement consisting of cement mixed with soapy, greasy, or other waterproof material. The cement described in 17,070 x912, may be used. A second internal lining of a porous cement consisting of cement and sand is applied and is impregnated with a mixt. of waxes to which gums or resins may be added, as a mixt. of beeswax, ceresin, paraffin wax, and carnauba wax. The supports for the attemperator and the sluice or parachute are fixed in the walls of the tun during the construction.

17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

The determination of the iodine number of essential oils. R. MARCILLÉ. *Ann. fals.* 9, 6-11(1916).—A continuation of the study of the I no. of essential oils, with reference to liquors. (Cf. *C. A.* 9, 1092.) The I no. obtained by the method previously given, and the n_D^{20} for 43 essential oils are tabulated. Tables and curves show the effect of light and the time of reaction upon the I no. of angelica, anise, and peppermint oils. In the dark there is a gradual increase in the I no. up to 18 to 20 hrs., but in the light with angelica a rapid decrease after 15 min., while with anise the max. value is obtained after 45 min., and then the value drops off gradually. Oil of balm-mint, and peppermint, do not reach a max. under 2 hrs., but most of the other essential oils give curves in the light showing a diminution in the I no. after the first 30 min. Among all the oils studied anise and star anise alone show an increase in the I no., due to the action of light, and this property may serve to identify them. Oil of peppermint has an I no. of 0.58, while menthol shows no I absorption. This fact can be used to distinguish them. The I no. of anise oil decreases with the age of the sample, or its oxidation.

H. S. BAILEY.

Evaluation of opium tinctures. P. BOHRISCH AND F. KUERSCHNER. *Apoth. Ztg.* 31, 53-5(1916).—Reference is made to Fromme's comment (cf. Caesar & Loretz Jahresbericht) on a similar investigation by the above authors (cf. *C. A.* 9, 1968). In their opinion, Fromme's suggested Al acetate method offers no material advantages over the modified procedure of the Ger. Pharm., for which the following amended form is favored: Evap. 50 g. opium tincture in a porcelain dish to 15-20 g., dil. with H_2O , to 38 g. and add 2 g. approx. NH_3 . Pass through a folded filter into a glass-stoppered flask. To 32 g. filtrate (=40 g. tincture) add 10 cc. EtOAc and 5 cc. NH_3 and shake 10 min. vigorously, then add 20 cc. EtOAc and agitate moderately. After sepn. into layers, pour the EtOAc as completely as possible on to a smooth 8 cm. filter. After the ethereal liquid has run through, follow with the aq. layer. Should any EtOAc remain on the paper, it may be made to pass through by raising the filter and introducing between it and the glass a few strips of paper. Both flask and filter are washed with five 5 cc. portions H_2O previously satd. with EtOAc. Transfer the moist filter and morphine to a 200 cc. flask, add thereto the morphine remaining in the former flask by dissolving with 25 cc. 0.1 $NHCl$, pouring to main portion and following with 50 cc. wash H_2O . Add 20 cc. Et_2O and 10 drops iodoeosin soln. and titrate with 0.1 $N KOH$, shaking the mixt. vigorously after each addition to the appearance of a faint red. The number of cc. of acid $\times 0.07125$ = the morphine in 100 g. tincture. The standardization of acid with respect to alkali should be effected with the same indicator.

W. O. E.

The disappearance of cyanogen in sweetened preparations of bitter almonds. E. RUPP AND A. HOELZLE. *Univ. Koenigsberg. Arch. Pharm.* 253, 401(1915).—As

is well known from the work of Killiani and E. Fischer, HCN and dextrose react with the formation of nitrile compds. Exactly similar behavior has been noted in the case of KCN and Ba(CN)₂ on dextrose (cf. C. A. 8, 1356), for which reason it is inadvisable to incorporate sugar into any medicinal prepn. containing aq. solns. of bitter almonds. In no case should such preps. be sweetened with fruit juices. W. O. E.

Evaluation of organic silver preparations. J. HERZOG. *Arch. Pharm.* 253, 441-2 (1915).—Reference is had to F. Lehmann's suggestions given under the same caption (C. A. 9, 2125), with which the present writer is in entire accord. W. O. E.

Benzoyl peroxide. L. VANINO AND F. HERZER. *Arch. Pharm.* 253, 426-40 (1915).—A monograph descriptive of methods for prepg. this compd., together with some exptl. data relative to the yields resulting therefrom. A new method for estg. Bz₂O₂ is as follows: Into a small erlenmeyer weight 0.2-0.3 g. pure, dry sample, add 10-15 cc. alc., warm a short time on the H₂O bath until fully dissolved, add an excess of 0.5 N KI soln. (if too dilute, some Bz₂O₂ may be pptd.), render slightly acid, then heat the mixt. 4 min. on the H₂O bath, allow to cool and titrate after 1/2 hr. with freshly standardized Na₂S₂O₄. W. O. E.

The constituents of licorice root and of licorice extract. II. PERCY A. HOUSEMAN. *Am. J. Pharm.* 88, 97-105 (1916); cf. C. A. 7, 534.—The methods for detn. of sugars and crude glycyrrhizin remain unaltered, but sepn. of the glycyrrhizin from the starch and gums is now effected with 75% alc. since 80% alc. ppts., in some cases, a small quantity of glycyrrhizin. H. summarizes results of recent extns. of licorice root with ether, 99% alc., 75% (by vol.) alc., 50% (by vol.) alc., and H₂O. The ether exts. range from 2.9% to 4.9%. Alc. (99%) exts. 4.8% to 7.0%, whereas 95% alc. gave 10.8 to 12.7% (C. A. 7, 534), the results from 99% alc. corresponding more closely to the true amt. of total resins present than do those obtained, with 95% alc. which exts. other materials, such as cane sugar. H. describes a systematic prepn. of cane sugar from the root and identified it by its crystalline form, by its $[\alpha]_D^{20} = 66.3^\circ$ and by analysis. The total yield was about 2% of the root used. The hemolysis test was used for the detection of biologically active saponins. Negative results were obtained with both strong and mild aq. extns. of both the green and dried root, and also with exts. in which dil. alc. up to 50% (by vol.) in strength was employed as solvent. Hemolytically active saponins were extd. from both green and dried root by 75% (by vol.) alc. The biologically active saponins are in the inner bark and not in the outer bark or in the central part of the root. A detailed prepn. of glycyrrhizin (glycyrrhizic acid) from licorice root is given. The soln. of the acid was evapd. to dryness *in vacuo* and crystd. twice from hot glacial AcOH and after standing over potash in a vacuum desiccator, the following av. combustion figures were obtained: C = 58.37%, H = 7.72%, N = 1.09%. A portion of these crystals was crystd. 3 times more from hot glacial AcOH and perfectly colorless crystals obtained which, however, did not crystallize well from 50% alc. Two N estns. made on this product both gave 1.89%. The acid prepd. by this method became brown at 185°, partly melted with frothing at 203 to 205°, dissolved readily in warm H₂O, and gelatinized on cooling. It behaves differently toward H₂SO₄ and Br than glycyrrhizin which has not been crystd. from AcOH since a drop of 2 N H₂SO₄ added to 1 cc. moderately strong aq. soln. of the purified glycyrrhizin produces no immediate ppt. but on standing the liquid becomes opalescent, clearing on warming, and on subsequent cooling a granular ppt. is deposited which redissolves on warming. It absorbs Br in the cold but gives no ppt. Work is now in progress on the oxidation of glycyrrhizic acid with KMnO₄ and HNO₃, and also on the isolation of a yellow dye W. G. GAESSLER

The most important new medicines in 1915. F. ZERNIK. *Z. angew. Chem.* 29, I, 89-92 (1916). E. H.

Review of the therapeutic novelties made known in 1915, including the specialties and proprietary remedies. S. RABOW. Lausanne. *Chem. Ztg.* 40, 145-7, 167-9, 183-5 (1916).—The trade name, curative principle and name of manufacturer are given in most cases. A bibliography of 174 references is appended. A special edition may be ordered from *Chem. Ztg.*, Cöthen, Germany. J. H. MOORE.

Mercury salicylate in oil. ROBERT W. TERRY. *Midland Druggist* 49, 495-6 (1915).—To allay pain in its use in subcutaneous injection, J. L. Wollheim (*N. Y. Med. J.*, July 27, 1912) added "quinine-and-urea-HCl" (m. 70-71°) as anesthetic. A homogeneous mixt. of these with the required anhydrous wool fat, some H₂O and liquid petrolatum is tedious to prepare. Eliminating wool fat, T. mixes the Hg compd. (10.0 g.) with liquid petrolatum sufficient for sirupy consistence, triturates with soln. of the quinine salt (2.0 g.) in H₂O (3.0 g.), alternating small portions of the quinine soln. and oil until all of the former is added and the mixt. is homogeneous; then the remainder of the oil, a total of 100.0 g., is added. This prepn. may be sterilized by heat without apparent decompn. Probably the Hg salt in itself is a sufficient sterilizing agent.

S. WALDBOTT.

Hypochlorite solution for the antiseptic treatment of wounds. F. GOLDBY. *Pharm. J.* 95, 573 (1915); Henry Rodwell, *Pharm. J.* 95, 750 (1915).—G. recommends the following modification of Dakin's 2nd formula (cf. *C. A.* 9, 2943): Dissolve 105 g. dried Na₂CO₃ in 2 l. of H₂O. Triturate 150 g. CaOCl₂ of at least 30% available Cl with 1 l. of H₂O, mix the 2 solns. When the thick mass has thinned, filter and wash to 3.5 l. of total filtrate. Titrate 20 cc. thereof with H₂BO₃ soln. (31 g. in 1 l.), using phenolphthalein. The amt. found is very variable with different batches. Dissolve the calcd. H₂BO₃ varying from 20 to 60 g., in 0.5 l. of H₂O and add it to the prepn. The finished soln. is faintly pink to phenolphthalein and has 2.7 to 2.8% available Cl. For use it is dild. with 6 vols. H₂O. A concd. sample kept for 1 month still showed 2.5% Cl. R. cannot confirm the variation of H₂BO₃ and advocates the use of Dakin's original 2nd formula in which the above amts. of Na₂CO₃ and CaOCl₂ are dissolved each in 1 l. of H₂O.

S. WALDBOTT.

Coal gas residuals and their application (WAGNER) 21.

Therapeutic compounds. FARBW. v. M. L. & B. Brit., 22,828, Nov. 20, 1914. 4'-Hydroxy-3'-carboxy-2-phenylquinoline-3-carboxylic acid is prepd. by heating isatinic acid with *p*-acetosalicylic acid in caustic alk. soln., or by heating *p*-aldehydosalicylic acid with aniline and pyruvic acid in alc. soln. It forms a disodium salt and a diethyl ester. It is intended for medicinal use, particularly in the treatment of arthritis and rheumatic diseases.

Organo-metallic compounds. SOC. ANON. DES ÉTABLISSMENTS POULENC FRÈRES. Brit., 22,521, Nov. 14, 1914. 4-Dimethylaminophenylarsonic acid is nitrated by means of dil. HNO₃ or a nitrate in the presence of dil. H₂SO₄; 1 mol. proportion of HNO₃ gives either 4-dimethylamino-3-nitrophenylarsonic acid, or 4-*N*-methylnitrosoaminophenylarsonic acid, or a mixt. thereof; excess of HNO₃ gives a mixt. of 2 dinitro compds. The 4-dimethylamino-3-nitrophenylarsonic acid on heating with caustic alkali soln. yields 4-hydroxy-3-nitrophenylarsonic acid. The parent substance 4-dimethylaminophenylarsonic acid is obtained by treating dimethylaniline with AsCl₃ and oxidizing the resulting 4-dimethylaminophenylarsonic chloride.

Hydroxytriarylmethanecarboxylic acids. BAYER & Co. Ger., 286,433, July 4, 1914. Mixts. of 2 mols. of an aromatic *o*-hydroxycarboxylic acid and 1 mol. of an aromatic aldehyde are treated with ZnCl₂ in the presence of POCl₃.

2-Chloro-4-dimethylaminobenzene-1-arsonic acid. C. F. BOEHRINGER & SÖHNE. Ger. 286,546, Feb. 4, 1915. $m\text{-ClC}_6\text{H}_4\text{NMe}_2$ is treated with AsCl_3 and the resulting arsenoxide is oxidized to 2-Cl-4-dimethylaminobenzene-1-arsonic acid. This acid is less poisonous, and more active, than the corresponding non-chlorinated acid.

Ether-like derivatives of barbituric acid. CHEM. WERKE VORM. H. BYK. Ger. 285,636, Sept. 17, 1912. Alkylalkoxyalkyl- or dialkoxyalkylmalonic acids or their derivs. are converted into the corresponding C,C-alkylalkoxyalkyl- or dialkoxyalkylbarbituric acids by the methods usual for the production of barbituric acids or their C-mono- and dialkylsubstitution products.

Acetic acid. FARBW. v. M. L. & B. Ger., 286,400, Apr. 27, 1913. See Brit., 10,377 (C. A. 9, 2796).

Dihydric phenols. C. F. BOEHRINGER & SÖHNE. Ger., 286,266, Mar. 20, 1912. Addition to 284,533 (C. A. 10, 94). The process of 284,533, addition to 269,544 (C. A. 8, 2221) for the production of dihydric phenols and their substitution products is modified by substituting alk.-earth hydroxide for the alkali hydroxide or carbonate, wholly or in part.

Bismethylhydrazinotetraminoarsenobenzene. C. F. BOEHRINGER & SÖHNE. Ger., 285,573, Dec. 12, 1912. 3,5-Dinitro-4-methylnitroaminobenzene-1-arsonic acid is subjected to a mild reduction (at 50° or less) by means of SnCl_2 and HCl .

Derivative of thebaine. M. FREUND and E. SPYER. Ger., 286,431, May 15, 1914. Thebaine, treated in acid soln. with H_2O_2 or $\text{K}_2\text{Cr}_2\text{O}_7$, yields a compd. of the compn. $\text{C}_{18}\text{H}_{19}\text{NO}_4$, m. 274° , in which the O atom has entered the nucleus. The base yields salts which crystallize well.

6-Nitro-3-amino-1-hydroxybenzene and its methyl ether. FARBW. v. M. L. & B. Ger., 285,638, May 5, 1914. 4-Nitro-1-acetylaminobenzene-3-sulfonic acid (nitroacetylmetanilic acid) is heated with MeOH -alkali under pressure and at elevated temps.

Aluminium ethylate. FARBW. v. M. L. & B. Ger., 286,596, Dec. 13, 1913. Pure Al ethylate is obtained from Al and anhydrous alc. with a good yield if, in the presence or absence of halogen alkyls or I, very small amts. of HgCl_2 are added as catalyst. Upon subsequent vacuum distn., for the purpose of purifying the crude product, the Al ethylate goes over readily and without bumping, solidifying to a snow-white mass, while Hg is not carried over with it.

Methyl chloride. A. HOCHSTETTER. Aust. (app.) 9,887, Feb. 20, 1913. COCl_2 is allowed to act on CH_4 at an elevated temp., and the mixt. is conducted over catalyzers which either act as Cl carriers, or hasten the reaction by surface action.

Methyl chloride from methane. H. HOCHSTETTER. Aust., 70,733, Dec. 27, 1915. COCl_2 is allowed to act on CH_4 at an elevated temp. In a modification, the mixt. of COCl_2 and CH_4 is conducted over catalyzers which function as Cl carriers or hasten the reaction by surface action.

Stable compounds of hydrogen peroxide with organic compounds. CHEM. FABRIK GEDRON RICHTER. Aust., 70,938, Jan. 10, 1916. In the stabilization of the unstable compds. of H_2O_2 with organic substances, according to 26,829, employing as stabilizing agents derivs. of organic acids which, in the presence of alkali, are decomposed with the combination of the alkali with the acid residue. E. g., the compd. of H_2O_2 and carbamide is mixed, while still moist, with 0.5% "urea citric acid," and carefully dried. Other additions are: succinic acid 0.5%, phenacetin 0.3%, alc. soln., Me phthalate 0.5% (dissolved in alc.). Cf. C. A. 10, 1079.

Amino acid esters. R. WOLFFENSTEIN. Aust., 70,829, Dec. 27, 1915. Trichlorotertiarybutyl haloacetates are condensed with secondary aliphatic amines.

Urea. BADISCHE. Aust., 70,830, Dec. 27, 1915. Urea is recovered from the reaction mixts. obtained by heating NH_4 carbonate, carbamate, and the like, by subjecting such mixts. to distn. at temps. not exceeding 80° . The recovery of the NH_3 - CO_2 mixt. passing over during distn. and failing to yield urea, is effected by conducting the NH_4 carbamate and carbonate into an indifferent liquid not miscible with H_2O .

Salts of betaine. AKT.-GES. FÜR ANILIN-FABRIKATION. Aust., 70,874, Jan. 10, 1916. $\text{Me}_2\text{NCH}_2\text{CO}_2\text{Me}$ is brought into reaction with a methyl halide in the absence or presence of an indifferent solvent, and the resulting methyl ester of the corresponding betaine salt is hydrolyzed by heating the aq. soln., preferably in the presence of a mineral acid.

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

Sulfur, pyrite, and sulfuric acid in 1914. W. C. PHALEN. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 131-49 (separate, published July 26, 1915).

E. J. C.

The production of salt, bromine and calcium chloride in 1914. W. C. PHALEN. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 291-306 (separate, published Sept. 20, 1915).

E. J. C.

The production of barytes in 1914. JAMES M. HILL. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 61-5.—The production of crude barytes in the U. S. in 1914 was 51,500 short tons. Sources are given.

E. J. C.

The production of borax in 1914. CHAS. G. YALE AND HOYT S. GALE. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 285-90 (separate, published Sept. 4, 1915).

E. J. C.

The gypsum industry in 1914. G. F. LOUGHLIN. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 261-70 (separate, published Aug. 23, 1915).

E. J. C.

The production of magnesite in 1914. CHAS. G. YALE. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 569-86 (separate, published Oct. 28, 1915).

E. J. C.

The production of fullers' earth in 1914. JEFFERSON MIDDLETON. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 35-40.—40,981 short tons were produced in 1914.

E. J. C.

The production of fluorspar in 1914 with a note on cryolite. ERNEST F. BURCHARD. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 123-9 (separate, published July 26, 1915).

E. J. C.

The production of feldspar in 1914. FRANK J. KATZ. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 449-54 (separate, published Oct. 15, 1915).

E. J. C.

Arsenic. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 553-64 (separate 26, published Feb. 26, 1916).

E. J. C.

The production of talc and soapstone in 1914. J. S. DILLER. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 151-7 (separate, published July 30, 1915).

E. J. C.

The production of graphite in 1914. EDSON S. BASTIN. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 159-74 (separate, published Aug. 20, 1915).

E. J. C.

The production of asbestos in 1914. J. S. DILLER. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 93-102 (separate, published July 20, 1915).

E. J. C.

The production of abrasive materials in 1914. FRANK J. KATZ. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 349-68 (separate, published Oct. 26, 1915).

E. J. C.

Results of the new processes for the production of chemically pure nitrogen from the air, also of water gas by a continuous treatment through utilization of the oxygen and decomposition of water vapor by red hot coal. R. PICTET. *Arch. de Genève* 39, 281-4(1915); *Beiblätter Ann. Physik* 39, 474.—The process, which is commercially profitable, rests on the cascade principle.

L. W. RIGGS.

The chemical industries of Germany and France according to French information. H. GROSSMANN. *Chem. Ztg.* 40, 181-3, 222-3(1916).—A review of French statistics as published by Fleurent.

J. H. MOORE.

High-temperature insulation. P. A. BOECK. N. Y. *J. Ind. Eng. Chem.* 8, 372-7 (1916).—Thermal insulation, especially of large furnaces, is discussed, covering some of the ground already covered in *C. A.* 9, 2572; 10, 722.

W. P. WHITE.

The manufacture of plastic masses from casein, especially of galalith. E. STICH. *Kunststoffe* 5, 145-6, 158-61, 171-3, 185-6(1915).—A comprehensive review.

F. W. SMITHER.

The American chemist and the war's problems. JAMES R. WITHEROW. *J. Ind. Eng. Chem.* 8, 453-6(1916).—An address.

E. J. C.

War chemistry. A. TSCHIRCH. *Pharm. Post* 59, 1-6, 17-9(1916).—A review of some of the chem. industries that have been stimulated by the war.

C. O. E.

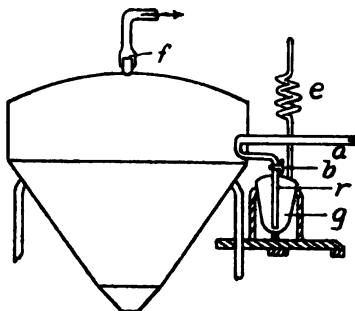
The influence of the first year of the war upon the price of American chemicals. H. G. *Chem. Ind.* 38, 481-2(1915).

F. W. SMITHER.

Sulfide of phosphorus. F. C. FRARY. *Can.*, 165,931, Nov. 9, 1915. See U. S. 1,153,054 (*C. A.* 9, 2800).

Anhydrous hyposulfite. OESTERREICHISCHER VEREIN FÜR CHEM. UND METALLURGISCHE PRODUKTION. *Aust.*, 70,949, Jan. 10, 1916. The dehydration of solid hyposulfite hydrate is carried on under a high boiling liquid, not miscible with H_2O , at a temp. above the b. p. of H_2O .

Table salt from rock salt. GEWERKSCHAFT EINIGKEIT I. *Aust.*, 70,947, Jan. 10, 1916. An app. comprises a channel, divided in the direction of the motion of the salt into canals, and heated on the bottom.



Sodium oxalate. K. HAUPT. *Ger.*, 286,461, Sept. 19, 1913. Na is fused with 0.1 its wt. of petroleum in the vessel g, provided with reflux condenser e, and heated to 150-200°. CO_2 is then conducted through the tube a at a temp. of 360-400° and under 0.5 atm. pressure, whereby the Na is atomized, by injection, through the tube r, provided with cock b, into the chamber in which the resulting $Na_2(OCO)_2$

falls to the bottom. The excess CO_2 escapes through the valve *f* to be returned to the system.

Zinc sulfate. H. T. DURANT and METALS EXTRACTION CORPORATION. Brit., 21,737, 1914. ZnSO_4 is obtained from roasted ZnS ores by dissolving out the ZnSO_4 with H_2O , if desired, and treating the residue, or the roasted ore without such preliminary treatment, with dil. H_2SO_4 in quantity less than sufficient to dissolve all the ZnO , thus obtaining a soln. free from Fe and SiO_2 . The residue is then treated with more dil. acid to ext. the remainder of the Zn, and this soln., which may be impure, is then used, together with more dil. acid, in the treatment of another batch of roasted ore in which the excess of ZnO ppts. the impurities. The ore before or after roasting is crushed and screened, the coarse part being treated by leaching, and the fine by pulping and filter-pressing.

Heating by chemical action. W. F. McNABB. Brit., 22,242, Nov. 9, 1914. A mixt. for producing heat by chem. action with H_2O consists of a caustic alkali in solid form such as KOH or NaOH, with an oxidizable substance such as $(\text{HOCO})_2$ or tartaric acid, and an oxidizing agent such as a persulfate. The mixt. may be used for warming food in an air-tight can, as a disinfectant, and for cleaning sewers and sanitary appliances. Suitable proportions are 15 g. NaOH, 5 g. $\text{H}_2\text{C}_2\text{O}_4 \cdot 2\text{H}_2\text{O}$, and 5 g. $\text{K}_2\text{S}_2\text{O}_8$ to which 0.5 g. KNO_3 and 3 g. tartaric acid may be added, and, in order to produce greater heat, 0.5 of finely divided or granulated Al. When used as a disinfectant, 0.3 g. of HgCl_2 may be added, together with vanilla, musk, or camphor.

Metal polishes. H. HUNTER. Brit., 22,752, Nov. 19, 1914. A metal polish consists of 1.25 lb. rottenstone, 1.25 lb. emery flour, 3 qt. turpentine, 2 qt. turpentine substitute, 1 pt. methylated spirit, and either 1.25 lb. pumice powder or 0.5 oz. jeweler's rouge.

Oxygen from air. L. BERGFELD and A. WEYRICH. Aust., 70,942, Jan. 10, 1916. In obtaining O from air, N_2O_5 is oxidized with air, in the presence of steam, to HNO_3 from which, by passage through H_2SO_4 , with heating, O is liberated, while the residual $\text{NO}_2 \cdot \text{SO}_3\text{H}$ is decomposed, by the action of steam, into H_2SO_4 and N_2O_5 which is treated as specified. Cf. C. A. 9, 237.

Non-explosive preparations. FARBW. v. M. L. & B. Aust., 70,653, Dec. 10, 1915. Sulfite cellulose end lyes, or their essential constituents, or phenols or their salts, are incorporated with the nitro- or di- and poly-nitro compds., especially the di- and trinitro-phenol salts.

Preparation of lithographic metal plate surfaces. F. NIEMEYER. Ger., 286,367, Feb. 9, 1913. The plates are treated with a dil. acid holding in suspension a finely divided material which is not attacked by the acid and which settles slowly, so that it gradually weakens the action of the acid on the plate, and finally stops it altogether. If desired, the process can be repeated by stirring the liquid. Especially suitable for the treatment of Zn plates are mixts. of the salts of 2 metals, such as the salts of Fe and Cu, especially CN compds. of these metals. These are not attacked by the acid of the bath, and, on account of the fineness of the particles and low sp. gr., they remain suspended for some time in the liquid.

19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

The production of silica (quartz) in 1914. FRANK J. KATZ. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1914, Pt. II, 443-8 (separate, published Oct. 14, 1915).

E. J. C.

Influence of the Al_2O_3 - SiO_2 ratio on the properties of porcelain glazes. R. RIECK AND W. STIEGER. *Sprechsaal* 48, 390-2(1915).—Glazes with 0.3 K_2O , 0.7 CaO , 0.3-2.0 Al_2O_3 , 6-16 SiO_2 were burned on porcelain at cone 15. With more than 9-10 SiO_2 an enamel-like turbidity was obtained, changing to complete opacity with higher SiO_2 . Crazing appeared below 6-8 SiO_2 and with 0.3-0.4 Al_2O_3 . The coeff. of expansion varied from 294×10^{-8} to 532×10^{-8} and was independent of the Al_2O_3 : SiO_2 ratio with increasing percentage of fluxes. The alkalis principally seem to increase the coeff. Glazes having a coeff. less than 400^{-8} were free from crazing, this being close to the coeff. of the body (50% Zettlitz kaolin, 25% quartz, 25% feldspar). R. K. H.

The adsorptive power of clays, kaolins and talcs. P. ROHLAND. *Apoth. Ztg.* 31, 40-2(1916); cf. *C. A.* 9, 2322.—Just as it has been found that animal charcoal adsorbs colors of animal, plant and artificial origin, such action being most pronounced in the case of blue and violet dyes, less so with red and green, and least of all the yellow and brown, in the present paper it is shown that the rate or order of adsorptive activity is given in the following scale: (1) methylene blue, (2) methyl violet, (3) malachite green, (4) brilliant green, (5) bordeaux red, (6) eosin, (7) vesuvin, (8) aniline yellow.

W. O. E.

Light porous bricks. ANON. *Brit. Clayworker* 24; *The Brickbuilder* 1916, 47.—Porosity may be secured by (1) adding sawdust, naphthalene, flour or paper pulp which burn out (coal causes overfiring); (2) using clay as a binder for kieselguhr, asbestos, silicate cotton, etc.; a typical mixt. is 7 lbs. kieselguhr, 3 lbs. asbestos, 5 lbs. clay mixed with water and burned to 1000° . Absorption should be 100%.

C. H. KERR.

Bricks for high temperatures. W. A. HEISEL. *Brit. Clayworker* 24, 183(1916).—A general description.

C. H. KERR.

Notes on the occurrence and use of flint clay. J. H. HANCE. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 639-48.—Typical analyses are given and the uses, geological occurrence, methods of sampling and testing and methods of development of deposits are described. A bibliography of the occurrences of flint clay is included.

E. J. C.

Statistics of the pottery industry in the United States in 1914. JEFFERSON MIDDLETON. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II (preliminary issue dated Aug. 6, 1915).

E. J. C.

Statistics of the clay-working industries in the United States in 1914. JEFFERSON MIDDLETON. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 455-548 (separate, published Oct. 23, 1915).

E. J. C.

Rough surfaced ceramic plates. UTZSCHNEIDER & E. JAUNEZ. *Aust.*, 70,826. Dec. 27, 1915. Granules of carborundum are incorporated in the upper layer of a burned plate. Cf. *C. A.* 9, 1984.

Securing metal coatings to ceramic surfaces. L. HELLER. *Ger.*, 286,537, Oct. 12, 1913. See U. S., 1,126,211 (*C. A.* 9, 701).

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

The cement industry in the United States in 1914. ERNEST F. BURCHARD. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 221-59 (separate, published Aug. 23, 1915).—Statistics.

E. J. C.

The production of lime in 1914. G. F. LOUGHLIN. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 363-73 (separate, published Oct. 14, 1915).

E. J. C.

Tests of Douglas-fir bridge stringers (to determine the effect of treatment on strength). H. B. MACFARLAND. Eng. of Tests, A. T. and S. F. Ry. System, Am. Ry. Eng. Assoc., *Bull.* 184 (1916) (to appear later *Proc. Am. Ry. Assoc.* 17, Pt. II).—Over 50 7 in. $\times$ 16 in. $\times$ 15 ft. D. fir bridge stringers were creosoted by the boiling under vacuum process and tested for strength in comparison with a similar number untreated. The results indicate that about $\frac{1}{3}$ of the moisture in the wood was removed by the treatment; the treated material lost about $\frac{1}{4}$ of its original av. strength; its stiffness was not affected; the loss in strength was not confined to the area penetrated by the creosote. Detailed records and photographs are given.

GEO. M. HUNT.

Methods for the examination of bituminous road materials. P. HUBBARD AND C. S. RÆGEV. U. S. Dept. Agr., *Bull.* 314, 48 pp. (1915).—A revision of a previous bulletin (cf. C. A. 6, 540). A detailed description of methods (with numerous cuts of app., report forms, tables, and an outline of equipment for a lab.), under the following captions: classification of materials, scheme of examn., sp. gr. detn., sp. viscosity detn., float test, penetration test, m. p., flash and burning points, volatilization test, distn. test, dimethyl sulfate test, bitumen sol. in CS_2 , bitumen insol. in paraffin naphtha, bitumen insol. in CCl_4 , fixed C, paraffin scale, extn. of bituminous aggregates, grading the mineral aggregate, voids in the mineral aggregate, bituminous emulsions.

F. W. SMITH.

Cements. L. P. BASSER. Brit., 22,644, Nov. 17, 1914. Modifications in the process of 17,873, 1913 (C. A. 9, 365), for mfg. cement or hydraulic lime from CaSO_4 , clay, and charcoal, consisting (1) in employing a furnace having two zones of different oxidizing powers, (2) in first treating the CaSO_4 with C under the conditions described in the parent specification, and subsequently mixing the lime obtained with clay, (3) in using an excess of clay so as to obtain a slag, and then either roasting the slag in presence of lime or CaCO_3 , or granulating the slag and mixing it with slaked lime to form slag cement. Both zones may be oxidizing, or the first zone may be reducing or neutral according to the proportion of C in the charge, and in the extreme case no C is present in the charge.

Rough stone. C. SCHNEIDER. Aust., 70,827, Dec. 27, 1915. In the manuf. of castings of cement and finely divided combustible matter, the latter is incorporated only in the outer layer of the block.

Artificial stone. A. RINNE. Brit., 28,417, Dec. 9, 1913. Artificial stone or synthetic marble slabs and the like composed of or containing $\text{Ca}(\text{OH})_2$ or $\text{Mg}(\text{OH})_2$, or other alk.-earth mixed with mineral filling materials or coloring matter are cast or pressed sep. in molds of the same size as the required slab, and are then suspended vertically while being hardened by CO_2 treatment so as to prevent distortion. The suspending means, such as metal wires, threads, or grips are pressed or embedded in the slabs during the casting or pressing operation. The slabs thus produced may be smoothed by means of powders and polished in the usual way, but preferably, polished steel molds are used, the smoothing operation being thereby rendered unnecessary.

Artificial marble. H. BRUSCH. Aust., 70,872, Jan. 10, 1916. The major portion of the H_2O is removed from the mass which has been made plastic with a little H_2O , by compression in two stages, whereupon the mass is broken up into pieces and, after this mass has been rolled out upon a perforated board covered with muslin, the coloring

matter is applied and a second rolled layer is superimposed, the whole is rolled together, compressed axially, and again rolled out.

Artificial stone slabs. A. HARTMANN. Aust., 70,937, Jan. 10, 1916. Artificial stone slabs are manufd. by working together a mixt. of hydraulic binder, well dild. with H_2O , and mineral fiber, on the pulp machine. Asbestos and slag wool are employed together.

Impregnating wood. GRUBENHOLZIMPRÄGNIERUNG GES. M. B. H. Aust., 70,654, Dec. 10, 1915. In the impregnation of wood with aq. solns. of dinitrophenols or their salts, with or without the addition of other substances, such as inorg. salts, adding to the solns. alkali chromates, dichromates, iodates, chlorates, borax, or dialkali phosphates, alone or in admixt.

Impregnating and preserving wood. M. MAYERL, JR. Aust., 70,732, Dec. 27, 1915. The wood is coated with an easily absorbed liquid such as tar oil, or the like, mixed with a readily combustible compd. such as alc., benzine, or the like, in such proportion that, upon burning this admixt. neither the other constituent of the mixt. nor the wood is kindled or destroyed, so that upon kindling, the readily combustible constituent burns and serves to burn the satg. agent into the wood. In a modification of the process, melted pitch, rendered odorless and difficultly fusible by removal of the volatile constituents, and preferably in admixt. with colophonium or the like, is burned onto the previously heated or artificially dried wood as a glaze.

Preserving and restoring wood. S. ENDRÖDI. Aust., 70,652, Dec. 10, 1915. The well dried article is imbedded in a paraffin-wax mixt., solid at the ordinary temp. m. below 100° , and contracting considerably upon solidifying. The wood is first heated to the m. p. of the molten mass, wherein it is heated, and the whole is allowed to cool, then the paraffin-wax casing is removed and the surface of the wood cleaned by means of a suitable solvent.

Destroying wood worms. J. M. LAP. Brit., 100,019, Jan. 14, 1916. Wood worms and other vermin in wood, etc., are destroyed by the application of a compn. consisting of Hg ointment, NaCl and wax. Coloring matter, such as yellow ochre and aniline dyes, may be added. The compn. destroys the parasites and fills up the holes.

21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

A test of a surface-combustion furnace. E. SCHRAMM AND J. R. CAIN. *J. Ind. Eng. Chem.* 8, 361-5(1916).—A laboratory surface-combustion type of gas furnace was tested by making simultaneous measurements of air and gas consumed, of flue gas compns. and of temps. developed with various rates of combustion. The effect on temps. of varying air-gas ratios was also studied. The highest temp. reached was 1675° , at which point the alundum muffle failed. The test established that complete combustion could be attained without excess air, that the best air-gas ratio was 5:3, and that a 20% excess of air caused a lowering of the furnace temp. of 100° .

E. SCHRAMM.

Fuel briquetting in 1914. EDWARD W. PARKER. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 57-60.—The production in 1914 was 250,000 short tons valued at \$1,500,000. Raw materials and binders are discussed. "The chief objection to the use of pitch binders is the emission of smoke when first fired, which

results in the deposition in the flues and on other surfaces of a tarry soot, which is difficult to remove."

E. J. C.

The production of coal in 1914. C. E. LEAHER. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 587-746 (separate, published Nov. 29, 1915).

E. J. C.

The production of peat in 1914. CHAS. A. DAVIS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 375-85 (separate, published Oct. 9, 1915).

E. J. C.

Peat as a source of power. GEORGE FLETCHER. Some chemical aspects of the peat problem. GILBERT T. MORGAN. *J. Dept. Agric. Tech. Instruction Ireland* 16, 33-45(1916); *Nature* 97, 19-23(1916).—It is considered that the industrial utilization of peat can be most efficiently brought about by gasifying it in gas producers, as this procedure renders feasible the recovery of several valuable by-products. The combined nitrogen of the peat can be economically recovered in the form of $(\text{NH}_4)_2\text{SO}_4$. This valuable fertilizer together with the peat ash containing potash and phosphoric acid can be restored to the land from which the peat had been taken. Peat tar, another by-product, can be fractionated into the following useful materials: refined pitch and tar, candle wax, lubricating and burning oils, and very powerful disinfectants. The aq. distillate from the producer contains MeOH, acetone, pyridine bases and crude AcOH, all of which are capable of recovery and utilization.

W. H. ROSS.

Coal-gas residuals and their application. FRED. H. WAGNER. Johns Hopkins Univ. *J. Franklin Inst.* 181, 505-24(1916); cf. *C. A.* 9, 142.—A comprehensive description of the chem. reactions involved and the procedure used in the recovery of graphite, tar, S, NH_3 and CN compds. in the destructive distn. of coal. An outline is given of the fractionation of the tar, and the manuf. of dyes, explosives, pharmaceuticals, and chemicals from the various fractions.

JOSEPH S. HEPBURN.

Coal problem. H. E. ARMSTRONG. *J. Soc. Chem. Ind.* 35, 220-71(1916); *J. Gas Lighting* 133, 416(1916).—An economic discussion on the utilization of coal.

R. H. SAWENS.

Coal handling and carbonization. J. DICKSON. *J. Gas Lighting* 133, 417-8 (1916).—A description of economics in coal handling as practiced at the Kirkintilloch Gas Works is given. In reference to carbonization, D. advocates greater production of gas of lower value, showing that it serves as well for most purposes. By giving careful attention to heats and settings an av. yield of 12,000 cu. ft. of 15.5 c. p. gas per ton is attained. The resulting coke is hard and gives very little breeze. A considerable advantage of this process is the automatic removal of C from the retorts. When the cake becomes about $\frac{1}{4}$ in. thick it falls off; this is attributed to the rapid retort charging followed by an increased pull on the exhaustor.

R. H. SAWENS.

Carbonization of coal in gas works. J. W. NAPIER. *J. Gas Lighting* 133, 407 (1916).—N. points out the advantage of vertical retorts over the horizontal type. There is no complicated machinery for charging and discharging; the capacity is greater; operation is more simple; coke of high quality is produced. A disadvantage at present is the lower yield of C_2H_4 and C_2H_2 . Expts. to increase the NH_3 yield were tried, the most successful being the passage of steam intermittently through the red-hot coke. In this way a slight increase of NH_3 was produced and a considerable increase in the volume of gas due to the H_2O gas formed.

R. H. SAWENS.

Carbonization and purification. J. DICKSON AND W. BENNET. *Gas World* 64, 200-3(1916).—The papers are confined to the personal experience of D. and B. and contain many useful details of coal handling, carbonization and gas purification in practical day operation.

M. L. TROWBRIDGE.

Purification (of gas). W. BENNET. *J. Gas Lighting* 133, 419-22(1916); *Am. Gas Light J.* 104, 202-5(1916).—Light tars and tar fog must be completely removed before the gas enters the scrubbers in order to avoid "clogging up" in the scrubbers and oxide purifiers. The small amounts of CO_2 escaping the scrubbers, and CS_2 produced in modern gas practice are of little consequence, the main problem being the removal of the NH_3 and H_2S . Since the NH_3 pressure of the soln. must be less than that of the gas in order to have any absorbing value, it is wrong to place a washer on the exhaust side. NH_3 absorption increases with decrease of temp. but this must not be carried low enough to throw out C_2H_4 and C_4H_4 . Dry purification with Fe_2O_3 seems to be most practical for removal of H_2S and, under certain conditions HCN and CS_2 . The fouled material is easily revived by passing air through it. In a series of oxidation boxes it has been found possible to introduce air in such a way that the oxidation goes on at the same time as the sulfiding. The reactions do not take place extensively side by side however. The soln. of the problem is to use the boxes in either forward or backward rotation, the valves working either way. A number of factors influence the efficient working of oxide purifiers: the physical state of the oxide, its size, moisture and compn. As a mixing material old oxide is preferable to sawdust or coke breeze. In the purifier the chemical action evolves heat which should be conserved to render the oxide more efficient. If the oxide is too moist this heat is taken up in evapg. the H_2O . Better results are obtained by artificially heating the boxes by means of interior steam coils. Light oils and tar fog together with moisture and heat are largely responsible for caking of the oxide. Acidity of the oxide should be avoided because of the formation of FeS_2 which is not easily revived. To correct this condition a trace of NH_3 is allowed to go forward with the gas although enough usually passes the scrubber to keep the purifiers alk. A downward flow of gas through the purifiers is desirable. In explanation of the fact that S is occasionally found deposited in the service pipes when the gas leaving the works rarely shows a trace, attention is called to the reversible reaction which takes place with moderate speed at temp. above 77° , $\text{CS}_2 + \text{H}_2\text{O} \rightleftharpoons \text{CO}_2 + 2\text{H}_2\text{S}$.
R. H. SAWENS.

Judging the accuracy of generator-gas analyses. F. HOFFMANN. *Z. anorg. Chem.* 29, I, 46, 54-6(1916).—From a study of the volumetric compn. of gas mixts. resulting from the dry or wet gasification of C with the aid of air, H. has devised a scheme for detg. the accuracy of a number of given generator-gas analyses. By means of formulas given in the text the gas is divided into 2 portions, the "de-gasification" (Entgasung and the "gasification" (Vergasung); the latter, considered independently, is studied by further formulas, or more simply by an accompanying diagram, as to whether and in what amts. its percentage compn. deviates from the volumetric compn. as previously detd. by analysis. The degree of deviation enables one to judge as to whether the analysis may be considered as correct, doubtful, or false. The method is explained by numerous examples. A large number of the generator-gas analyses reported in the literature are inaccurate according to H.'s formulas.
F. W. SMITH.

The production of natural gas in 1914. JOHN D. NORTROP. U. S. Geol. Survey. *Mineral Resources of U. S., 1914*, Pt. II, 747-818 (separate 32, published Dec. 15, 1915).
E. J. C.

Pitch for gas making. A. YUILL. *J. Gas Lighting* 133, 422(1916); *Gas World* 64, 174(1916).—10% of a hard pitch fusing at 90° , broken into small pieces and thoroughly mixed with a good coking coal and carbonized in a vertical oven will give satisfactory results and will yield as found by expts. 9488 cu. ft. of gas per ton of pitch. Compared with all coal results the admixt. of coal and pitch yielded rather less coke per ton of material; rather more tar and about the same quantity of liquor; and 262 cu. ft. less

of gas of higher calorific value. The mixed coke is of excellent appearance and burns well. In a horizontal retort a 5% mixt. gave satisfactory results. M. L. T.

Increasing the yield of hydrocarbons in gas and tar. A. ROLLASON. *Gas World* 64, No. 1646, *Coking and By-Product Section*, 10(1916).—A series of tests has been made on low grade coking slacks with and without the addition of limestone before carbonization. Careful measurements of the volume and calorific value of gas were made. The results obtained per ton of coal carbonized follow. The ash content of the coal was 26.9%.

	Coal only.	Coal and Carbonate.
A. v. temp. of carbonization.....	1,081°	1,099°
B. t. u. in gas made.....	4,535,600	4,984,900
Tar.....	6.29	9.26 gals.
Light oil, 0-170°.....	0.31	0.69 gal.
Toluene in tar.....	0.53	1.21 lbs.
Toluene in gas.....	1.64	3.13 lbs.

M. L. TROWBRIDGE.

The manufacture of coke in 1914. C. E. LESHER. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 387-442 (separate, published Oct. 13, 1915).—Statistics. E. J. C.

Portable gas detector (BURRELL) I.

Gaseous-fuel furnaces. J. M. RUSBY. *Brit.*, 22,425, Nov. 12, 1914. The temp. of combustion in a retort furnace heated by a combined gas producer is controlled in two stages, namely (1) by supplying steam to the producer in sufficient quantity to maintain the temp. of the fuel bed at a point below that dangerous to the refractory material of the producer, or at which clinker is formed, and (2) by admitting inert gases, e. g., returned combustion products, to the chamber in which the producer gas is burned with air.

Nitrogen compounds and combustible gas from nitrogenous fuel. C. F. MAULE. *Aust.*, 70,612, Dec. 10, 1915. The necessary lowering of the generator temp. is effected by the return of a portion of the cooled gas from the generator. This gas is allowed to generate and take up the greatest possible amt. of steam, whereby, in addition to the cooling effect, a marked decrease in its combustibility results. A modification consists in employing a very moist fuel (peat with about 60% H₂O) in the generator.

Recovering ammonium sulfate from distillation gases. BERLIN-ANHALTISCHE MASCHINENBAU-AKT.-GES. *Aust.*, 70,650, Dec. 10, 1915. The condensate falling beyond the saturator, at the high temp., is treated with an excess of H₂SO₄, and this mixt. is returned to the saturator.

22. PETROLEUM, ASPHALT AND WOOD PRODUCTS.

F. M. ROGERS.

Petroleum in 1914. JOHN D. NORTROP. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 893-1098 (separate 33, published Jan. 12, 1916).—Statistics. E. J. C.

United States standard tables for petroleum oils. S. W. STRATTON. *Bur. Standards, Circular 57*, 64 pp.(1916).—This circular contains the following tables:

No. 1. Sp. gr. at 60°/60° F. of oils having, at the designated temps., the apparent specific gravities indicated. No. 2. Degrees Baumé at 60° F. of oils having, at the designated temps., the apparent degrees Baumé indicated. No. 3. Vol. that would be occupied at 60° F. by a quantity of oil, of various sp. grs., occupying unit volume at the designated temps. No. 4. Degrees Baumé, lb. per gal., and gal. per lb. corresponding to the designated sp. grs. No. 5. Sp. grs., lb. per gal., and gal. per lb. corresponding to the designated degrees Baumé. These tables apply to all crude and refined petroleum oils produced in the United States. F. M. ROGERS.

The effect of temperature on the formation of olefins from petroleum at atmospheric pressure. G. EGLOFF AND T. J. TWOMEY. *Mel. Chem. Eng.* 14, 247-50(1916); cf. C. A. 10, 820.—The object of the authors was to show the influence of temp. on the unsatd. hydrocarbon formation in the fractions boiling up to 95°, from 95 to 120°, 120 to 150°, 170 to 230°, 230 to 270°, and 270° to tar, and in the gasoline cut up to 150°. A gas oil derived from Penn. crude petroleum was cracked in the gaseous state by passing it through a steel tube at atm. pressure at the following temps.: 450°, 500°, 550°, 600°, 650°, 700°, 750° and 800°. The recovered oil from each expt. was distd. with the aid of an efficient fractionating column. The % unsatd. compds. in the different cuts was detd. by means of 95% H₂SO₄. Ten cc. of oil were measured into a Babcock milk bottle, the neck of which was calibrated in tenths of a cc.; one cc. of 95% H₂SO₄ was then added. The bottle was shaken for 5 mins. with cooling. Following the same procedure 2, 3 and 4 cc. of acid were added, making 10 cc. in all. The bottle was centrifuged for 3 mins., enough H₂SO₄ put in to bring the unabsorbed oil upon the scale in the neck of the bottle, and the latter again centrifuged until no further increase of unabsorbed oil was obtained. The amt. of unabsorbed oil was read, and the unsatd. formation was found by difference. The oil used for the cracking expts. was not affected by the 95% acid; it boiled between 250 and 350°. The fraction of recovered oil cracked at 450°, boiling from 0 to 95°, contained 36% of unsatd. compds. At 500° this same fraction contained 40% of unsatd. compds.; at 550°, 51%; at 600°, 50%; at 650°, 39%; at 700°, 29%; at 750°, 19%; and at 800°, 5%. For the fraction 95° to 120°, the max. of unsatd. compds. is 39% at 550°, and the min. 4% at 800°. The max. amt. of unsatd. hydrocarbons in the 120° to 150° fraction is 35% at 550°, and 10% at 750°. The 170 to 230° cut has its max. of 20% at 700°, and min. 11% at 550°. The 230 to 270° fraction has a max. of 16% at 700°, and a min. of 1% at 450°. The 270° to tar fraction has a max. of 20% at 700° and 1% at 450°. The % of unsatd. compds. in the gasoline cut, from 0 to 150°, was 44% at 550°, and 5% at 800°. In the cracked oil, the total unsatd. formation increased with temp. with indications that a decrease would have been found at the higher temps. The change in compn. of the lower boiling fractions of the cracked oils with increase of temp. may be represented by low boiling paraffins to low boiling olefins to low boiling aromatics. In the higher boiling fractions, the change may be expressed as follows: high boiling paraffins to high boiling olefins to high boiling aromatics. O. E. BRANSKY

Experiments on the production of gasoline from hydrocarbon oils of high boiling points. E. L. DAVIES. *J. Ind. Eng. Chem.* 8, 114-8(1916).—The purpose of the author was to det. the best conditions for cracking the oil, and for satg. with H those portions converted into unsatd. compds. The app. consisted of a superheater for steam a retort for distg. the oil under pressure, a chamber for cracking the distd. oil in the presence of H made by passing steam over red hot iron and steel shavings, a condenser and a meter for measuring the gases. The oil was distd. from the retort at pressure varying from 60 to 100 lbs. The oil vapors were mixed with the superheated steam. the mixt. passing on through the cracking and hydrogenating chamber, which was kept at 650 to 675°. The rate of flow of the steam was about 10 lbs. per gal. of oil.

The steam and cracked-oil vapors were condensed, and the oil condensate sep'd. from the water. The best yield of naphtha (38%) was obtained by distg. the oil at the rate of 17 mins. per gal., with the steam temp. 625° and the temp. in the cracking chamber 650° . The cracked products reacted readily with the nascent H. The yield increased with pressure. The residue left after distg. off the naphtha can be re-cracked satisfactorily. Oils having higher boiling points are cracked more easily than those with lower boiling points, but the production of gas is greater. O. E. BRANSKY.

Naphthenic acids in Balachanski petroleum residues. J. HUTT. *Chem. Tech. Ztg.* 33, 43(1915).—The oil distillates are treated with NaOH which removes the acids in the form of Na soap. These soaps are then salted out with NaCl, and heated to remove H_2O . The dried soaps are distd. with steam to remove free oil. The residue in the steam still is then decompd. with mineral acids. The naphthenic acids so obtained from spindle oil possess a sp. gr. of 0.9506 at 20° , and an acid value of 171.8, and boil between 160° and 180° at 2.5 mm. pressure; those obtained from machine oil have a sp. gr. of 0.9461 at 20° , an acid value of 169.2, and boil between 160 and 300° at 2.5 mm. pressure. O. E. BRANSKY.

Area, distribution, and present production of the petroleum deposits of Argentina. E. M. HERMITTE. *J. Ind. Eng. Chem.* 8, 194(1916).—In 1914, 44,000 cu. meters of crude oil were produced; up to Aug., 1915, 48,500 cu. meters were obtained from 10 wells. The deposits are found principally in Cachenta, Mendoza, Comodoro Rivadavia, and in the provinces of Salta and Jujuy. The oil has a high sp. gr., and only a small amt. of S. O. E. BRANSKY.

The production of asphalt, related bitumens, and bituminous rock in 1914. JOHN D. NORTHROP. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. II, 347-62 (separate, published Oct. 18, 1915). E. J. C.

Identification of bituminous materials. H. B. PULLAR. *Oildom* 6, 130-2(1916). —A review. F. W. SMITHER.

Temperature control in wood distillation plants. R. B. GOETSCHUS. *J. Ind. Eng. Chem.* 8, 196(1916).—Temp. control of the retorts is possible only where the raw material is uniform in size. When the size of the blocks varies, the smaller pieces give up their free water and are decompd. before the larger pieces have become water free. Pyrometric regulation of the destructive distn. of wood will materially increase the yield of its important products, but uniformity of the raw material is a necessary preliminary to proper temp. control. O. E. BRANSKY.

Temperature control in wood distillation. R. C. PALMER. *J. Ind. Eng. Chem.* 8, 283-4(1916); cf. *C. A.* 9, 2587.—P. contends, contrary to the views of Goetschius (preceding abstract), that pyrometric regulation of wood distn. retorts is of advantage, even when the size of the blocks of wood shows considerable variation. Equal mixts. of large pieces of split wood and smaller pieces of sawed wood more readily gave the desired rate of rise of temp. than either of the two kinds alone. By proper control of temp., the variability of size of the blocks may even prove an advantage. O. E. B.

Potash from fir mill waste. H. F. ZOLLER. *J. Ind. Eng. Chem.* 8, 105-8(1916). —One lb. portions of ashes obtained from large mill waste incinerators for burning butts, slabs, and sawdust of Douglas fir, were digested with 1 liter of H_2O at 80° to 90° for 24 hrs. The insol. matter was filtered from the ext., and the residue washed until the filtrate measured 1 liter. The ext. was analyzed for K by the perchlorate method. Amts. varying from 15.65 to 21.3 lbs. of K_2O per ton of ash were obtained from Douglas fir ash. From cedar ash 5.99 lbs. per ton of ash were obtained. The ashes consisted largely of charcoal, and inorganic matter from occluded soils. A large amt. of NaCl

was found in several samples, and this is explained by the fact that the logs in their transportation by water to the mills became impregnated with salt sea water.

O. E. BRANSKY.

Examination of bituminous road materials (HUBBARD) 20.

Purifying oils. E. V. EVANS and SOUTH METROPOLITAN GAS CO. Brit., 22,147, Nov. 6, 1914. S is eliminated from an oil by heating the oil, either in the liquid or vaporous condition, with H, or with a gas containing free H, in the presence of a catalytic agent or contact substance; the H_2S which is produced is removed by absorption in reagents. Ni, Fe, Co and Cu, deposited in porous nuclei, are cited as catalytic agents; and pumice, fire-clay, and asbestos are mentioned as suitable contact substances. Coal gas is cited as an alternative to H. The catalytic material used in the purification of coal-tar naphtha may be prepared by steeping porous fire-clay spheres in a satd. soln. of $NiCl_2$, and reducing the salt in a stream of H or coal gas at a temp. of 300-350°. It is stated that hydrogenation of the oil does not take place.

Cracking oils. A. M. MCAFEE. Brit., 22,244, Nov. 9, 1914. The high boiling constituents of mineral oils are converted into low boiling hydrocarbons by heating the oil in the presence of finely divided Al, Zn, Fe, or other metal capable of reacting with Cl or HCl, and simultaneously passing a current of Cl or HCl gas into the oil. An aluminous material, such as Al_2O_3 obtained by drying $Al(OH)_3$, may be used in place of Al. The Al may be used in the form of "aluminium bronze" powder, com. Al containing Zn, pure Al ground with coke, etc., or Al amalgam. The vapors of the lighter hydrocarbon escaping from the still may be cooled to 300-350° F., in order to condense and return to the still the heavier constituents of the vapors. The oil under treatment is fed continuously to the still, the catalytic activity of a charge of Al being spread over 2-3 days. The still is fitted with an agitator. A granular coky mass containing the aluminous matter is formed, and may be removed from time to time and replaced by additional quantities of Al. In treating oils containing S, the S is disengaged in the form of H_2S ; where the S content is high, a preliminary purification of the oil is resorted to.

Cracking oils. A. M. MCAFEE. Brit., 22,243, Nov. 9, 1914. High boiling mineral oils are converted into gasoline and other low boiling hydrocarbons by boiling them with $AlCl_3$, cooling the vapors to a temp. of 350° F. or less, and returning the condensed portion to the still for further treatment. About 5% of $AlCl_3$ is employed, and fresh oil is added from time to time to render the vol. of oil constant. After 2 or 3 days the $AlCl_3$ accumulates in coky granules and begins to lose its activity. The period of activity may be lengthened by passing Cl into the still. If the vapors are cooled to 300° F., gasoline constitutes the major portion of the product escaping to the condenser. When S-bearing oils are treated, the S is disengaged as H_2S ; but when the S content is high, it is preferable to adopt a preliminary treatment with H_2SO_4 . The $AlCl_3$ may be recovered in the manner described in 22,923, 1914.

Motor fuel. G. E. HEYL and T. T. BAKER. Brit., 21,738, Oct. 29, 1914. A fuel for internal combustion engines consists of 75-50% of petrol, paraffin, or other mineral-oil fuel, mixed with 25-50% of the liquid obtained when the 170-230° distillate (middle oil) of coal tar or analogous tars is freed from naphthalene and tar acids. The mixt. is filtered from a deposit, probably of bases, before use.

Motor fuel. P. SUCHY. Brit., 22,191, Nov. 7, 1914. A fuel for internal-combustion engines is obtained by dissolving in fuel hydrocarbons $(HO)_2C_6H_7CO_2H$ or other substances containing the group OH in combination with carboxylic acids or esters,

and distg. with a reflux condenser. In an example, illuminating oil, a light benzine, EtOAc, ether and $(\text{HO})_2\text{C}_6\text{H}_4\text{CO}_2\text{H}$ are distd. together.

Motor spirits. J. J. SHEDLOCK. *Can.*, 166,101, Nov. 16, 1915. Impurities and solid matters are removed from liquid hydrocarbons in the first stage of their treatment by forcing the liquid hydrocarbons through heated solids having an affinity for the impurities and solids of the hydrocarbon.

23. CELLULOSE AND PAPER.

A. D. LITTLE.

Modern development in pulp and paper. W. R. BROWN. *Paper* 18, No. 2, 11-5(1916).—General with regard to paper twines, textiles and specialties. V. N.

Review of the paper textile industry. ANON. *Pulp Paper Mag. Can.* 14, 103-6 (1916). V. NUNEZ.

Origin and development of papermaking in the old world. ALBERT KOMP. *Paper Trade J.* 62, No. 10, 35-8, No. 11, 40-4(1916). V. NUNEZ.

Paper problems at the University of Maine. J. N. STEPHENSON. *Paper* 17, No. 26, 16-8(1916).—The effect on (a) bursting strength, (b) tensile strength, (c) stretch and (d) folding endurance, of concn. and temp. of stock in beater, pressure on wet sheets, and temp. of drying, gave the following general results: Increased concn. of stock increased *a* and *c*, decreased *d*, and had no effect on *b*. Increased temp. of beating gave decrease in all respects. Increased pressure on wet sheets increased *a*, *b* and *d* and decreased *c*. Increasing drying temp. decreased *a*, *c* and *d* and had no effect on *b*. V. NUNEZ.

Wood pulp for paper making. C. F. CROSS. *Nature* 97, 35-7(1916).—Statistics on the production of wood pulp in Canada and other countries, and on the quantity imported annually into Great Britain. W. H. ROSS.

Manufacture of pulp and paper from straw. JAS. BEVERIDGE. *Paper* 18, No. 1, 18-9(1916).—A general description. V. NUNEZ.

Bache-Wüg ground-wood process. ANON. *Paper* 17, No. 21, 18(1916).—The wood in blocks is confined in a digester which is partially evacuated, then treated with SO_2 under pressure and finally cooked with water, NaCl soln. or bisulfite liquor. The wood is then ground. The resulting pulp is stated to be suitable for the manuf. of print paper without the addition of sulfite pulp. V. NUNEZ.

The Friedsam ground-wood process. ANON. *Paper* 17, No. 21, 19(1916).—Mineral fillers or pigments are added to the wood pulp while it is being produced on the grindstone. The pulp is thoroughly impregnated with the filler, improved in color and quality and rendered more greasy. Filler retention is very high. V. NUNEZ.

White mechanical pulp by the Enge process. ANON. *Paper* 17, No. 18, 11-5 (1916).—A digest of German and Austrian opinions of the Enge process in which wood is boiled with water for about 6 hrs. at temp. of 230°F . and pressure of 147 to 176 lbs. before grinding. The process is generally considered as of great significance and excellent results have been obtained by its use. In the manuf. of print papers, the use of N. G. (Enge) pulp permits a decreased percentage of sulfite cellulose, but the opinion is expressed that the saving so effected will be practically wiped out by the increased cost of N. G. pulp over ordinary white ground wood. A report by E. KIRCHNER is very favorable to the strength and printing functions of paper made from N. G. pulp.

V. NUNEZ.

New Enge wood-grinding process. WILLI SCHACHT. *Wochenbl. Papierfabr.; Paper 17*, No. 21, 17(1916).—While admitting the superior strength of N. G. pulp over ordinary white mechanical pulp and the general excellent qualities of the paper in which it is used, S. points out that the samples of paper reported on by Kirchner (cf. preceding abstract) appear to contain less filler and to be made at slower speeds than ordinary newsprint. Exact data concerning yields of pulp (which will probably be lower than for white mechanical pulp), cost of plant and of process are necessary to draw final conclusions.

V. NUNEZ.

More about Enge mechanical pulp. ANON. *Paper 17*, No. 26, 11-2(1916).—The printing qualities of paper made from N. G. pulp are reaffirmed by Kirchner to be excellent. The reliability of K.'s conclusions is questioned by an anonymous writer.

V. NUNEZ.

Beater rolls and bed-plates of basalt. G. F. LOUGHLIN. *Mineral Resources of U. S., 1914, Paper 17*, No. 22, 11-2(1916).—Requirements for the stone are hardness, toughness and a uniform vesicular structure. The stone now used is of German origin but lavas of this general character are found in the western U. S. and may prove usable. The basalt-lava beating tackle is considered excellent for certain classes of paper.

V. NUNEZ.

Sulfite cooking with forced circulation. EINAR MORTERUD. *Paper 17*, No. 23, 13-5(1916); *Chem. Eng.* 23, 103-6(1916).

V. NUNEZ.

Proposed method for the profitable utilization of waste sulfite liquor. HERMAN V. TARTAR. *J. Ind. Eng. Chem.* 8, 226-8(1916).—A process is described for production of EtOH from waste sulfite liquor in which the essential novelty is the method of freeing the liquor from SO₂. This method is as follows: H₂SO₄ is added in amount to be the reacting equiv. of the total SO₂ in the liquor and the liquor concd. *in vacuo* at not over 85°. This drives off the SO₂. Residual traces are carefully neutralized with lime and the concd. liquor is subjected to fermentation which proceeds favorably by the use of ordinary brewer's yeast. A yield of 1% abs. alc. is considered possible. The residue after distn. appears harmless to fish life.

V. NUNEZ.

Ash tests for percent of filler in paper. JOS. E. PLUMSTAD. *Pulp Paper Mag. Can.; Chem. Eng.* 23, 70-1(1916).—General considerations regarding retention of filler and the relation between bulk and strength.

V. NUNEZ.

Resistance of paper to folding in machine and cross directions. W. HERBERG. *Papier Ztg.* 41, 137(1916).—Tests of 918 papers show that the folding strength is greater in the machine direction in case of $\frac{2}{3}$ of the papers and greater in the cross direction in case of $\frac{1}{3}$. Variation between individual specimens of a given class of normal papers is much greater in case of the folding test than in the tensile or stretch tests.

V. NUNEZ.

The paper industry and substitute materials. U. HAASE. *Kunststoffe* 6, 21-2(1916); continuation of *C. A.* 10, 822.—Various combinations of pasteboard and crepe paper with other materials are discussed.

F. W. SMITH.

The production of celluloid coatings. ANON. *Kunststoffe* 5, 291-2(1915).—Celluloid is applied to articles by laying on thin sheets previously warmed and then pressing, by repeatedly dipping the articles into thin celluloid solns., or by spraying the solns. on the articles. Solvents dissolving both the celluloid and the surface of the article to be coated are used to advantage. Mother of pearl effect is obtained by using transparent celluloid mixed with special fish scales. In spraying, the temp. of the solns. is very important. Transparent celluloid is seldom used for dipping. Lacs are sometimes used for dilg. the celluloid solns.

CHESTER TUSTIG.

Plastic composition from cellulose. W. T. BONNER. U. S., 1,173,336, Feb. 29. Dry cellulose is treated with liquid NH_3 and a very reactive product is obtained which yields a substance resembling viscose on reaction with CS_2 and treatment with H_2O .

Preparing sulfite-cellulose back waters for use as a briquet binder. M. PLARSCH. Ger., 286,210, Aug. 20, 1911. The object of the treatment is to remove lime by the addition of H_2SO_4 in slight excess. When H_2SO_4 is added to the back water with heating, or when the lye is heated with H_2SO_4 before briqueting, H_2O -insol. substances sep. from the lye which no longer have the power to act as binders, wherefore a loss of both lye and acid results. This breaking down of the lye can be prevented if the acid is added in the cold, with cooling of the lye. All organic lye constituents remain in soln., and a needless loading of the briquet with non-binding lye constituents is prevented.

Working reed stalks into long fibers and fiber for paper stock. B. VON ORDODY and B. SCHORRIK & Co. Ger., 285,539, June 14, 1914. After ripening, the fibrous material, cut, slit and dried, is treated in roasting vats at $20-30^\circ$ for about 2-5 weeks, with repeated change of H_2O , and then, after washing and drying, it is placed in a petroleum soap emulsion with added caustic alkali, either in open vessels, in layers and cross layers, or under pressure in closed vessels. The fibrous material is washed and the long and short fibers sep'd. at the same time, and treated further in the usual manner. The treatment is continued, in open vessels, for 2.5-3.5 hrs., at a pressure of 1-1.5 atm. for about 1-1.5 hrs. The resulting spun fiber is strong, soft and lustrous.

Washing stripped vegetable fiber. F. KRUPP, AKT.-GES. Ger., 285,929, May 28, 1914. Addition to 280,545 (C. A. 9, 1998).—The loose fibers are run alternately over partitions and through a H_2O bath, the surface of which is below the upper edge of the resistance.

Apparatus and methods for reducing and washing paper pulp. C. W. SHARTLE. U. S., 1,173,747-8-9-50, Feb. 29.

Safety paper for checks. J. B. WEIS. U. S., 1,172,414, Feb. 22. Paper pulp for safety paper is mixed with FePO_4 0.5, $\text{Mn}_2\text{Fe}(\text{CN})_6$ 2, $\text{Na}_4\text{Fe}(\text{CN})_6$ 0.5 and PhNH_2 -HCl 1%. Acids and Cl produce blue and brown stains, resp., on the paper, if alterations with such reagents are attempted.

Cellulose esters. H. DREYFUS. Brit., 100,009, Apr. 30, 1915. In the acetylation of cellulose, the H_2SO_4 employed as condensing agent is replaced by equiv. quantities of NaHSO_4 , or other bisulfate, containing a small proportion of free acid; the bisulfate is preferably formed in the acetylating mixt. of Ac_2O , glacial HOAc , and H_2SO_4 , by addition of appropriate quantities of Na_2CO_3 or NaOAc , etc. The bisulfates of K or pyridine are also specified as suitable. The products can be converted (C. A. 8, 1010) into other products of various solubilities as specified in 20,877, 1911, 10,852, 1912, 21,376 (C. A. 8, 1010), 1912, and 22,645, 1912. Cf. also 6,463, 1915.

Colored or bronze paper for packing. H. OESER. Ger., 284,656, Mar. 10, 1914. The paper consists of two transparent sheets of paper, united with the color or design between them. The paper is rendered transparent by the use of an agent which serves both to hold the color and bronze powder, and to cement the paper. As binder between color or bronze and paper, or between both paper sheets, adhesives sol. in H_2O or alc. may be used.

Rendering paper transparent and air- and water-tight. H. OESER. Ger., 285,978, May 19, 1914. The paper is first sat'd. with resin and wax melted in oil, with the addition of alc., is then treated with a colloidal soln. of gelatin, agar-agar or the like. In case

the fixing agent is formed with the aid of a size soln., such coating can be hardened by means of HCHO , alum, or the like. To produce a colored transparent paper, a transparent dye (aniline or vegetable dye) is added to the satg. mass or to the fixing agent. The fixing agent can be melted together with the satg. mass. If a glue-like substance, such as gelatin, glue, or agar-agar, is used as fixing agent, this is first softened in H_2O , and then melted, by warming in alc. Single-ply paper can be made into colored or bronze paper by dusting the color or bronze powder on the satd. sheet.

24. EXPLOSIVES AND EXPLOSIONS.

C. R. MUNROE.

Oxyliquite. LUDWIG SIEDER. *Z. ges. Schiess-Sprengstoffw.* 10, 165-6, 179-80 (1915).—As pointed out in 1906 the basis of this explosive is free O while all others have chemically fixed O. To get a practical explosive it is necessary to have large surface for liquid so that mols. of O and oxidizable substances can come into close contact. Kieselguhr and burnt cork are good absorbents; the former is used so as to be partly satd. with petroleum. Charcoal cannot be used because it reacts with the O to form CO. The procedure of Baldus and Kowastch for use of oxyliquite is as follows: A thick paste-board shell, provided with an inner perforated distribution tube and filled with the harmless mixt. of kieselguhr and any oil, asphalt, soot, or paraffin is introduced into the drill hole. In the central tube is placed a thin admission tube made of paper, and above the latter is a wider paper tube to carry off evapn. products. The stemming may be put on without danger. Weighed amts. of liquid air are at hand in small bottles fitted with metal hose with a conical tip which is introduced into the central admission tube protruding from the stemming. When the bottle is inverted the liquid air rises under its own evapn. pressure from the bottle, through the admission tube and into cartridge where it lodges between particles of the charge, ready to combine vigorously with constituents of the cartridge when explosion is started by elec. ignition. S.'s method is to dip the cartridge into liquid air prior to introduction into bore hole. The excess of O can evap. 4-5 min. without impairing the effects of the explosive while drill holes are being prepd. 40 parts petroleum was absorbed in 60 parts kieselguhr and by using well insulated shells the full strength of the explosive was maintained 8-10 min. after removal from liquid O. The chief objection to oxyliquite is the difficulty of transporting it.

W. C. CORG.

Nitrocellulose or nitroglycerin powders. ALBERT BUISSON. *J. U. S. Artillery* 44, 211-4 (1915).—B. discusses the relative advantages and disadvantages of these 2 classes of propellants. While accidents on French vessels have been shown to be due to nitrocellulose powders the explosions on the 2 Japanese ships Mikasa (1905) and Matsushima (1908) are to be attributed to decomp. of cordite (nitroglycerin powder). The powder which Germany uses in the navy has about 25% nitroglycerin which up to now has never been the cause of any accidents, but this country works over its stock of this powder every four years. Tables are given showing the extent of the erosion caused by cordite and other nitroglycerin powders which produce temps. as high as 3000° . The verdict of A. Trévor Dawson, which appears to be accepted, is as follows: The most important considerations in detg. the best compn. of powder to be adopted are, (1) its keeping qualities and safety under normal climatic conditions; (2) its capability of obtaining the highest possible ballistics, and consequently the flattest trajectory; and (3) its regularity in results, so that the ballistics may not be seriously affected by change of temp. or by the wearing away of the gun due to excessive erosion. All these qualities are secured by the use of a properly manufactured nitrocellulose powder,

whereas none of these conditions can be said to be met by any powder containing nitroglycerin.

CHARLES E. MUNROE.

Report of Chief Inspector of Bureau for Safe Transportation of Explosives and other Dangerous Articles. B. W. DUNN. *Bureau of Explosives Report* No. 9, Feb., 1916; cf. *C. A.* 9, 1392.—Although during 1915 explosives and ammunition of all kinds were transported in larger quantities than ever before they gave rise to but 11 accidents in which none was killed, only 6 were injured and but \$127 of property lost. The chief source of disaster was inflammable liquids, which caused 55 deaths, 470 injuries and a loss of \$851,348 in property, while acids and corrosive liquids came second in the injury wrought. The main report contains 13 statistical tables analyzing the data for the year and in the comparison columns giving *modified* data for previous years. This is followed with appendices which bring the report up to 85 pages of fine print matter. The Chemist's report shows examn. of: new explosives all of which passed the tests; fireworks in which those containing NH_4 salts with chlorates were condemned as liable to spontaneous ignitions; railway time signal fuses in which new substances are successfully replacing the acceptable KClO_4 ; fire engine torches disapproved on errors in construction; rubber scrap and buffed rubber found liable to ignite spontaneously; garbage tankage, dried manure, dried alfalfa, lime, charcoal and other substances gave rise to self-occurring fires. Cylinders for chlorine, packings for carboys, and many other articles were examined and are reported on at length. It is interesting to note that excelsior treated with $\text{Al}_2(\text{SO}_4)_3$ is not a satisfactorily fire-proofed material. Another report describes, with illustration, an app. for detg. the vapor pressure of liquefied petroleum gas.

CHARLES E. MUNROE.

Aluminium in war munitions. ANON. *Metal Ind.* 14, 7(1916).—While before the war shrapnel fuses were made of brass, the larger part of them is now being made of Al containing a small percent of Cu. But Al is still more largely used for war purposes as thermite for ignitions or with NH_4NO_3 as a detonating explosive in shells. It is also in use as tips for rifle bullets and in aeroplane constructions.

CHARLES E. MUNROE.

Cause of transmission of detonation in explosives. A. VOIGT. *Z. ges. Schiess-Sprengstoffw.* 10, 180-2(1915).—A theoretical discussion.

W. C. COPE.

Oil-hardening tank explosion. A. D. BYRNE. *Chem. Trade J.* 58, 164(1916).—An explosion occurred May 22nd, 1915, in 1 of 6 tanks employed by Messrs. Ardol, Ltd., Selby, Yorks in converting oil into a solid by means of H. Each tank was fitted with 3 vertical coils of Cu tubing forming an endless circuit through which hot water was passed. Its temp. normally was about 290° and its pressure 2000 lb. per sq. in. The oil in the tank was heated to a temp. of about 260° and the H, at a pressure of 5 lb. per sq. in. was sent from the bottom upward through the tank to the cleansing plant. B. finds the accident to have been due to a leakage from the copper coil producing an undue pressure in the tank.

CHARLES E. MUNROE.

Benzene explosion at gas works. ANON. *Chem. Trade J.* 57, 388(1915).—An explosion occurred at Beckton works of London Gas Light and Coke Co., Oct. 18, 1915, as purified C_6H_6 was being run from the condenser into the 50-gal. drums in which it was to be shipped. Precautions had been taken as to naked lights, matches, smoking, and fire, and no cause of sparks was found. The building was seriously damaged, one man killed and several injured. The cause was not found.

C. E. M.

Inquiry into Manchester chemical works explosion. ANON. *Chem. Trade J.* 57, 343(1915).—An explosion occurred in a factory for the manuf. of dyestuffs. It is

believed to have originated in the grinding mills where straight and blended materials were treated. The investigation failed to indicate any cause. The material appears to have been a black dyestuff.

CHARLES E. MUNROE.

Temporary gas by-pass over decked subway excavations. *Gas Age* 37, 253-8 (1916).—Under the legend "Danger of Gas Pockets in a Decked Excavation" and "Serious Nature of Gas Explosions," the nature of the construction by which to avoid the formation of pockets in which explosive gaseous mixtures may accumulate is described and the seriousness of the results following gas explosion where these precautions have not been taken is illustrated by citations of explosions which have actually occurred and photographs showing the effects are given.

CHARLES E. MUNROE.

Coal-gas residuals and their application (WAGNER) 21. Aluminium dust (CLEVENGER) 9. Portable gas detector (BURRELL) 1.

Explosive charges of fusible explosives. DEUTSCHE SPRENGSTOFF AKT.-GES. Aust., 70,734, Dec. 27, 1915. The liquid explosive is centrifuged, horizontally, thereby securing high density, freedom from bubbles, and adhesion to the shell.

Explosives. SPRENGSTOFF AKT.-GES. CARBONIT. Ger., 286,736, Apr. 2, 1913. Hexanitrodiphenyl is especially suitable for use as an explosive, alone or in combination with other components. It consists of fine bright yellow crystals which do not attack the skin nor color it, and also has completely neutral properties inasmuch as it does not form salts with acids or alkalis. Furthermore, it is very stable and may be stored without deterioration. It is but slightly sensitive to percussion and concussion. It is insol. in H₂O, slightly sol. in alc., acetone, benzene, and toluene. The flashing temp. is above 320°, and the m. p. is about 230°. Its power exceeds that of hexanitrodiphenylamine about 10%, and that of picric acid to a still greater extent. It is employed in grenades, torpedoes, and mines in a compressed state. Cf. C. A. 9, 392.

Charges for blasts, mines, and torpedoes. SPRENGSTOFF AKT.-GES. CARBONIT. Ger., 286,543, Aug. 28, 1912. [1,3,5-(NO₂)₃C₆H₃]₂S is employed, in cryst. or compressed form, and alone or with the addition of other nitrohydrocarbons, C compds., or O carriers. The product is chem. very stable, has a high explosive action, is easily compressible, yields SO₂ on detonation, does not become yellow, and is not poisonous.

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

The status of the German dyestuff trade in the U. S. A. L. W. SCHMIDT. *Chem. Ind.* 38, 477-9(1915).

F. W. SMITHER.

Production of aniline black with the aid of a diamine. ALFRED EHRENZEIG. *Z. Farben-Ind.* 14, 41-2, 51-2, 59-60, 67-8, 75-6, 81-2, 90-1, 96-7, 104-5(1915); 15, 1-2(1916).—There are several processes which utilize the catalytic effect of a diamine in the oxidation of the aniline. E. distinguishes three different kinds of action, differing with the ratios of the number of moles of aniline to diamine: 12 to 1, 6 to 1, and 3 to 1. Each of these differs radically from the others. In the first, chlorate, diamine and Cu salts are used; in the second, the catalyzers are Cu salts and diamine, no chlorate being added; and in the third only chlorate and diamine are employed, the oxidation being carried directly to aniline black. The first process is suitable for dyeing when the dry-

ing is effected at 90–100° in a calendar (Glattfärben), and causes no weakening of the fabric. The second process gives an aged black and is particularly applicable where no regular equipment is available. The third process is suitable for steamed-black in dyeing and printing. A single drying is required, the black being entirely ungreenable. Both animal and vegetable fibers can be handled satisfactorily. Ger. pat. 267,628 (C. A. 8, 828) covers the first process. The following ingredients are used in making 30 l. of padding soln. for mercerized or 24 l. for unmercerized goods: 12 moles $C_6H_5-NH_2HCl$, 1 mole *p*-phenylenediamine, $\frac{1}{2}$ mole $NaHSO_3$, 1 mole 90% $HCOOH$, 2 moles $NaClO_2$, 1 mole $CuSO_4$, 1 mole 50% lactic acid, $\frac{3}{2}$ mole $C_2H_5(OH)_2$, $\frac{1}{2}$ mole powdered $Al(OH)_3$, and 1 mole 50% $AcOH$. Dynamometric tests show decreases in breaking strength of only about 1%, as compared with 15% by the usual processes. Stock solns. of the sep. ingredients may be made, but no large quantities of the complete bath should be prepd. at any one time. Complete directions for padding, drying, chroming, etc., are included. For the 2nd process, any drying temp. between 30 and 100° may be used, the ageing period being 2–8 days. In the 3rd process, glycolic acid is used instead of lactic acid. Tables of costs are given, as well as a brief description of a fairly permanent lustering produced on moist fabric by calendaring with fluted rolls.

W. F. FARAGHER.

Removal of the natural impurities of cotton cloth by the action of bacteria. B. S. LEVINE. *J. Ind. Eng. Chem.* 8, 298–302(1916); cf. C. A. 9, 1548.—The following summary is given: (1) "Of all the natural impurities of cotton cloth only the N-containing and the ether-sol. substances when insufficiently removed from the cloth previously to the "chemick," cause yellowing of bleached cloth in the steam test or during storage. (2) The N substances of the fibers were broken down by bacteria so that they were completely removed from the cloth. This transformation in the presence of the $Ca(OH)_2$ has probably resulted in some cases in the formation of ether-free NH_3 or N, $CaCO_3$ and H_2O , and in some in the reduction of the N substances to peptones and amino acids which are easily oxidized to nitrites and nitrates. (3) The ether-sol. substances were removed by bacterial treatment more efficiently than is the case in the ordinary bleaching process. (4) The alc.-sol. substances were very little attacked by the bacteria, probably because of the formation of a Ca salt in the presence of the $Ca(OH)_2$ of the media. (5) None of the bacteria experimented with have transformed the starch of the cloth any further than to dextrins. (6) Bacteria may be profitably employed as a substitute for the present method of purifying cloth preliminary to its bleaching." Full details of the expts. are given with the results in 4 tables. Cf. Hebden, C. A. 8, 3632.

L. W. RIGGS.

The determination of the impermeability of cloth. G. A. LEROY. *Ann. fals.* 8, 377–85(1915).—A description of the "impermeabilimeter," very similar to that previously reported (cf. C. A. 9, 2595), followed by cuts and description of another app. suitable for measuring the impermeability of tissues to air. The rarefaction due to the absorption of CO_2 by KOH , from a definite quantity of air- CO_2 mixt., is the basis of the app. which is similar to the "impermeabilimeter." The space below the diaphragm of tissue which is being tested contains CO_2 -free air and 25 cc. of 20% KOH soln., a handful of glass beads being added to increase the absorption surface. The bell-shaped cover of the diaphragm is closed, at the top, with a 2-hole stopper, through one hole of which passes a pipet, and through the other connection is made with a U tube partly filled with Hg. In each side of the U is an elec. contact. To operate, the pipet, which has a stopcock above and below the bulb, is filled with CO_2 , the air in the space both above and below the diaphragm is brought to atm. pressure, and connection is made with the U gage. After the entire app. has come to const. temp. by standing in a thermostat, the lower cock of the pipet is opened, and CO_2 allowed to run down

and mix with the air in the space above the diaphragm. As it passes through the diaphragm and is absorbed by the KOH, the pressure in the app. decreases, and the Hg in one side of the U tube rises, closing the elec. circuit, and ringing a bell or registering on the chromograph. The time interval between the adding of the CO₂ and the making of the elec. contact is taken as the measure of permeability.

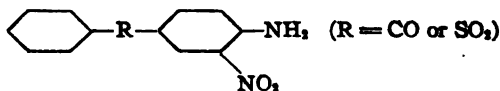
H. S. BAILEY.

Military clothing. EUGEN SEEL AND ALBERT SANDER. Stuttgart. *Z. angew. Chem.* 28, I, 457-63(1915).—The fabrics used in making field-gray uniforms have in a great many cases been unsatisfactory in regard to fastness to light and weather during service. Fading often results in change of shade due to differences in fastness of the dyes used. The resulting shades are often dirty blue, yellow or brown. Many complaints have been made also about the poor wearing qualities of the fabrics. The causes of the unsatisfactory serviceability are attributable to the methods employed in manufacture and dyeing of the fabrics, and to the poor quality of wool used owing to the cutting off of imports. Three methods of producing field-gray dyeings are permissible: Indigo bottom, topped with acid chromed dyes, straight vat dyeing (helindon, thiondigo, algol dyes), and mordant dyeing with acid chromed dyes. The dark wool for mixing is dyed by the first method and constitutes 50% or more of the stock. The remainder can be undyed wool, a lightly dyed wool (as, e. g., "Greenish pearl," an indanthrene mordant-dye dyeing) or a wool dyed lightly with Cu or Cr salts. Gray-green produced by alizarin on indigo bottom is generally deficient in light fastness on account of the great difference in light fastness of the separate components. The greater simplicity of vat dyeing is in its favor especially since vat dyes are now available, which can be used like indigo in an NH₂-hyposulfite vat. Cheap chrome dyes are deficient in light fastness. If the lightly dyed wool for mixing is dyed with inorganic salts, the fastness to rubbing and the strength of the fabric are less than with undyed wool, while the fastness to light is superior. S. and S. have worked out a process for identifying the different dyeings which are allowed in the production of field-gray. Complete tables showing the reagents and their reactions are included. W. F. FARAGHER.

Coal-gas residuals and their application (WAGNER) 21. Manchester dyestuffs works explosion 24.

Developing dyes. BAYER & Co. Aust., 70,921, Jan. 10, 1916. The diazo compds. of the dyes obtained by coupling diazo- or diazoazo compds. with 1-amino-2-naphthyl ethers or their derivs., are coupled with derivs. of 2,5-aminonaphthol-7-sulfonic acid or of 2,8-aminonaphthol-6-sulfonic acid which contain diazotizable amino groups in union with the heteronuclear nucleus.

Body dyes. BADISCHE. Aust., 70,642, Dec. 10, 1915. Body dyes consist of compds. of the following general formula, or their nucleus substitution products, and the substrata common in dye lake manuf., such as alumina, blanc fixé, kaolin, heavy spar, etc.



Yellow monoazo dyes. BAYER & Co. Aust., 70,917, Jan. 10, 1916. The amino carboxylic acids obtained from dehydrothiotoluidine, its homologs and substitution products, as also from the corresponding primulin compds., by oxidation, are diazotized and coupled with acetoacetic acid arylides.

Aldehydes of the anthraquinone series. AKT.-GES. FÜR ANILIN-FABRIKATION. Aust., 70,873, Jan. 10, 1916. The corresponding methylantraquinones are oxidized directly with MnO_2 in H_2SO_4 soln. at moderate temps., *i. e.*, below 100° .

Alizarin. CHEM. FABRIK GRIESHEIM-ELEKTRON. Aust., 70,646, Dec. 10, 1915. *meso*-Nitration products of anthracene are heated with alkalies, with or without the addition of oxidizing agents, in the presence or absence of sulfites or lime.

Converting *o*-amino dyes into pseudoazoimines. CHEM. FABRIK GRIESHEIM-ELEKTRON. Aust., 70,641, Dec. 10, 1915. The *o*-aminoazo dyes are heated with catalyzing metals in the presence of solvents.

Dyes. DURAND and HUGUENIN, SOC. ANON (formerly FARBW. v. J. DURAND, H. & Co.). Brit., 22,247, Nov. 9, 1914. Gallocyanins are condensed with aromatic diamines, containing at least one free NH_2 group, by stirring at ordinary temp. with or without using diluents, such as alc. Gallic acid gallocyanins yield products from which CO_2 has or has not been eliminated according to the working conditions. According to examples, the gallocyanins from gallic acid or Me gallate and nitrosodimethylaniline are condensed with *p*-aminodimethylaniline. 21,949, 1906, is referred to.

Dyes; dyeing. FARBW. v. M. L. & B. Brit., 22,148, Nov. 6, 1914. Stable preps. for addition to indigo fermentation vats are obtained by mixing isolated albuminous substances with H_2O -sol. carbohydrates or glycerol; indigo or indigo white may be added to the mixt., also materials containing bacteria, such as cut hay, hay infusion, or liquids undergoing lactic or butyric fermentation. Suitable albuminous substances are concd. ext. of rye-bran, gluten, vegetable casein, casein, albumoses, peptones, etc.; suitable carbohydrates are molasses, invert sugar, glucose, or maltose.

Dyeing. M. BECKE, W. SUIDA and H. SUIDA. Aust., 70,640, Dec. 10, 1915. In a process of dyeing with quinoneanilide- or anilinoquinone-like dyes, on the fiber, ready-formed or forming quinones of the benzene and naphthalene series, and their derivs., are allowed to act, in the dye bath or on the fiber, upon aromatic amines, their sulfo and carboxylic acids, or upon dyes with free amino groups. Cf. C. A. 10, 278.

Dyeing fiber with water-insoluble vat and mordanting dyes. R. WEDEKIND & Co. Aust., 70,849, Jan. 10, 1916. The dye compds. are applied to the fiber and then converted into suitable dyeing form. Neutral, acid, or alk. aq. suspensions are used, without thickening agents, the labile dye compds., on the fiber, being then converted into the stable compds. by vat treatment and oxidation of the resulting leuco compds., or, in the case of mordanting dyes, by subsequent heating under H_2O or in steam.

Dyeing animal fibers. K. HOFMANN. Ger., 286,411, May 8, 1914. Gaseous or dissolved C_2H_2 is allowed to act on the material (wool) pretreated with Cu compds., whereupon the material is after-treated with dil. acid and dil. NH_4OH or warm NH_4Cl . Dark dyeings are obtained which are fast to washing and milling.

Centrifugal pump with heating and cooling means. P. JERUSALEM. Aust., 70,636, Dec. 10, 1915.

Dyeing and bleaching textiles. J. F. POSSELT. Ger., 286,208, Jan. 3, 1913. Means are provided for the periodic automatic interruption of the flow of the vat liquors.

Fast dyeing on textile goods. SOC. ANON. POUR L'IND. CHIM. À BALE. Ger., 286,410, Dec. 11, 1913. Brown, olive, to black shades are obtained. Amino derivs. of car-

bazole, its homologs and derivs., are applied to the fiber, which is thereupon oxidized as usual for amines.

Continuous bucking of textile goods. E. WEICHERT. Ger., 286,429, Aug. 13, 1912. The material is conducted, successively, in a chamber from which air is excluded, through lye and through a steaming chamber disposed above the bath.

Preparing fiber for spinning. C. A. NEUBECKER. Aust., 70,648, Dec. 10, 1915. A machine is specified.

Cleaning textile stuffs. O. RÖHN. Aust., 70,850, Jan. 10, 1916. Tryptic enzymes are added to the washing liquor.

Fireproofing; bleaching. T. J. I. CRAIG and WHIPP BROS. & TOD. Brit., 22,617, Nov. 17, 1914. Unbleached or partly colored unbleached textile fabrics, etc., are first fireproofed by the process described in 16,153, 1914 (C. A. 10, 98), and then bleached. suitable bleaching agents are NaOCl soln. when treating uncolored fabrics or partly colored fabrics dyed with dyes unaffected by hypochlorite, or H₂O₂ soln. when treating partly colored fabrics dyed with dyes affected by hypochlorite; alkali bicarbonate is preferably added to the bleaching solns. used. Examples of the treatment of gray cotton cloth and striped flannelette are given.

Weighting silk. SCHMID, GEB. Brit., 100,033, Jan. 21, 1916. In the weighting of silk by treating it alternately with metal chloride baths and alkali phosphate baths, and subsequently with an alkali silicate bath, baths of ZnCl₂ or of SnCl₄, or of a mixt. of the two, are employed, to which are added silk and silkworm chrysalids in soln., or the product obtained by boiling silk and silkworm chrysalids in H₂O, or the oily H₂O obtained by boiling the remnants of cocoons known as "shave silk," or other silk waste containing silkworm chrysalids.

Degumming silk. SCHMID, GEB. Brit., 100,029, Jan. 22, 1916. In the ungumming of silk or silk waste, as raw material, yarn, or woven fabric, if the material is free from silkworm chrysalids, the soap hitherto used is partially replaced by gallettadini (silk waste containing silkworm chrysalids), or silkworm chrysalids; if the material contains chrysalids or parts of chrysalids, part or the whole of the soap hitherto used is replaced by soda. Cf. 13,952, 1905.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

The production of mineral paints in 1914. JAMES M. HILL. U. S. Geol. Survey, *Mineral Resources of U. S.*, 1914, Pt. II, 103-22 (separate, published July 21, 1915).—Natural mineral pigments, pigments made directly from ores and chemically manufd pigments are considered. E. J. C.

Detection of resin in drier. E. W. BOUGHTON. Bureau Standards, *Tech. Paper* No. 66, 9 pp.(1916).—A discussion of the significance of resin in drier is given. Purchasers of oil drier presumably desire material that is free from resin. The proposed method for the detection of resin is as follows: (1) Test for rosin by the Liebermann and Storch method; (2) if no rosin is detected by (1), treat 0.2 g. of the mixture of unsapon. matter, resin acids and fatty acids, separated from the drier, with 5 cc. of 97% EtOH. A turbidity or deposit of insol. matter shows the presence of resin, but rosin, Manila, shellac and very small amts. of Kauri cannot be detected by this step (3) if no rosin is detected by (1) or (2), esterify 1 g. of the mixt. used in (2) by Wolff's method (cf. C. A. 1, 8, 2495) using abs. EtOH and H₂SO₄, and titrate the unesterified

acids. An acid no. (mg. KOH per g. of the mixt. of unsapon. matter and acids taken) of over 10 shows the presence of resin in the sample. By this step resin can be detected when the amt. is at least 6% of the ash-free, non-volatile portion of the drier.

E. W. BOUGHTON.

Determination of oil and resin in varnish. E. W. BOUGHTON. *Bur. Standards, Tech. Paper No. 65*, 32 pp.(1916).—Existing methods were found to give erroneous results with certain types of varnish. The $C_2H_5(OH)_3$ yields of varnishes, detd. after sapon. with aq. KOH soln., when multiplied by 10, gave figs. which were fairly close to the amts. of oil present, except with varnish containing tung oil, in which case the results were low. Extn. of oxidized films with $CHCl_3$ removed only a portion of the resinous matter present, except with a sample the non-volatile portion of which was mainly rosin. Treatment of varnish with petr. ether did not quant. ppt. the "gum," and the amt. of oil pptd. by this treatment varied with the nature of the varnish. Treatment of the unsaponifiable matter, resin acids and fatty acids (sepd. from varnish) with petr. ether did not quant. ppt. the "gum;" the amt. of fatty acids pptd. was small with a short-oil varnish, but considerable with a spar varnish. The proposed method, for which directions are given in detail, is briefly as follows: To approx. 4 g. of varnish add 25 cc. of H_2O and boil. Add alc. KOH and C_2H_5 and heat on the steam bath. Sep. most of the unsaponifiable matter by one extn. with Et_2O . Add HCl to the soap soln. and after recovering the fatty and resin acids, esterify by Wolff's method (cf. *C. A.* 8, 2495). Sep. the resin acids from the fatty acids ester and remaining unsaponifiable matter by treatment with KOH soln., recover and weigh. Saponify the fatty acid esters with alc. KOH, sep. the unsaponifiable matter by repeated extns. with ether, liberate the fatty acids, recover and weigh. Also recover and weigh the total unsaponifiable matter. By this procedure about 7% of the total resin content of the varnish is weighed as fatty acids, so (resin acids + unsaponifiable matter) $\times 1.07$ = resin present. The calcn. of the oil content from the fatty acids is correspondingly corrected. The method gives results which are sufficiently accurate for practical purposes. No attempt was made to sep. rosin from "gum."

E. W. BOUGHTON.

Synthetic resins. R. ELLER. *Kunststoffe* 6, 45-7(1916).—A review of the patented processes for the production of condensation products, e. g., HCHO and phenol or similar reactions.

F. W. SMITHER.

Recovering atomized colors, pigments. P. HEINRICH. *Aust.*, 70,616, Dec. 10, 1915. The pptg. color is taken up by means of a sheet of liquid formed by a flow under pressure.

Coating processes. H. B. TOONE and H. S. TOONE. *Brit.*, 22,398, May 12, 1915. A smooth surface is produced on wood, card, paper, and other materials which have been coated with ordinary oil paint or spirit varnish by placing them, after drying, in contact with a polished finishing plate and applying heat and pressure, the finishing plate being removed after cooling. A press may be used capable of being heated by steam and cooled by H_2O , and a number of coated sheets and finishing plates may be treated together in a pile. The finishing plates are preferably made of metal such as bronze or Ni, and may be plated to resist corrosion.

Coating compositions. G. CARTER. *Brit.*, 22,533, Nov. 14, 1914. An anti-corrosive coating compn., intended especially for machinery but applicable generally, consists of a soln. of 100 oz. of common rosin or colophony in 100 oz. of petroleum

spirit, with the addition of 5 oz. of liquid drier and 0.25-0.5 dram of solid spirit-sol. red.

27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

Recovery of wool fat. E. E. AYERS. *Met. Chem. Eng.* 14, 317-8(1916).—*Discussion of methods of recovery:* Recently some work has been done on the commercial recovery of wool fat by centrifugal force, and there is now a centrifuge on the market which is said to be satisfactory. A scouring H_2O contg. 1.55% wool fat yielded 1.45% or 10-11 lbs. of fat per hr. at a temp. of $145^\circ F$. The purification of the product can be effected by a combination of washing and chem. bleaching agents. The elimination of odor depends on the oxidation, reduction or hydrolysis of the odoriferous substances. SO_2 and Cl give the best results as bleaching agents.

E. SCHERUBEL.

Determination of the melting point of fats and waxes. L. GOLODETZ. Hamburg. *Chem. Ztg.* 40, 223(1916).—Select a thermometer with a uniformly cylindrical bulb about 8 mm. diam. and slip through a rubber stopper. Cut pieces about 3.5 cm. long from a glass tube that will just slip over the end of the thermometer and carefully close 1 end of each piece by fusing so that the end is of uniform thickness. Weigh about 0.2 g. of the substance into 1 of the tubes, melt carefully, slip over the warmed thermometer till the bulb touches the bottom, let cool, carefully re-melt over a burner and quickly insert the thermometer into a closed glass tube about 2 cm. diam. by means of the stopper. The outer tube is to protect from air currents and allow slow cooling. Hold the tube toward the light and note the temp. at which the transparent substance suddenly becomes cloudy. This is sufficiently near the true m. p. for practical purposes. Any number of check readings may be made by re-melting the same sample.

J. H. MOORE.

Oleic acid. W. FAHRION. *Chem. Umschau* 23, 2-8(1916).—A valuable account of our present knowledge of the chem. constitution of oleic acids, 16 of which are possible by theory; 15 of these may also exist in their stereoisomeric form of elaidin acids, making a total of 31. Their general formula is $CH_3(CH_2)_nCH:CH(CH_2)_mCOOH$ with the exception of 17,18-oleic acid whose formula is $CH_3:CH(CH_2)_nCOOH$. The known 11 acids and their 3 known elaidin forms are described ranging from 2,3-oleic acid, $CH_3(CH_2)_4CH:CHCOOH$, up to 12,13 acid, $CH_3(CH_2)_4CH:CH(CH_2)_{10}COOH$, the higher ones 13,14 to 17,18 are unknown; 4 of the 11 known acids are liquid, the remainder, including the 3 elaidin forms, are solid. P. FASCHER.

Notes on the feeding and manurial value of lime seed. H. A. TEMPANY. *West Indian Bull.* 15, 27-8(1915).—Analysis showed N 1.11, P_2O_5 0.58, K_2O 0.353, moisture 9.30, crude protein 6.94, crude fat 34.44, crude fiber 17.79, crude ash 2.49, and crude carbohydrates 29.04%. An extn. with $CHCl_3$ gave an oil of dark yellow color and pronounced bitter taste, the latter being removable by washing with alc. HCl . The oil does not appear to possess any drying properties; in general, it resembles the rape oil and cottonseed oil groups. The following constants were detd.: $d_{25}^{25.8}$ 0.9160, n 1.4700, I absorption 153.9, sapon. equiv. 339.6, solidifying point $6-7^\circ$.

W. H. FRY.

Method for the determination of free caustic alkali in soap. F. H. NEWINGTON. *J. Soc. Chem. Ind.* 35, 95-6(1916).—Ten g. soap are weighed into a 250 cc. wide-necked flask; 50 cc. of boiled hot distd. H_2O are added, the flask lightly corked and heated on

a hot plate until the soap is dissolved. Next 50 cc. of a hot satd. soln. of Na_2SO_4 is added and after mixing the contents of the flask are transferred to a narrow-mouthed separatory funnel. The funnel is lightly corked and stood perpendicularly in a beaker in a hot- H_2O oven. In a short time the soap seps. on the surface while beneath is an aq. soln. of Na_2SO_4 and the free alkali, which is drawn off and titrated with 0.1 N H_2SO_4 with 5% AgNO_3 as outside indicator. As long as free NaOH is present brown Ag_2O is produced. Throughout the test the sample is very little exposed to the air and if the Na_2SO_4 and AgNO_3 are neutral there appears to be little source of error.

E. SCHERUBEL.

Analysis of waxes with special reference to beeswax and wool wax. F. W. RICHARDSON AND G. A. BRACEWELL. *J. Soc. Chem. Ind.* 35, 160-3 (1916).—The methods described are those generally used in oil and fat analysis such as detn. of acid, ester and sapon. no. with ratio of acid value to ester value. To sep. the unsaponifiable matter in beeswax R. and B. add 50 cc. of 0.5 N alc. KOH to 5 g. of the wax in a flask and evap. the mixt. almost to dryness, after which it is emulsified with boiling H_2O , transferred to a large separator and shaken out with large vols. of petr. ether. The unsaponifiable matter thus sepd. gave no trace of ash and yielded the following figures: I no. 8.0, n_{D}^{20} 1.4386, butyrefractometer at 75° 21.30. The latter will at once indicate the presence of paraffin or ceresin as the reading for these lies between 9.6 and 11.6. To det. glycerol in beeswax 5 g. of the wax which has previously been washed with hot H_2O to remove honey, are boiled with 50 cc. of 0.5 N alc. KOH in an oil flask and the alc. is then removed by heating. The pasty mass obtained is neutralized with AcOH and after diln. is mixed with excess of basic Pb acetate and filtered and the ppt. washed. The Pb is removed from the filtrate by H_2SO_4 and after concn. the dichromate method is applied. Resin can be detd. by the well-known process depending upon the relative insoly. of cerotic acid and its homologs in hot 50% alc. For the sepn. of the unsapon. matter in wool wax, about 3 g. are heated with 50 cc. of N alc. KOH , the alc. evapd. and the residue treated with a boiling mixt. of equal vols. of alc. and H_2O and while still almost at the b. p. petr. ether is added to the soln. which should be in a separatory funnel. After shaking the alc. layer is drawn off into a 2nd separatory funnel and the alc. soap soln. plunged into a boiling H_2O bath till it has attained the temp. of the bath; then the extn. is repeated. In all 7 extns. are necessary. Tables are given showing analyses of saponifiable and unsaponifiable matter of wool wax.

E. SCHERUBEL.

Action of chlorinated hydrocarbons on metals (SASTRY) 9. A large fat-extractor (SCHMIDT) 1.

• **Hydrogenating fatty acids, their glycerides and esters.** OELVERWERTUNG G. M. B. H. Aust., 70,930, Jan. 10, 1916. H is introduced with the aid of H carriers (catalyzers) such as finely divided metal oxide, carrying out the process at the ordinary pressure or under a pressure of not more than 20 atms.

Recovering fats and oils. G. BOTTARO. Brit., 22,351, Nov. 11, 1914. Trade effluents obtained in the bleaching of wool, etc., and consisting of a fatty or oily emulsion containing an insol. alk. earth sulfite, are treated to sep. fat, oil, or fatty acid by passing in SO_2 so as to transform the sulfite into a sol. bisulfite. The fat, etc., rise to the surface and may be sepd. On boiling the aq. soln., SO_2 is sepd., and the sulfite is pptd. and may also be sepd. Any sol. ingredients of the emulsion, such as glycerol, metallic chlorides, etc., may be recovered from the liquid.

28. SUGAR, STARCH AND GUMS.

A. HUGH BRYAN.

The determination of reducing sugars in the presence of an excess of sucrose. L. MAQUENNE. *Compt. rend.* 162, 207-13(1916); cf. *C. A.* 10, 980.—Data are given, showing that in the detn. at boiling temp. 10 g. sucrose affect the detn. of invert sugar at most 1 mg. M. recommends working with a fixed quantity of sugar, either 5, 10, or 20 g. If, on account of high invert content, it is necessary to work with a smaller sample, enough pure sucrose should be added to bring the total up to the usual amt. In this way, only a single entry table is necessary, as the sucrose is const. For 20 g. of sucrose, and 10 min. heating in a bath at 65°, the correction for sucrose is const. and amounts to 5 or 5.5 buret divisions of $\text{Na}_2\text{S}_2\text{O}_3$. For low invert sugar (less than 0.2%), M. recommends the following method: Mix 10 cc. each of Cu soln., tartrate soln., and H_2O , dissolve in this 10 or 20 g. solid sugar, and heat 10 min. in a 65° bath. Cool, add 20 cc. 50% H_2SO_4 , and, with vigorous stirring, 5 cc. 20% KI. Titrate with $\text{Na}_2\text{S}_2\text{O}_3$ (20 g. cryst. salt per l.) using starch paper as an outside indicator. The $\text{Na}_2\text{S}_2\text{O}_3$ soln. should be standardized weekly. The method is not applicable to molasses. If the sugar must be previously dissolved, the detn. must be made immediately, or else the soln. must be boiled for 5-6 min. to destroy invertase; otherwise the invert sugar is sometimes increased 1% in 2 days. The soln. must be cooled and titrated immediately after the heating, as 5 or 10 min. standing at ordinary temp. may increase the reduction by an amt. equiv. to more than 1 mg. of invert sugar. For concordant results, the temp. must be held const. to 0.5°, and all other conditions kept the same. Since personal equation influences the results, each one should make his own table. Sucrose free from reducing sugars may be obtained by the method of Pellet (*C. A.* 10, 538), or by 3 recrystns. from a 75% aq. soln., made at 90°. The accuracy is about 2% of the total invert sugar present. P. M. GIBBY.

Steuerwald's modification of the double polarization method, and some general observations on inversion. H. PELLET. *Intern. Sugar J.* 18, 83-8(1916).—The method described by S. (cf. *C. A.* 8, 2501) by which inversion is carried out in the cold, by allowing a quantity of HCl 3 times as strong as that ordinarily used to react at the prevailing temp., is not recommended. The ordinary method will give constant results in the hands of several chemists using the same product if the usual precautions are observed. Inversion is often found to be incomplete if the HCl is not of the required d. because of the neutralization of a large part of this hydrolyst by the excess of Pb remaining in the soln., and the neutralization of another portion by org. salts contained in the molasses or similar impure product being examd. Other sources of error attributed to the inversion are the influence of dilution, the failure to place the tube in the saccharimeter in the same position each time when examg. the liquid, and the lighting of the saccharimeter. The Andriik process is suggested for molasses, as the presence of substances of the nature of glutamine and probably asparagine do not modify the rotation when using 5 cc. or even 15 cc. concd. HCl. For 50 sugar soln., 5 cc. HCl (with 5 g. urea) should be used. A. GROSS.

The recovery of copper as sulfate from the filtrates from sugar determinations according to Fehling. KRUMBHARR. *Chem. Ztg.* 40, 174(1916).—The hot filtrates are pptd. with a slight excess of a dil. glucose soln., decanted, the Cu_2O filtered and washed free of alkali with hot H_2O , treated with concd. HCl in a covered beaker on a H_2O bath, with the addition from time to time of small amts. of H_2O_2 till oxidation is complete; evap. the soln. as far as possible on the H_2O bath, add excess dil H_2SO_4 , evap., redissolve in H_2O and evap. 2 or 3 times, filter the hot soln. into 3 vols. 96% alc., filter and wash the fine ppt. with alc. J. H. MOORE.

Some observations on the deterioration of sugars in storage. W. L. OWEN. *Louisiana Planter* 56, 173-4, 188-90(1916); cf. *C. A.* 9, 1130.—These observations confirm to a certain extent the "factor of safety" of the Colonial Sugar Refining Co., of Australia, as a criterion of the keeping quality of sugars. The factor holds that the moisture of a sugar should not be more than half of the non-sugar, or when $\text{water}/(100 - P) < 0.333$, the sugar will not deteriorate. In the case of Louisiana test sugars, 40% of the samples were safe according to this factor, and only 13% actually deteriorated. In this instance only 50% of the sugars found unsafe according to the factor actually deteriorated, which indicates that with this type of sugar a lower ratio between the non-sucrose and moisture than required by the factor need not unvariably be regarded as unsafe. Of the samples of 96 test sugars that deteriorated the av. ratio of non-sucrose was 0.450 with a minimum of 0.303, while the av. for the samples which kept well was 0.300 with a max. of 0.347. The degree of infection of a sugar with deteriorative microorganisms may invalidate the reliability of the factor of safety as a means of predicting the behavior of sugars in storage. A sugar with a factor of 0.488 ordinarily regarded as unsafe retained its original polarization during a 12-month storage period. In this sugar there were only 2200 microorganisms per g., while another containing 11,000 per g. with a factor of 0.242 deteriorated appreciably during a similar period of storage. The factor seems equally applicable to plantation white sugar. Theories regarding the nature and extent of moisture films surrounding the sugar crystals are discussed, together with the influence of bagacillo. This substance possibly hastens deterioration by maintaining a moist zone surrounding the sugar and in this way fosters the activities of microorganisms. The theory that the deterioration of sugars could be contingent upon the presence of bagacillo is held untenable, in so far as it attributes to this substance the function of supplying food for the microorganisms in sugar. Sugars which in comparison with white sugars are most bountifully supplied with nutrient material for microorganisms are the ones most likely to contain bagacillo. A. GROSS.

The use of the steam turn plate. JAMES MALLON. *Louisiana Planter* 56, 109 (1916).—Instead of water, steam is applied to the bagasse in the cane mills in the line of the turn plate. The extrn. of cane juice is accomplished without serious dilution due to the softening of the cane fibers, the ready penetration of the mass by the steam and the reduction of the viscosity of the cane juice by the higher temp. developed. Tests by this method gave 3.48% (on the basis of the wt. of the cane) of additional juice. The quality of the juice is also improved and the bagasse becomes a more ready and economic fuel due to the lower moisture content and its conservation of the heat of the steam. A. GROSS.

The manufacture of sugar in Java. J. F. CLARENC. *Intern. Sugar J.* 18, 80-2 (1916).—A description of the sugar industry of Java. A. GROSS.

Effect calandrias. CHAS. E. NEWBOLD. *Intern. Sugar J.* 18, 71-8(1916).—A practical description with suggestions for increasing efficiency. A. GROSS.

Starch and dextrin. A review of patents for the last nine years. R. M. WOLF. *Chem. App.* 3, 52-4(1916).—German patents to Nov., 1915. J. H. MOORE.

Sugar cane mills. J. WILSON. *Brit.*, 22,390, Nov. 12, 1914. A sugar cane or like mill is built up with a series of pairs of rollers mounted on an inclined frame. The pairs of rollers are set parallel and inclined at the same angle to the frame, and the roughness of the surface of the rollers decreases with each pair, while the pressure in-

creases. The last pair of rollers may be either both smooth, or the lower smooth and the upper one finely grooved.

Betaine and betaine salts. AKT.-GES. FÜR ANILIN-FABRIKATION. Aust., 70,875. Jan. 10, 1916. In the manuf. of betaine or betaine salts from molasses, molasses washings, or other end liquors from beet sugar manuf., the initial material is freed from H_2O as completely as possible, then mixed with HCl , while avoiding overheating so that, *e. g.*, a temp. of $50-60^\circ$ is not exceeded, and the betaine- HCl is cooled to crystn., the sepd. crude salt being purified in the known manner, as by resoln. in $MeOH$ and evapa., or by recrystn. from H_2O .

29. LEATHER AND GLUE.

LLOYD BALDERSTON.

Barium in the leather and allied trades. Its history, occurrence, manufacture, use in the leather industry, and the testing for it. FRED ASHWORTH. *Leather Manuf.* 27, 2, 43-5 (1916).
J. S. ROGERS.

Tanning substitutes. W. EITNER. *Gerber* 41, 263 (1915).—As substitutes for the unobtainable tanning substances, E. enumerates *Rhus cotinus*, from Southern Tyrol, Dalmatia and Herzegowina, whose leaves, gathered immediately after the flowering stage, contain up to 18% tannin. During the Napoleonic wars a book, "Ausführlicher Beschreibung der Lohgerberei," by Ignaz Bautsch, a tanner in Wurtemberg, was published (1796) in Dresden, which contains a list of many plants useful as tanning substitutes or auxiliaries. E. has elsewhere described members of the Ericaceae, *e. g.*, the bilberry and the cranberry, and a few vaccinia, which contain tannin, both in leaf and stem.
W. B. J.

The war and tanning requirements. E. GLÜCKSMANN. *Gerber* 41, 197 (1915).—Syntans can largely replace the tannins unobtainable because of the war. Five to 15%, based on the wt., of the raw hide, of Neradol D following sumac tanning, quickly gives good leather from sheep and goat skins. Upper leathers and all kinds of heavy leathers can be tanned either in the drum or vat, with Neradol D, and all vegetable tannins, in less time, and with greater yield. With heavy leathers, 1 to 2° Bé. solns. of Neradol D are used. The advantages of the different neradols, with and without vegetable tans, are further discussed.
W. B. J.

The leather industry of the Philippine Islands. VINCENTE Q. GANA. *Philippine J. Sci.* 10A, 349-71 (1915).—A study of the resources of the islands for leather manuf. and of the methods in use, with special reference to remediable faults in methods. There are 167 tanneries in the islands, the yearly output being about 93,000 tanned hides. Statistics of imports, exports and prices are given. The method of tanning used is that introduced centuries ago by the Chinese. Beside native hides, some Australian hides are used, and more from China. A large proportion of the hides taken off in many parts of the islands are wasted. The tanning materials used are mangrove bark of several species and the bark of *Pithecolobium dulce*, called camanchile. Mangrove is used only in Manila, the native tanners generally preferring camanchile, although its price is very high, reaching \$40 per ton, because of the lighter color of the product. Analysis of camanchile shows (dry basis) tannin 25.4, non-tannins 9.4%. Some nitrogenous matter is present, which may account in part for the growth of putrefactive organisms in the tan-liquors. Analyses are given of a number of other materials which have been proposed as possible sources of tannin. None which is available in quantity has enough tannin to make it useful. The camanchile bark is

prepd. for use by chopping it into pieces 3-4 cm. in size. A sample of spent bark showed more than half as much tannin as the new bark. Hides are soaked for a few hours in water and then limed from 10 to 15 days, with 3 or 4 haulings. After being unhaired and fleshed they are washed for a few hours in running water and placed in pits with liquor and bark. Once a day for 4 days the packs are shifted and the hides kneaded with bare feet to aid in the penetration of the tannin, which by the end of this time amounts to $\frac{1}{2}$ the thickness of the hides. If evidence of putrefaction is found, a 5th or even a 6th handling is given. In the rainy season some tanners shut down because of the difficulty in preventing the hides from putrefying in the first stage of tanning. After being taken from the handlers, the hides are laid down in other pits with liquor and bark for 6 weeks to complete the tannage. After washing, the leather is dried in sunshine and sold without further treatment. Losses from putrefaction are great. Much tannin is wasted, and the product is very much under-tanned. One cause of poor results is the use of unsuitable water. Analyses of 3 waters are given. Lack of cleanliness is partially responsible for putrefaction in the liquors. Putrefactive bacteria were found in both weak and strong liquors. In this respect infusions of camanchile bark differ from those of other familiar tanning materials. Several analyses of liquors at various stages of the process are given. The percentage of tannin is low in all. G. tried an expt. in one of the Philippine tanneries, using ten hides, which were placed for 24 hrs. in a 1% soln. of phenol after being unhaired, fleshed, and partially delimed with H_2SO_4 . In the later stages stronger liquors were employed, and the whole time in the liquor was increased to 12 weeks. The leather was oiled, rolled and dried in the shade. The wt. of leather produced was 32% greater than that from similar hides tanned by the native process and its quality much higher. In another expt. some mangrove bark was used in the layers, the product being of good quality and orange brown in color.

L. B.

Potassium titanium oxalate as a dye, stainer and mordant. FRED ASHWORTH. *Leather World* 8, No. 2, 15-6(1916); *Shoe and Leather Reporter* 121, No. 9, 77-9(1916).—Ti salts in conjunction with tanning materials form a yellowish brown lake which is fast to light and to the action of alk. salts. It is used in the dyeing of both chrome and vegetable tanned leathers. A shade of yellowish brown tan suitable for strapping purposes may be produced by dissolving 2 oz. of K Ti oxalate in 1 gal. of water and applying with a brush. K Ti oxalate has an advantage over tartar emetic as it not only fixes the tannin on the leather, thus preventing staining in the dye bath, but on account of the yellowish brown color lake, much less dyestuff is required. A large variety of shades can be obtained by its use with dyewood exts. Formulas are given for light yellow, light yellowish brown, sugar loaf brown, brown, chocolate, red, crimson, scarlet, olive green, brown, and reddish violet. Bright blue cannot be obtained as the yellow color would produce bluish greens. Satisfactory shades may be produced without the use of coal-tar dyes or with only a little added to make the shade a trifle "livelier." One advantage is that the color is regular throughout the whole of the skin. The goods may be fat-liquored after dyeing. Wood vessels are preferable to copper, as the latter lead to a darkening of the color, and are injurious to the basic coloring matters.

J. S. ROGERS.

Dressing pig skins. I. E. MORTON. *Leather World; Hide and Leather* 51, No. 10, 25-6(1916).—Pig skins are almost without exception tanned with oak bark, and require a light prepn. for dressing. They are, as a general rule, shaved by hand, lightly boraxed, washed, scoured, washed, and sumaced, washed, struck out, set and strained. For color work, the straining is done after the dyeing. They must not be tallowed before dyeing. For London Color, the skins should be sorted and then stained, usually

with an annatto in an alk. or alc. soln. Suitable dyes are Golden brown Y, Cuba yellow, croceine AZ, phosphine substitute, tartrazine, turmeric substitute, sun yellow G, titan yellow Y, titan orange, and resorcine brown. One-quarter oz. of any of these dyes is dissolved and made up to one gal. Six lbs. of gum tragacanth are dissolved in 60 gal. cold water with 4 oz. oxalic acid. Two pints dissolved gum and $\frac{1}{2}$ pint of dye are taken and made up to 4 gals. The skins are given two good brushings, horsed up and set. Hand stuffing is done by brushing the grain side with dubbin. The skins are then hung up and dried in a cool place, trimmed and slicker whitened on the flesh side, pebbled on the grain side, and grained in almost any direction. They are then flattened by graining on the flesh side, and finally brushed on the grain. Paraffin wax will give a bright face. A suitable mixt. for drum dyeing is 8 oz. tartrazine, 8 oz. resorcine brown, and 16 oz. formic acid for 3 doz. medium sized pig skins. Dye for an hour, run off water, wash with drum in motion, drain and examine. They must be warm for stuffing. A good stuffing mixt. is 6 parts stearin, 2 parts hard tallow, and 2 parts cod oil. Allow $\frac{1}{2}$ the quantity of stuffing to the dry wt. of the goods. The paddle is preferred to the tray or drum for dyeing as it is cheaper and the goods can be watched and do not need handling. The chief colors required are yellows and tan browns. Lime water should be neutralized by acetic acid. Practical recipes are given for tan shade in the drum, browns medium, light, medium and dark green, maroon, blue, and black, and the method of dyeing described in detail. Acid colors give a more even and clean result than basic. The Russian smell may be imparted in various ways. M. prefers spraying a mixt. of birch tar oil and whale oil on to the skins when they are hanging up. Pig skins for saddles are soaked in linseed oil. J. S. ROGERS

Report of committee on miscellaneous methods. L. BALDERSTON. *J. Am. Leather Chem. Assoc.* 11, 95-8(1916).—Estn. of volatile acid in lactic acid was studied. A standard method of distn. is suggested, and results of distg. mixts. containing up to 3% of CH_3COOH are given; also a table showing amts. of volatile acid in distg. flask corresponding to amts. up to 70 mg. found in distillates. L. B.

The use of nickel hydroxide in tannin estimation. PURAN SINGH AND T. P. GHOSH. *J. Soc. Chem. Ind.* 35, 159-60(1916).—As supplies of hide powder sometimes run short in India it is desirable to secure a substitute. It is difficult to prepare $\text{Ni}(\text{OH})_2$ free from sulfate in paste form. Kahlbaum's extra pure $\text{Ni}(\text{OH})_2$ contained traces of sulfate. After repeated washing with hot water and finally with water containing traces of tannic acid, it was free from sulfate and in a fairly granular condition. The $\text{Ni}(\text{OH})_2$ was used in this form. Babul pods by the $\text{Ni}(\text{OH})_2$ paste method give 26.3% tannin, by the hide powder method 23.7%, and by the Cu acetate method 26.6%. Solns. of tannic acid, gallic acid, glucose, and cane sugar of known strength were treated with chromed hide powder and with $\text{Ni}(\text{OH})_2$ under similar conditions, and encouraging results were obtained. The table of results is given. Comparative estimates were then made with a number of tanning materials, the results of which are given. Instead of hide powder, 20 g. $\text{Ni}(\text{OH})_2$ free from water should be added for detannization. The authors are using this $\text{Ni}(\text{OH})_2$ method and consider it as reliable as and perhaps preferable to the hide powder method considering that $\text{Ni}(\text{OH})_2$ is a standard substance and can be used wherever org. and mineral acids likely to dissolve $\text{Ni}(\text{OH})_2$ are not present. In the discussion Procter said that this method could not take the place of the hide powder method commercially but there was no reason why it should not be used as a preliminary method in forming judgment for forestry purposes. $\text{Al}(\text{OH})_3$ has been used with good results. Cu gives considerable accuracy with some tannins, but many tannins give ppts. which are sol. in ammoniacal copper solns.

J. S. ROGERS.

Analysis of Dutch, English and American sole leathers. ANON. *Hide and Leather*; *J. Am. Leather Chem. Assoc.* 11, 167-70(1916).—De Nederlandsche Leder-industrie has published an article giving comparative analyses of Am., Dutch, and Eng. sole leathers. In none of these countries do tanners still use pure oak bark exclusively. The use of exts. in drum tannage is much quicker but the quality of leather is not improved. Oak-tanned sole leathers contain only 8-10% of water-sol. materials. With mixed tannage this percentage is higher, while with pure ext. tannage it is still higher, the av. being 18.6% for Dutch ext. tanned sole leather according to expts. by the Govt. Expt. Station at Waalwyk, Holland. The English Federation of Tanners recently decided on 25% as the limit. Figures are given showing the results of 32 analyses of Dutch sole leather. They show 11.3% sol. org. materials and 19.4% moisture. The results of analyses of 3 English leathers are given. One was a good tannage, having 21.1% sol. org. materials. The others were of leather of the quick tanning method as it is now made to satisfy the urgent demand. They contain 31.4% and 32% sol. org. materials. Analyses results are given for 6 Am. leathers. The worst of these was a sole leather of a large corporation and so-called "scoured bends." It sold for 59 cents a lb., had 31.2% sol. org. materials, 2.7% ash, 9.76% sugar, 4.85% Epsom salts, and 18.66% combined tannin (indicating quick tannage with strong materials). This leather looked all right on the grain, thus indicating that American leather cannot be judged by its looks. Far superior to this was a hemlock-tanned sole leather (from a leading producer) which sold for 49 cents a lb. The best sample was an oak-bark tanned product of Kentucky, tanned by the old system. The price was 59 cents a lb. It contained 22% sol. org. materials, but only 12.68% moisture. The two samples next in quality were normal excepting in sugar content. They contained 3.42% and 2.5%, respectively, while only 2% is allowed. One of these sold for 55 cents a lb.

J. S. ROGERS.

Analysis of tannery lime liquors. H. G. BENNETT. *Collegium (London)* 1915, 258-66, 313-22, 329-35; *J. Am. Leather Chem. Assoc.* 11, 98-130.—(1) *Alkalinity:* Methyl orange or phenolphthalein may be used for rough control work, though neither gives accurate results. Alizarin paste is a better indicator, being sensitive to weak acids and suitable for the titration of ammonia. It should be added near the end of the titration, as its Ca salt is insol. Half of the Na present as sulfide is detd. along with other alkalis. Two other methods for total alkalinity of liquors containing sulfide are given: indirectly by boiling with excess of 0.1 N H_2SO_4 till H_2S is expelled and titrating the excess, and directly by titrating with 0.1 N acid and methyl orange after pptg. peptone matters held in soln. by alkalis by means of H_3BO_3 and filtering. Methyl orange is not affected either by H_3BO_3 or H_2S . (2) *Ammonia:* As long as the liquor is boiled, NH_3 continues to be given off, in consequence of gradual decompn. of org. matter present. The distn. must therefore be stopped at some arbitrary point. To check liberation of NH_3 20 cc. of a 10% soln. of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ are added to 100 cc. of lime liquor before distg., and the mixt. is distd. exactly 15 min., the NH_3 being collected in excess of boric acid soln. and titrated direct with 0.1 N HCl and methyl orange. If ZnSO_4 soln. be substituted for MgSO_4 , the pptn. of nitrogenous matter is more complete. (3) *Sulfides:* The method recommended employs a soln. of ZnSO_4 with NH_4Cl and NH_3 with Na nitroprusside as external indicator (*C. A.* 7, 716; 8, 3135, 2505). (4) *Soda:* A measured amt. of filtered liquor is evapd., ignited, the residue moistened with $(\text{NH}_4)_2\text{CO}_3$ soln. and gently ignited. The residue is washed on a filter and the filtrate titrated with 0.1 N HCl and methyl orange. (5) *Lime:* (a) *Total lime:* Evap. 25 cc. of filtered liquor, ignite the residue and dissolve it in HCl. Ppt. Ca as oxalate, wash and dissolve in dil. H_2SO_4 and titrate with 0.1 N KMnO_4 at 70°. (b) *Caustic lime:* Three methods are discussed, and their errors pointed out.

B. prefers a fourth, in which the liquor is treated with HCHO before titration. HCHO reacts with NH_3 to form hexamethylenetetramine which is neutral to phenolphthalein. It also reacts with hydrosulfides, converting them into hydroxides. There is thus no error due to the escape of H_2S , but the alkalinity to phenolphthalein is increased. HCHO also reacts with amino acids present in the liquor, forming acids which affect the indicator, thus reducing the alkalinity. Such reduction may be determined separately by a method suggested by Stiasny (*C. A.* 5, 1004). To 10 cc. 40% HCHO add 10 cc. H_2O , and neutralize to phenolphthalein with 0.1 *N* NaOH. Add 25 cc. filtered lime liquor and titrate with 0.1 *N* HCl. *Stiasny's correction:* Neutralize 25 cc. filtered liquor to phenolphthalein with 10% AcOH. Add 0.1 *N* I to slight excess, then 10 cc. 40% HCHO, neutralize, and titrate again with 0.1 *N* NaOH. The 2nd titration is a measure of the amino acids present in the original liquor. If sulfides and NaOH have been detd., it is now possible to calc. the $\text{Ca}(\text{OH})_2$. (6) *Nitrogenous material:* The Kjeldahl method is satisfactory. Six possible causes of error are discussed. The Ronch  e method is recommended for estg. the NH_3 ; after digestion exactly neutralize excess H_2SO_4 with NaOH, and add excess of neutral HCHO, which converts NH_3 to hexamethylenetetramine, liberating an equiv. amt. of H_2SO_4 , which is titrated with 0.1 *N* NaOH. (7) *Sodium chloride:* (a) *Indirect.* Sulfides and much of the organic matter are thrown out with $\text{Zn}(\text{NO}_3)_2$. The filtrate is oxidized with HNO_3 and a definite amt. of 0.1 *N* AgNO_3 is added; pptd. AgCl filtered off, and excess of AgNO_3 titrated with KSCN, ferric sulfate indicator. (b) *Direct.* Sulfides, NH_3 , and much organic matter are thrown out by boiling with $\text{Mg}(\text{NO}_3)_2$, which leaves the liquid neutral, and permits the usual titration with AgNO_3 , K_2CrO_4 indicator. The direct method is less satisfactory because of incomplete removal of org. matter which causes too great consumption of AgNO_3 .
L. B.

Artificial leather and leather substitutes. R. LAUFFMANN. *Kunststoffe* 6, 41-3 (1916).—A discussion of processes patented during the past 2 yrs. in Germany (cf. Kausch, *C. A.* 8, 1885; Micksch, *C. A.* 9, 1258, 1553, 2606). F. W. SMITHER.

Leather. REBERLE & Co. Brit., 22,753, Nov. 19, 1914. Hides are bated by means of a material obtained by the decompn. of animal organs by the enzymes contained therein or by peptolytic enzymes; pancreatic gland, liver, gall, bowel, etc., are suitable starting materials; other albuminous substances such as meat, glue, casein, etc., may be added; when decompn. is complete, the mass is heated to destroy the enzymes, and the liquid portion of the product is sepd.; it may be used as such or absorbed in kieselguhr, sawdust, etc.

Artificial leather. N. G. SCHUEER. Brit., 100,038, Jan. 24, 1916. Artificial leather is made by impregnating linen duck with linseed oil or a varnish to which a little siccative and Vienna red have been added, drying and sticking sheets of this material together with a mixt. of 4 kg. heated wood-tar pitch, 2 kg. India rubber dissolved in benzene or the like, 4 kg. Vienna red mixed to thick consistence with French turpentine, and 2 kg. of powdered cork. The compd. sheet is finally passed through pressure rollers.

Artificial sole leather. O. LINDNER. Aust., 70,943, Jan. 10, 1916. The fibrous material serving as initial material, such as hair mat, wool fiber, or the like, is subjected first to a petrifying process by satn. with sol. silicates, finally in the presence of substances containing lime or silica, the plates obtained from this material by rolling it out, are rendered water-tight and flexible, after drying, by immersing them in mixts. of resin solns. with glycerol, and these plates are then impregnated with

a melt of resinous wax-like or fatty acid-like substances or mixts. of these. Cf. C. A. 9, 1857.

Linoleum soles for boots and shoes. I. FIZIA. Aust., 70,609, Dec. 10, 1915. The soles are built up of layers of linoleum and fabric, cemented together with shoe-makers' cement and enamel varnish.

Tannin-colored etchings with vat dyes. KALLE & CO. Aust., 70,946, Jan. 10, 1916. The tanned material, before printing with the color etch, is prepd. with Al acetate.

Tanning and impregnating. ELEKTRO-OSMOSE AKT.-GES. Aust., 70,915, Jan. 10, 1916. The liquid containing the active substances is subjected, between diaphragms, to the action of the elec. current. Circulation of the liquid is facilitated by stirring, or the like.

Tanning and cleaning the tanning material simultaneously. ELEKTRO-OSMOSE AKT.-GES. Aust., 70,916, Jan. 10, 1916. In the application of the process of 70,915 (*supra*), an electro-osmotic purification process for the tanning substance is combined with the tanning process.

Glue and gelatin. C. TWELE. Aust., 70,944, Jan. 10, 1916. Alum leather scrap or the usual leather parings for size are treated with a NaCl soln. After washing out the NaCl, and boiling, a neutral glue liquor is obtained.

30. RUBBER AND ALLIED SUBSTANCES.

R. T. STOKES.

Investigation of caoutchouc-like products. ALFONS LANGER. *Pharm. Ztg.* 61, 14(1916).—The examn. of 2 samples of caoutchouc substitutes revealed the presence, among other things, of naphthalene and a saponifiable material yielding glycerol and fatty acids, of odor resembling that of oleic acid. W. O. E.

Prevention of the harmful effects of ultraviolet light on balloon fabric. THEODOR SCHOPPER. Berlin, Neukoelln. *Gummi-Ztg.* 29, 1250(1915).—Inspired by Ger. Pat. 286,260, on the coating of balloon fabric with yellow pigment, Al powder, or both. S. describes expts. which show that the action of light on sensitized paper is almost completely prevented by the addition of $1/100000$ th part of β -methyl-dihydroxycoumarin or a 1% soln. of dimethylamino- β -methylcoumarin to a colorless lacquer on a glass plate covering the paper. A spot of tender skin covered with a very weakly alk. 15% soln. of β -methylhydroxycoumarin in glycerol was not sun-burned, while a spot next to it covered with glycerol only was badly burned. These materials have the further advantage of low gravity and could be used as pigments to color the balloon fabric.

E. L. D.

Prevention of harmful effects of ultraviolet rays on balloon fabrics. C. MANNICH. *Gummi-Ztg.* 30, 349(1916).—M. claims that Schopper's discoveries on this subject (cf. preceding abstract) were anticipated by him, and are protected by Ger. patent No. 253,334 (cf. C. A. 7, 433). R. T. S.

Tackiness of crude rubber. K. GORTER. *Gummi-Ztg.* 30, 351(1916); *Caoutchouc et Gutta-percha* 12, 8721-2(1915).—According to Spence tackiness is caused by a breaking down of the caoutchouc mol. G. exposed samples of caoutchouc in sealed tubes to the action of light, the tubes being filled with air, CO₂, O, and H, respectively. The caoutchouc became tacky only in those tubes which contained O and air. The oxidation proceeded slowly the first 6 days, then more rapidly, reaching

a max. in about 30 days. Rubber boiled in H_2O oxidized under these conditions also, proving that tackiness is not caused by enzymes, as claimed by Whitby (*C. A.* 7, 2318). The presence of aldehydes in the tacky rubber was established. R. T. S.

Reclaimed rubber. M. WACHTER. *Gummi-Ztg.* 30, 373-4(1916).—A rambling discussion of the manuf. and uses of reclaimed rubber. W. grants that American reclaimed rubber is in general superior to the European product, for the reason that the rubber scrap in America is better than European scrap, containing less factice. W. considers reclaimed rubber especially suited for elec. insulation, and protests vigorously against the prohibition of its use by specification writers. [W. is an authority on cable manufacture.—ABSTR.] R. T. S.

Indigenous rubber plant, high in rubber content. J. SCHILLER. *Gummi-Ztg.* 30, 500-1(1916).—Discussion of *Laetuca viminea*, a plant which flourishes in the Danube and Elbe valleys, and which grows to a height of 1 to 2 m. The "latex" yields a weak rubber, analyzing 19.06% of resin and 73.21% of caoutchouc. The % of rubber, calcd. against dry material, is 0.49, the yield being higher in cultivated than in wild plants. S. points out that the annual yield from *Hevea brasiliensis* and *Kickxia elastica* is only 0.3% on a dry basis. *Parthenium argentatum* yields 10%. The article must be regarded as the theoretical ideas of a biologist, rather than the practical consideration of a rubber expert. R. T. STOKES.

Porosity of rubber. ANON. *Gummi-Ztg.* 30, 456-7(1916).—Porosity of rubber, in a technical sense, may be due to several factors. Surface porosity is usually caused by condensation of steam on the goods during vulcanization. If the goods are embedded in talc, the drops of H_2O percolate through the talc to the rubber and cause uneven vulcanization. Höhn (*Gummi-Ztg.* 14, 423) suggested that this danger might be obviated by slightly moistening the entire surface of the talc before the heater is closed. In the case of goods which are wrapped before vulcanization, moistening the wrapper will prevent blowing. Internal porosity is caused by moisture in the rubber or compound, by the use of a low-grade weak rubber in whole or in part, or by over-milling the stock in "breaking down" or compounding. Porosity in molded goods is due to the fact that the mold was not completely closed, or that insufficient stock to fill the mold was taken. R. T. S.

The storage of rubber goods. ANON. *Gummi-Ztg.* 30, 402-3(1916).—Light, high and low temps., and moisture tend to shorten the life of rubber goods. Blue and violet light rays are particularly harmful; red light is practically without effect. The color of the goods seems to have some influence, bright colors acting to some degree as preservatives. The S "bloom" may have a certain protective effect. R. T. S.

Hard rubber and other electrical insulation. ANON. *Gummi-Ztg.* 30, 499-500(1916).—A description of methods of making-up and curing sheet, rod, and molded articles, of the prepn. of hard rubber dust, etc. R. T. S.

The manufacture and use of reclaimed rubber. ANON. *Gummi-Ztg.* 30, 147-9(1915).—Discussion, under the following captions: What is reclaimed rubber; what brought about its manuf. and use; should the rubber goods factory run its own reclaiming plant, or leave reclaiming to the reclaiming industry? The author inclines to the latter view. The article contains nothing new. RAXLEY F. WESSER.

The resin content of rubber. F. JACOBSON. *Gummi-Ztg.* 30, 5-6, 28-30, 53-6(1915).—A comprehensive compilation from the literature of a mass of information regarding the resins of various sorts of rubber and gutta-percha, their source, compn. and nature, the conflicting views as to their significance, their role in vulcanization, etc. The following related subjects are also considered: compn. of rubber latex, theories

of coagulation, causes of tackiness, technical uses of resins (particularly of Pontianak resin). A bibliography is included.

RAXLEY F. WEBER.

Determination of barium carbonate and barium sulfate in rubber goods. J. B. TURRLE. *Bur. Standards, Tech. Paper No. 64*, 5 pp.(1916); *J. Ind. Eng. Chem.* 8, 324-6(1916).—Since the presence of BaCO_3 interferes with the detn. of total S in rubber goods, a method for its detn. is needed. T.'s method is as follows: Heat 1 g. of the sample in the app. described by Schaeffer (cf. *C. A.* 7, 906), passing a current of CO_2 through the tube. After ignition, remove the boat containing the sample and transfer it to a 250 cc. beaker. Treat with 5-10 g. of $(\text{NH}_4)_2\text{CO}_3$, 15-20 cc. concd. NH_4OH and 50 cc. H_2O . Boil for 15 min., filter and wash. Wash insol. matter back into beaker and treat with 10 cc. glacial AcOH and enough H_2O to bring the vol. of the soln. to about 100 cc. Boil and filter. Pass H_2S through the filtrate, filter off the PbS , wash and det. Ba in filtrate by pptn. with H_2SO_4 and weighing as BaSO_4 . $\text{Wt. BaSO}_4 \times 0.845 = \text{BaCO}_3$. Analysis of mixts. of known compn. showed the method to be reliable.

E. W. BOUGHTON.

A method for the direct determination of rubber in a compound. R. W. BELFIT. *J. Ind. Eng. Chem.* 8, 326-7(1916).—The method is applicable only to high-grade compounds which are free from org. substitutes of every description. Instead of converting rubber into a nitrosite as Wesson does (*C. A.* 8, 2815), B. treats the acetone-extd. sample with boiling HCl , and burns the residue in a combustion tube after washing out HCl and drying in CO_2 . From the wt. of CO_2 obtained from the combustion, the % of caoutchouc is calcd. Two detns. on fine Para gave 96.19% and 96.57%; and in the analysis of 4 "30% compounds," results checking remarkably well with the theoretical figures were obtained.

R. T. S.

Action of chlorinated hydrocarbons on metals (SASTRY) 9.

India rubber. S. C. DAVIDSON. *Brit.*, 22,138, Nov. 6, 1914. Rubber latex is coagulated by adding an "alkalized" cresol, cresylic acid or higher tar acids, or other "alkalized" phenol, as described in 11,470, 1912 (*C. A.* 7, 3673), and 13,438, 1913 (*C. A.* 8, 3867), and an aq. soln. of a thio sulfate, sulfite, or other compd. capable of evolving SO_2 on treatment with acid or acid substance, and finally coagulating by adding an acid or acid substance to liberate the preservative substance in the phenol and also to liberate SO_2 .

Kneading India rubber. S. C. DAVIDSON. *Brit.*, 22,490, Nov. 13, 1914. Machines for kneading, and at the same time, if desired, for drying or washing, rubber, etc., consist of a number of rollers assembled so as to form a cavity in which the rubber is rolled over and over.

Coagulating rubber latex. S. C. DAVIDSON. *Brit.*, 22,489, Nov. 13, 1914. Latex is coagulated by the addition of dil. acid or other coagulant during its oscillation in a specially shaped churn or receptacle. The latex is contained in a vessel having its ends curved over inwards, and with an open top. The vessel is attached to links pivoted so that it can be oscillated by any suitable means. A tank contains the coagulating liquid, which flows through a measuring vessel into the latex vessel. When coagulation is finished, a catch holding the said latex vessel is released, and the vessel turned over so that the liquid flows through a screen on to a deflecting shoot, the rubber being retained on the screen. The vessel is then turned over on the opposite side and the rubber emptied onto another discharge shoot on the opposite side of the center line of the app.

3-Methylbutenol, its homologs and analogs. BAYER & Co. Aust., 70,880, Jan 10, 1916. 3-Methylbutenol, its homologs and analogs, are obtained by treating 3-methylbutinol, as well as its homologs and analogs, with reducing agents. The products have technical value inasmuch as isoprene and its homologs and analogs can be obtained from them by the removal of H_2O . The reducing agents specified are Na, Zn dust and HOAc, Zn dust and H_2O ; colloidal Pd, and Ni.

Chemical Abstracts

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CHEMICAL ABSTRACTS

Vol. 10.

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No. 10

I. APPARATUS.

L. C. JONES.

Simple vacuum distilling apparatus. T. G. GREAVES. *J. Am. Leather Chem. Assoc.* 11, 172-3(1916).—For the app. having a glass dome joined to the lower part by a rubber gasket, extra parts for which cannot now be obtained, G. substitutes a glass jug of about 4 l. capacity, set in an outer metal vessel. L. B.

Pocket carbon dioxide indicator. ANON. *Eng. Mining J.* 101, 647(1916).—The app., designed to det. the amt. of CO_2 in flue and furnace gases, is constructed with an upper and lower bulb; the latter is filled with KOH, one filling sufficing for 200 detns. About $2\frac{1}{2}$ min. are required for a test. *Operation:* A sample of gas is pumped in through a cock above the upper bulb; a lower cock is then turned 180° to permit the gas and KOH to come in contact. The lower cock is closed, and the app. is inverted and immersed in H_2O ; the upper cock is then opened, and H_2O flows in to take the place of the absorbed CO_2 . Closing what was the top cock and bringing the app. to its normal upright position, the percentage of CO_2 is read off on the graduated tube at the H_2O level. The H_2O is then poured out through the top cock, and the app. is ready for another test. The app., manufd. by the Bacharach Industrial Instrument Co., Pittsburgh, Pa., is of small wt. and with case fits one's pocket. F. W. SMITHER.

Practical cock keys. F. W. HORST. *Chem. App.* 3, 49-50(1916).—Descriptions, with 9 cuts. J. H. MOORE.

Vacuum drier for substances which can be shoveled (grain, etc.). J. E. BRAUER-TUCHORZE. Hanover. *Chem. App.* 3, 50-1(1916).—General remarks, with description and 1 cut of the Paszburg drier (capacity 55 tons per 24 hrs.). J. H. M.

Illuminating gas retort for school instruction. RICHARD SCHULZE. *Chem. App.* 3, 54(1916).—To illustrate the production of illuminating gas, an Fe pipe about 20 cm. long and 2.5 cm. diam. is closed with caps and filled with small lumps of coal. Near 1 end is an exit pipe connected with suitable scrubbers for purifying the gas. The retort is heated with Bunsen burners. J. H. MOORE.

A universal switch for thermoelement work and other potential measurements. W. P. WHITE. Geophys. Lab., Washington. *Am. J. Sci.* 41, 307-16(1916).—This switch is intended to favor rapidity and completeness in measuring. It enables different thermoelements (or other sources of unknown e. m. f.) to be quickly connected for reading in a variety of combinations with other app., such as potentiometers. Contact is made between thin strips of Cu, which is thermoelectrically one of the best forms of contact known and permits the use of very simple mechanical arrangements. The mechanical arrangement is such that for each combination of app. used the connections are made by pressing an appropriate button; the combinations can be changed by rotating the buttons. The switch is also very easy to overhaul and to construct. W. P. WHITE.

A new form of optical pyrometer. ANON. *Iron Age* 97, 779-80(1916).—This instrument aims to improve, without greatly altering, the usual practice, which is to judge temp. by color. The light from the object measured is compared directly.

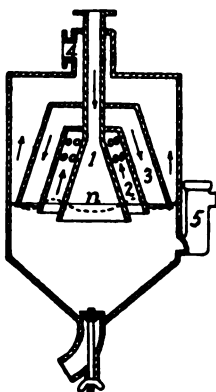
with an illuminated color scale. The whole instrument is about the size of a pocket flashlight, and gives results "to 1 or 2%." W. P. WHITE.

Apparatus for producing ultraviolet radiation. W. S. ANDREWS. *Gen. Elec. Rev.* 19, 317-9(1916).—The high tension disruptive spark between Fe terminals is very rich in ultraviolet radiation covering about 80% of that part of the spectrum which is useful for producing fluorescent effects. Compared to other metals tried, Fe shows a more uniform distribution throughout the entire range. Accordingly Fe electrodes have been adopted in the new app. described. The complete outfit comprizes a small transformer that steps up 60-cycle 110-volt a. c. to about 4000 v.; a condenser; an adjustable spark gap. The app. can safely be connected to any a. c. lighting circuit since only 250 to 300 watts are consumed. A number of interesting expts. with willemite and other salts are briefly described. Diagram of connections is shown. C. G. F.

New apparatus. F. MEYER. *Chem. Ind.* 39, 20-1(1916).—A description with cuts of the Bihn-Jones automatic air device for raising or handling large quantities of liquids, and the Wiegand chain screen doors. (Cf. *Met. Chem. Eng.* 13, 875-7(1915).)

F. W. SMITHER.

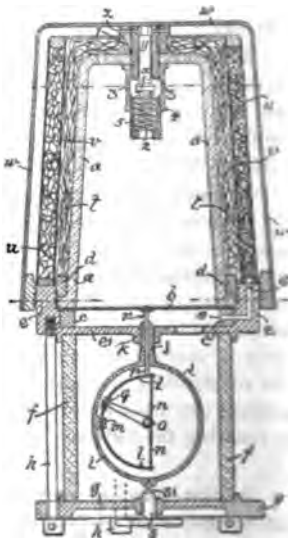
Cleaning and sterilizing apparatus (BARLADEAN) 17.



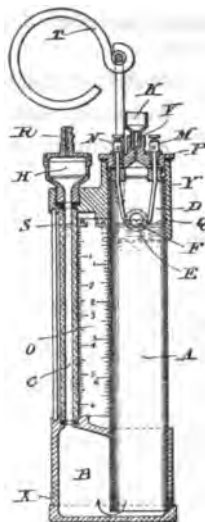
Purifying air or gases. H. GRIEN. *Ger.*, 286,221, July 28, 1912. The air or gas is forced or aspirated through the concentric downwardly directed and enlarged supply tube 1, into the washing liquid, passing thence upwards through the space formed by the concentric jacket 2, which does not dip so deeply into the liquid as does tube 1, and which is perforated near the closed top surface, around the sides. The air or gas passes through the perforations, whereby the gas bubbles are broken so that the impure gas contained therein will be purified upon passing again through the washing liquid under the lower edge of jacket 3 which surrounds the system concentrically and dips still less into the washing liquid. After passing under the edge of jacket 3, the gas or air rises and passes out through the exit tube 4.

During the operation the liquid assumes the uneven surface as shown by dotted lines. The level n of the liquid is maintained const. by the overflow 5.

Diffusion apparatus for detecting gas in air. H. R. WEBSTER. U. S., 1,174,370, Mar. 7. The app. is especially designed to detect CH_4 in mines. The vessel a is formed of porous material surrounded by a layer of cotton fibers t and a layer of moisture-absorbing material u which may be KOH or CaCl_2 to protect the porous receptacle from clogging by H_2O or coal dust when the outer cover w is removed. The KOH or CaCl_2 also serve to prevent interference of CO_2 with the operation of the app. When in use the cover w is removed and the app., previously filled with pure air, is exposed to the atm. to be tested. CH_4 by diffusion causes increase of pressure within the chamber a and the diaphragm b actuates an indicating hand on the outside of the app.



Gas-analyzing apparatus. G. A. BURRELL. U.S., 1,176,199, Mar. 21. (Dedicated for free use by any person in the U. S.) To determine the amt. of CH_4 , CO , gasoline vapor or other combustible gas or vapor in air, the app. is filled with H_2O to the levels S and Q in the tubes C and A , by removal of the plug P , which is then replaced. By gaseous pressure or blowing in the app. at R the level of H_2O is raised to cause slight overflow into the cup K . A sample is then drawn in at V by allowing escape of air at R and equalizing level of H_2O in the tubes. A filament F is elec. heated by current supplied to terminals M and N to effect combustion of the combustible constituents present and after cooling the diminution in volume indicates the approx. compn. of the sample.



Quantitative analysis of gas mixtures with known constituents. SIEMENS & HALSKE AKT.-GES. Aust., 70,788, Dec. 27, 1915. In the quant. analysis of gas mixts. with known constituents, with the employment of a standard gas for comparison, according to 69,801, the speed of rotation of the centrifugal app., which causes the pressure difference necessary in detg. the compn. of the gas, is automatically regulated by the position of a manometer which is connected with the centrifuge for the standard gas, in order to render independent of temp. and pressure changes the reading of that manometer which is connected with the centrifugal app. for the gas under examn.

Quantitative analysis of gas mixtures with known constituents. SIEMENS & HALSKE AKT.-GES. Aust., 70,787, Dec. 27, 1915. In the quantitative analysis of gas mixts. with known constituents, according to 69,801, with the employment of a standard gas which is set in rotation at the same rate, whereby both samples of gas are kept at the same temp. and under the same pressure, the pressure differences caused by both gases are registered on the same indicator, which shows the proportion of the pressure difference.

Vapor burner. J. FELDMEYER. Ger., 286,179, July 4, 1911. The vaporizer is mounted on the cap plate.

Straight tubular burner for gas-air mixture. JUNKER & RUH. Ger., 286,263, May 8, 1914. The burner tube is revoluble and movable longitudinally, so that the regulation of the proportions of gas and air, as also the variation of the direction and position of the flames may be controlled by the tube itself.

Drying drums. C. KOCHEN. Ger., 285,817, Apr. 23, 1914. Construction whereby the caking and burning of the material on the charging chute is prevented.

Vacuum apparatus. W. GAERDE. Ger., 286,404, Sept. 25, 1913. The connection with the vacuum chamber is closed by a diffusion diaphragm. A current of steam is conducted past the side of the diaphragm towards the vessel, while upon the vacuum side a condensation or absorption app. takes up the diffused steam.

Furnaces. F. ORTH. Brit., 23,243, Nov. 28, 1914. In reversible chequer-work regenerators, in order to prevent the upper courses of the chequer-work from becoming clogged by the fusion of dust or the like, the speed of the gases is reduced on entering the regenerator, and the gases are passed through large passages of a primary heat-absorbing structure and then through distributing channels of large area before entering the smaller passages in a secondary structure of ordinary chequer-work.

Apparatus for washing filter masses. UNIONWERKE AKT.-GES. MASCHINENFABRIKEN. Aust., 70,785, Dec. 27, 1915. The app. is constructed in such manner that the

greater part of the fouled water is drawn off before the filter mass enters the washing device.

Acetylene generator. J. G. HARSTER. Ger., 286,576, May 24, 1914.

Automatic acetylene generator. W. J. JACKSON. Brit., 23,191, Nov. 27, 1914.

Acetylene generator. J. W. and E. H. SMITH. U. S., 1,175,568, Mar. 14.

2. GENERAL AND PHYSICAL CHEMISTRY.

WILLIAM D. HARKINS and E. B. MILLARD.

The scattering of X-rays and atomic structure. C. G. BARKLA AND JANETTE G. DUNLOP. Univ. Edinburgh. *Phil. Mag.* 31, 222-32(1916).—The scattering of X-rays of very short wave-lengths by equal masses of various substances increases only little with the at. wt. of the scatterer. With greater wave-lengths increase of at. wt. brings a more marked scattering and for long wave-lengths the scattering by heavy metals is considerable. The mass absorption coeff. can be const. only if each electron acts independently of all others; this is the case only for short wave-lengths but there the number of electrons indicated is about half the at. wt. The effect of heavier atoms on long wave-lengths is due to scattering by groups of electrons. G. L. WENDT.

Radiations from atoms and electrons. J. J. THOMSON. *Engineering* 101, 259-60, 282-4(1916).—Lecture. The regularity of interference bands is no indication of corresponding regularity in the vibration of the luminous body producing the light; it depends entirely on certain peculiarities of the instruments used or of the medium passed through by the light in the interval between its emission and its reception on the screen. If a wave passes through a homogeneous medium, its character and length remain unchanged, *e. g.*, the "crack" of a whip is propagated through air without any tendency toward prolongation. If this same sound be reflected from a flight of steps it corresponds to a long musical note of definite pitch because the foot of the disturbance on reaching the nearest step was reflected back, but the rest of the impulse passes on to the rizer of the next step, etc. This illustrates the way in which light reflected from a grating depends entirely on the grating and not at all on the character of the original light. The formation of several types of wave from a single disturbance on water is similar to the action of a prism on light. The expts. of Michelsen on interference of Hg light showed that a Hg atom sustained vibrations with such persistency that after over 500,000 vibrations perfect interference was still possible. Apparently the necessary precision of phase is produced by the light itself, and the light is not produced by a single vibrating atom, but by a considerable number of luminous centers forced into phase by their mutual interaction. The stream of green light in passing Hg atoms excites them to radiate in phase with itself. This phase is forced on the atoms, and as one ceases to radiate another begins, and the phase in which it starts is fixed by the stream of light in which it lies. The regularity of Michelsen's wave train is due to the medium through which the light passes, not to the source of light. Several mechanical models were used to show that vibrations could be transmitted from one system to another not of the same period. If light from a salted burner falls on Na vapor, there is an intense reflection, and back of this reflecting layer there is a region of faint glow. If the wave-length is properly chosen, the reflection is as complete as from white paper. The expts. of R. W. Wood were used to illustrate the fact that as long as the vapor is in phase with the incident light there is no absorption, and that this occurs only when there are irregularities in the substance through which the light passes.

E. B. MILLARD.

Magnetic rotary dispersion in relation to the electron theory. I. The determination of dispersal periods. S. S. RICHARDSON. Univ. Liverpool. *Phil. Mag.* 31, 232-56(1916).—Measurements of the magnetic rotary dispersion in the ultra-violet by H_2O , C_6H_6 , *m*-xylene, and $\text{C}_{10}\text{H}_7\text{Br}$ are applied to a new formula for calcg. dispersal periods. G. L. WENDT.

Determination of the work function when an electron escapes from the surface of a hot body. HORACE H. LESTER. Princeton Univ. *Phil. Mag.* 31, 197-221(1916).—Measurements of the adverse potential difference against which an electron escapes from a hot wire were made for filaments of C, Mo, Ta and W. The values are identical with those for Richardson's const. b , which represents the work done by an escaping electron, and both are similarly affected by traces of active gases. Intrinsic potential differences do not exist, but the observed contact effects are due to ionized surface films formed by the active gases and having a potential which opposes the escape of electrons and is independent of the applied field. A new method for measuring the temp. of the filaments is suggested, making use of Richardson's equation. G. L. WENDT.

Relative deflections of the positive and of the negative ions as compared with those of the electron. CHAS. T. KNIPP. Univ. Illinois. *Science* 43, 393-4(1916).—Photographs are reproduced showing on a single plate the paths of the simultaneous electrostatic and magnetic deflections of both the large ions (positive and negative) and the electrons streaming from the cathode in an electric discharge tube. The electrons are retained within the field by the use of a low magnetic field. G. L. WENDT.

Free electrons in gases. E. M. WELLISCH. Univ. Sydney. *Phil. Mag.* 31, 186-9(1916).—Free electrons have now been observed in air at 8 cm. pressure, in H at atm. pressure, and in CO and CO_2 at intermediate pressures. Petroleum vapor contains only free electrons and no negative ions. At atm. pressure a trace of O in the H removes the free electrons but at lower pressures the effect decreases rapidly. This is ascribed to the necessity for a critical velocity of collision below which a free electron cannot effect a permanent union with the molecule concerned. G. L. WENDT.

Properties of mechanically pulverized mercury droplets and the charge of the electron. A. SCHIDLOF AND A. KARPOWICZ. *Arch. sci. phys. nat.* 41, 125-48(1916); cf. *C. A.* 10, 550.—An app. similar to that formerly used, based on the Millikan app., was employed to study the rise and fall of small charged drops of Hg between the plates of a condenser. The time of fall of a drop increases continually and indefinitely, on account of evapn. of Hg from the surface of these droplets. This takes place in an atm. which is satd. with Hg vapor, even when large drops are on the lower plate of the condenser. The drops used by Millikan were said to be volatile as well. Closely agreeing results were obtained in atms. of air and N. The charge of the electron is $e = 4.818 \times 10^{-10}$ e. s. u., $\pm 0.015 \times 10^{-10}$, in good agreement with Millikan's value, and in fair agreement with the earlier work with oil drops. The expts. of Ehrenhaft on the existence of sub-electrons are discussed (*C. A.* 9, 411, 1000). E.'s droplets could not have had the same chem. compn. as those in the present expts. They did not have the compn. and spherical shape E. assumed for them, and were of poorly-defined character. The coeff. of correction for the Stokes-Cunningham law for small Hg spheres has the same value as that found for slightly larger drops of olive oil, $K = 8.29 \times 10^{-6}$. E. B. MILLARD.

Van der Waals' equation. W. V. METCALF. *J. Phys. Chem.* 20, 177-87(1916); cf. *C. A.* 10, 416.—The equation is again written in the form $p + a/v^2 = RT/(v - b)$, with p the external pressure, $p_2 (= a/v^2)$ the "cohesive pressure," and $p_3 (= RT/(v - b))$ the "elastic" pressure. The paper is a supplement to the previous one pointing out that the "cohesive pressure" varies inversely as the 2nd power of the whole vol., while

the "elastic pressure" varies as the first power of a corrected vol. ($v - b$), and that the cohesive force between the mols. is a function of the av. distance between the center of the mols., while the elastic pressure, depending at any given temp. on the mean free path, varies as some function of the av. distances between the surfaces of the mols. If the mols. are elastic spheres the distance between faces is probably less than half the diam. of the mol. in liquids under ordinary conditions. A math. discussion of these points follows.

E. B. MILLARD.

The kinetics of multirotation in gelatin sols. W. OSTWALD. *Kolloid-Z.* 17, 113-9 (1915).—A mathematical expression for the rotation of gelatin sols., based on the data of Trunkel (*C. A.* 4, 3091) and holding for sols. of less than 1%, temps. between 15° and 25° and rotations between 112° and 245°, is $[\alpha]_D^t = K \cdot t^{0.06}$, $K = 0.687 (100 + 186)$. $K = 9.17 (38 - t)$ in which $[\alpha]_D^t$ is the angle of rotation of the D line at temp. t , t the time after the beginning of the change in rotation, and K a const. which varies with the concn. c and the temp. t as expressed in the last two equations. The importance of the kinetic treatment of colloidal chemical phenomenon is emphasized, but an effort to show a quant. relation between changes in viscosity and in rotation was without success.

H. I. MATTILL.

The influence of capillary active materials on the stability of arsenic trisulfide sols. C. F. VAN DUIN. Utrecht. *Kolloid-Z.* 17, 123-30 (1915).—Pure iso-BuOH was prepd. in order to complete the comparison between the effects of phenol, iso-AmOH and iso-BuOH on the stability of As_2S_3 sols (*C. A.* 8, 603). The effect of these capillary active materials, measured by the concn. of electrolyte necessary to ppt. the As_2S_3 , was directly proportional to their adsorption by blood charcoal. The adsorption isotherms (by charcoal) for phenol, iso-AmOH and iso-BuOH are not proportional to the surface tensions of their sols., for phenol, whose soln. shows the least surface tension, is nearly as strongly adsorbed as iso-AmOH and much more so than iso-BuOH at the low concns. studied. Very carefully purified phenol and iso-AmOH show less adsorption by charcoal than "purified commercial products," the difference being greater than any error of observation; therefore the adsorption of a material is suggested as a test of its purity, after such a difference is once established. Iso-BuOH shows no such difference.

H. I. MATTILL.

The capacity for adsorption of living yeast. P. ROHLAND AND F. HEYDER. *Kolloid-Z.* 17, 139-41 (1915).—In general, inorganic, organic (animal and blood charcoal) and organized (living yeast) colloids show similar capacity for adsorbing dyes, the quantity of dye adsorbed depending on its constitution (*C. A.* 9, 1567), though there are exceptions, notably that the brown dye of the sulfite cellulose industry, much like chlorophyll, is not adsorbed by colloidal silicates and but slightly by living yeast. The constitution of the dye is a deciding factor, but another unknown factor must be considered, for living yeast will not adsorb the vegetable dye, indigo, nor the animal dye, carmin, which are readily adsorbed by inorganic and organic colloids.

H. I. MATTILL.

Adsorption of acids by cellulose. ALAN LEIGHTON. *J. Phys. Chem.* 20, 188-94 (1916).—Cotton was purified with NaOH as in *C. A.* 10, 824. H_2SO_4 , H_3PO_4 , and HCl form no compds. with cellulose, and are adsorbed by it in the above decreasing order. The presence of any one of the acids considerably cuts down the amount of H_2O adsorbed by cotton. Selective adsorption is most marked with HCl, it is less marked with H_2SO_4 and does not occur at all with H_3PO_4 . The sols. used covered a range of concn. up to over 700 g. of acid per l. of soln. for H_2SO_4 and H_3PO_4 , and from 45 to 414 g. of HCl per l. Both volumetric and gravimetric detns. of the acid concn. were carried out, and large differences were observed, because the first method gives only the selective adsorption.

E. B. MILLARD.

Velocity of saponification of fats and oils by potassium hydroxide in different solvents. E. ANDERSON AND H. L. BROWN. *J. Phys. Chem.* 20, 195-213 (1916).—A measured vol. of butter fat, cotton seed, castor, olive or croton oil, or MeOAc was made up to 100 cc. with MeOH, EtOH or C_2H_5OH , brought to the temp. of the thermostat, and mixed with an equal vol. of KOH in the same solvent. Samples were withdrawn and titrated from time to time. All of the saponification reactions were bimol. under the conditions studied. The glycerides are saponified at approx. the same rate. An increase of 1% in the H_2O content of the alc. caused an increase of 4% in the velocity of the reaction. The velocity of saponification of the glycerides in amyl alc. was about twice as great as in EtOH and about 10 times as great in EtOH as in MeOH, all at 15.5° . Between 15 and 25° the temp. coeff. of the reaction const. was 2.36 with castor oil in EtOH. An increase in the concn. of KOH greatly increased the velocity of the reaction, but no definite relation between the velocity and the concn. was found. Increasing the amount of oil causes a decrease in the velocity of the reaction in amyl alc., but increases the velocity in EtOH and MeOH. E. B. MILLARD.

Mechanism of reactions in aqua regia. E. BRINER. *Compt. rend.* 162, 387-9 (1916).—B. has examd. a monovariant system of phases with the 2 components, HCl and $HN\cdot O_3$, and shows that the reaction producing NOCl, Cl_2 , and H_2O is reversible. L. H. CHERNOFF.

Correction of about $1/100$ in freezing-point determinations in diluted aqueous solutions at one degree undercooling. M. G. DEKHUYZEN. *Chem. Weekblad* 12, 24-8 (1915).—D. emphasizes the importance of the above correction which should be detd. for each app. separately. The correction is necessary on account of the increase in concn. due to the formation of ice. J. T. FLOHIL.

Molecular volumes of the hyponitrites of the alkali metals and metals of the alkaline earths. PRAFULLA C. RAY AND RAJENDRALAL DE. *J. Chem. Soc.* 109, 122-31 (1916); cf. *C. A.* 7, 3 903.— $Hg_2N_2O_2$ was pptd. from $HgNO_3$ by an alkaline earth hyponitrite, avoiding an excess of $HgNO_3$, since the hyponitrite is sol. in excess and ppts. as a yellow substance on diln. Difficulty in dehydrating the Ca salt was due to a trace of $CaCl_2$ which was supposed to change the cryst. into the amorphous CaN_2O_2 . Detns. of d. were made with a pycnometer and xylene, as follows: $Na_2N_2O_2$ 2.466 at room temp., $Ag_2N_2O_2$ 5.75, $Hg_2N_2O_2$ 7.33, CaN_2O_2 2.527, SrN_2O_2 2.683, BaN_2O_2 3.891. For the first 3 salts the difference in mol. vol. between nitrite and hyponitrite is much greater than between the corresponding nitrite and nitrate. Sr has an atomic vol. between the values for Ca and Ba, but the nitrite has a larger mol. vol. than either that of Ca or Ba. Expts. have been made on the mol. vols. of some of the hydrates of these salts and vols. calcd. for the crystal H_2O . The vol. occupied by 4 mols of H_2O in the Ca salt is the same as that of the 5 mols. of H_2O in the Sr salt. No const. mol. vol. for crystal water is obtained, and the values in general do not agree with those of Thorpe (1880).. E. B. MILLARD.

Thermometer testing. (Temperature scale.) E. WARBURG. Charlottenburg. *Verh. deut. physik. Ges.* 18, 1-3 (1916); *Ber.* 49, 474-6 (1916).—Beginning with Apr. 1, 1916, the Physikalisch-Technische Reichsanstalt has adopted the following temp. scale: (1) Between the m. p. of Hg and the b. p. of S the scale is detd. by a Pt resistance thermometer, using the equation of the second order; $R = R_0(1 + at - bt^2)$. The consts. are detd. at 0° , 100° , and the b. p. of S, which is detd. by $444.55 + 0.0908(p - 760) - 0.000047(p - 760)^2$. The Pt must be of such purity that R_{100}/R_0 is greater than 1.388 and δR less than 1.52 where $\delta = b \cdot 10^4/(a - b \cdot 10^4)$. The following fixed points have been detd.: Melting or freezing point of Hg -38.89 , of Sn 231.84 , of Cd 321.07 , of Zn 419.4 , the transformation point of Na_2SO_4 32.38 ; the b. p. of $C_{10}H_8$ 217.96 .

+ 0.058($p - 760$), of Ph_3CO 305.9 + 0.063($p - 760$). This scale agrees with the international H scale between these limits within the limits of error. (2) Below the m. p. of Hg the scale of Henning (*C. A.* 7, 2892; 8, 1230) is used. As fixed points the b. p. of $\text{CO}_2 = -78.5 + 0.01595(p - 760) - 0.000011(p - 760)^2$, and of H = $-183. + 0.01238(p - 760) - 0.0000079(p - 760)^2$. (3) Above the b. p. of S the following fixed points are used: M. p. of Sb 630°, Ag 960.5°, Au 1063, Cu 1083, Pd 1557, Pt 1764. For interpolation between these points a thermocouple, Pt-PtRh 10%, is used. The equation is one of the third degree whose constants are detd. by the m. p. of Cd, Sb, Au and Pd. Within the limits of error this agrees with a radiation pyrometer scale in which $\log e H_1/H_2 = C/\lambda \{1/(273 + t_1) - 1/(273 + t_2)\}$ where t_1 and t_2 are the temps. corresponding to the brightness H_1 and H_2 of a black body for wave length λ , and $c = 14300$. F. A. HARVEY.

Location of the thermal energy of solids. A. H. COMPTON. *Phys. Rev.* 7, 349-54 (1916).—An explanation of the sp. ht. according to the quantum hypothesis implies that the heat energy of a solid lies in its elastic vibrations, while according to C.'s agglomeration hypothesis this energy lies in the vibrations of the individual atoms. A previous study of thermal cond. has shown that the distance through which an atomic collision is transmitted is in a crystal many times the distance between neighboring atoms, but is in amorphous substances not many times the atomic distances. The max. wave-length of elastic vibrations which can possess thermal energy appears to be greater for crystalline than for amorphous substances, which is shown to mean that if it is the elastic vibrations which possess the heat energy, the sp. heat of amorphous substances should be comparatively less at low temps. than that of cryst. substances. The fact that expt. shows no such difference indicates that vibrations of period greater than that of the individual atoms probably play no important part in the sp. heat, though the evidence is not conclusive. E. B. MILLARD.

Characteristics of tungsten filaments as functions of temperature. IRVING LANGMUIR. *Phys. Rev.* 7, 302-30 (1916).—A theoretical discussion of the various functions that may be used to estimate the temp. of W filaments. Exptl. data have been taken on the volt-amp.-candlepower characteristics of W filaments as functions of the temp. and the diam. of the filament, and these have been tabulated with derived functions such as watts, ohms, and watts per candle, over the temp. range from the m. p. of W to room temp. All data are corrected for the cooling effect of the leads. Data are also given for the sp. resistance of W and its total emissivity (black body taken as unit). Foote's formula for total emissivity of metals gives accurate results up to 500 or 600° K., but above 1200° K. the results are much too low. The intrinsic brilliancy of a black body as a function of the temp. has been calcd. in terms of the mechanical equiv. of light from Nutting's visibility data by means of the Planck equation. By comparing these results with the exptl. detd. brilliancies of W and correcting for the known emissivity of W the mechanical equiv. of light was found to be 0.00121 watts per lumen. This agrees with the Ives value 0.00125 calcd. from Nernst's data but differs from the Ives and Kingsbury value 0.00159 directly detd. The color of the light from a W filament is distinctly bluer than from a black body at the same temp., and corresponds to that from a black body at 40 to 80° higher temp. An equation for the thermal expansion of W in terms of its length at 300° K. and the first 2 powers of T , has been derived which represents the actual results to within 2 or 3%. E. B. MILLARD.

Study of the hydrogen electrode, of the calomel electrode, and of contact potential. V. W. F. CLARKE, C. N. MYERS AND S. F. ACREE. *J. Phys. Chem.* 20, 243-65 (1916).—To the app. of Loomis and Acree (*C. A.* 6, 823) as modified by Myers (*C. A.* 8, 1378) a new heating device was added, and another form of calomel battery was devised which could be easily cleaned and filled. The 0.1 N KCl-HgCl-Hg system is a const.,

stable system reproducible to 0.01 millivolt. The H electrode is a system which is extremely sensitive to small amounts of impurities and suited to the detn. of small H^+ ion concns. $Hg-HgCl-0.1 N KCl-0.1 N HCl-Pt-H_2$ is an accurate and const. element which gives one of the best intercomparisons that can be obtained. The 0.1 N $HCl-HgCl-Hg$ system is rather unsatisfactory for long periods of time, due to the formation of Hg and $HgCl_2$. An accuracy of 0.01 millivolt may be obtained with these electrodes if the materials are carefully purified.

E. B. MILLARD.

Factors affecting the electromotive force of binary solid alloys. D. F. SMITH AND N. T. GORDON. *J. Phys. Chem.* 20, 228-42(1916).—Zn-Cu alloys were prepd. by melting Zn under borax and adding Cu in the required amt. The specimens were annealed at 700-750°. The expts. reported are preliminary in character. Detns. of the e. m. f. of the alloys were made with Hg_2SO_4 and normal calomel electrodes on polished pieces cut from the melts, and these indicated that brasses could be prepd. which would give reproducible results if the specimens were subjected to no mechanical treatment from one expt. to the next and which would show gradual progressive changes of potential. A very marked but unexplained influence is exerted by surface treatment, producing with a given alloy and electrolyte "drifts" even the direction of which cannot be foreseen. Expts. on the influence of grinding, sawing and polishing are in progress.

E. B. MILLARD.

Electromotive forces. W. D. BANCROFT. *Trans. Am. Electrochem. Soc.* 28, 357-67(1915).—Nernst's original formulation of the e. m. f. of a cell in terms of the soln. pressure of the electrodes and the osmotic pressure of the ions in soln. is not readily applicable to all classes of cells. A more general statement of the e. m. f. is obtained by combining van't Hoff's formula for the reaction isotherm $A = RT \ln K \Sigma p_1 / \Sigma p_2$ with the expression for electrical energy $A = nFE$ to give the working equation $E = (RT/nF) \ln K \Sigma p_1 / \Sigma p_2$ in which Σp_1 refers to the substances which are consumed during the reaction and Σp_2 to the substances which are formed. It is shown how this formula may be applied to 5 classes of cells which are ordinarily treated in different ways: cells with reversible metallic electrodes, amalgam cells, gas cells, oxidation and reduction cells, chemical affinity cells.

E. SCHRAMM.

Direct photoelectric determination of Planck's "h." R. A. MILLIKAN. *Phys. Rev.* 7, 355-88(1916).—Einstein's photoelec. equation has been subjected to very searching tests and it appears in every case to predict exactly the observed results. The value of "h" has been detd. with a precision of about 0.5% and has the value 6.57×10^{-27} .

E. B. MILLARD.

Light sensitiveness of cuprous oxide. A. H. PFUND. *Phys. Rev.* 7, 289-301 (1916); see *C. A.* 10, 418.

E. B. MILLARD.

The absorptive power of luminous gases. F. SALZMANN. *Sitzb. Akad. Wiss., Wien, Abt. IIa* 123, 2071-84(1914); *Beiblätter Ann. Physik* 39, 518(1915).—The specific absorptive power of the luminous vapors of Li, Na, Sr and Tl was measured by a spectrophotometer, using an elliptical flame with an axial ratio of 2:1, and coloring the flame by spray from solns. of differing concns. Li and Na show 2 minima which are attributed to the varying intensity of the 2 red lines of Li and by the broadening of the lines at high concns. in both cases.

G. L. WENDT.

Energy changes in photochemical processes in gases. VI. Photolysis of hydrobromic acid. E. WARBURG. *Sitzb. kgl. preuss. Akad. Wiss.* 1916, 314-29; cf. *C. A.* 9, 883; 10, 546.—As a further test of the Einstein law of photochem. equivalents the photolysis of HBr has been detd. by passing a stream of H or N through satd. HBr at 0° and, after drying at -77°, conducting it through a decomposition cell on which Zn-spark radiation was falling, and finally through KI soln. Traces of O were removed

from the H or N by passing over hot Cu. The quantity of Br freed per g. cal. of radiation of a definite wave length and the partial pressure of the HBr in the gas mixt. were detd. for $\lambda = 0.209\mu$ and $\lambda = 0.253\mu$ for several concns. of HBr with an accuracy of a few %. There was a slight deviation from the Ångström law, i. e., a slight increase in the mol. absorption with increasing partial pressure of HBr. The sp. photochem. action was independent of the velocity of the gas stream, of the nature of the admixed gas, and has the value 1.53×10^{-8} mol. Br/g.-cal. for $\lambda = 0.209$. The mol. absorption for $\lambda = 0.253$ is about 7% greater than for 0.209, the av. value of the sp. photochem. action being 1.79×10^{-8} . As has been found before, the Einstein law does not hold for photolysis.

E. B. MILLARD.

The reflecting power of metals in the ultraviolet region of the spectrum. E. O. HULBURT. Johns Hopkins Univ. *Astrophys. J.* 42, 205-30(1915).—The reflecting power was measured for a fixed angle of incidence, viz., 18° , throughout the region 3800 to 1800 Å. Curves of reflecting power are given for the following substances: Au, C, Pt, Mg, Ni, Te, Cu, Sb, Ag, Cr, stellite, Pb, Se, steel, Pd, Si, Al, carborundum, Cd, Bi, W, Co, magnalium, speculum, Zn, Mo, Ta. The curves show 2 general characteristics; in the region studied the reflecting power decreases as the wave-length decreases, and the reflecting power is never zero. Several of the curves show a marked decrease in reflecting power beginning about 2000 Å. Cu, Cr, Ni, Mo, and cathodic Si all show a shallow minimum about 2400 Å. Ag differs from the others in that it has a decided minimum at 3100 Å., the reflecting power falling to about 5%, then rising to 32% at 2400 Å. Si gives the max. reflection, 76%, at 3000 Å., decreasing to 62% at 1870 Å. Pt and Ni are most serviceable as mirrors in this region. They reflect about 30% at 2000 Å. and are resistant to chem. action. The reflecting power for wave-lengths shorter than 3000 Å. is rarely above 50%.

F. A. HARVEY.

The application of the activation theory to oxidation phenomena. H. J. PRINS. *Chem. Weekblad* 12, 38-48(1915).—A lecture dealing with: the action of O, the action of O in the presence of catalysts and action of O in O compounds. J. T. FLOHL.

Fluorescing sodium uranyl phosphate. H. L. HOWES AND D. T. WILBER. *Phys. Rev.* 7, 394-6(1916).—Mixts. of $\text{H}_2\text{UO}_4\text{PO}_4 \cdot 3.5\text{H}_2\text{O}$ and Na_2HPO_4 in the mol. ratio 1:1, 2:1 and 4:1 at -180° gave exactly similar spectra when excited by the C arc. Other specimens were prepd. contg. more H_2PO_4 , and in these the strongest line series were suppressed and the dimmer lines were merged into broad bands. The spectra of the mixts. containing no H_2PO_4 consisted of recurring groups of bands. The interval on any one of these line series has a value lying between 80 and 81 units, which is the shortest interval yet observed in the study of the fluorescence spectra of uranyl salts. With either H_2PO_4 or HNO_3 as a solvent the solid at low temps. has a vitreous appearance, perhaps because the acid is still dissolving the phosphate even at the temp. of -180° . If the acid were crystalline presumably the broad bands which appear would not be present. From the expts. with glassy and cryst. solids it appeared that cryst. form was a necessity if a resolved spectrum was to be obtained.

E. B. MILLARD.

The crystallization of diphenyl ether. C. DAUVERNE. *Compt. rend.* 162, 385-7 (1916).—Through the microscope, D. observed that when a crystal of Ph_2O is introduced into liquid Ph_2O at 20° there was at first a rush of liquid towards the crystal, producing a whirling motion. Another undulatory motion was observed towards the plane sides of the crystal. These waves cause the ridges and growth of crystals, and also their cicatrization.

L. H. CHERNOFF.

The thermionic current generated in an electric lamp at incandescence. ALFREDO GRANDONE. *Rend. accad. sci. fis. et mat. Napoli* [3] 21, 165-72(1915).—In studying elec. resistance from the electron point of view G. made some observations on the nature

of the thermionic current generated by an incandescent lamp with a C filament and one with a W filament. From the numerical results it was calcd. that a 16 c. p. C filament lamp at 110 v. emits 0.32×10^{10} electrons per unit of surface per unit of time.

E. J. WITZEMANN.

A difference between the action of light and of X-rays on the photographic plate (SALOMONSON) 5. The forms of dispersion of metallic silver (LIESEGANG) 6. The passivification of iron by nitric acid (YOUNG) 9.

3. RADIOACTIVITY.

WILLIAM H. ROSS.

Remarks on the production of radium by the Bureau of Mines. CHARLES H. VIOL. Standard Chem. Co., Pittsburgh. *J. Ind. Eng. Chem.* 8, 284-6(1916).—Polemical with respect to the conclusions reached by Parsons, *et al.* (*C. A.* 10, 424) on the cost of extg. Ra from carnotite ores by the method devised by the Bureau of Mines.

W. H. ROSS.

The atomic weight of radium emanation. S. C. LIND. Bur. of Mines, Denver. *Science* 43, 464-5(1916).—In the International Atomic Weights Table for 1916, the Commission has adopted for Ra the value of 226.0 obtained by Hönigschmid in 1911 (*C. A.* 7, 19). The at. wt. of Ra Em, however, has been retained at its former value of 222.4 instead of substituting 222.0 which would conform with the new value for Ra. The exptl. value obtained by Gray and Ramsay was 223 (*C. A.* 5, 1869), and the value of 222.4 was simply chosen on purely genetic grounds in accord with the then accepted value for Ra of 226.4. L. now points out that since the value for Ra Em of 222.4 was thus chosen in recognition of the principle of genetic relationship among the radioelements, it would now appear requisite that the at. wt. of Ra Em should be changed automatically to accord with that of Ra, and that there is no sufficient reason to retain the old value of Ra Em in the new Atomic Weights Table. W. H. ROSS.

The laws of the passage of alpha rays through air. L. FLAMM. *Elster-Geitel Festschrift* 1915, 601-22; *Beiblätter Ann. Physik* 39, 752(1915).—A review.

G. L. WENDT.

The ionization-current curve with alpha rays. A. LIEBERT. *Vierteljschr. natur. Ges., Zürich* 59, 117-44; *Beiblätter Ann. Physik* 39, 120-1(1915).—The curves obtained may be erroneous unless contact potentials are avoided. The direction of the current may also be a factor in case the electrodes are unsymmetrical. A magnetic field can introduce an effect on the current due to ionization by collision, and this is dependent on the gas pressure, the potential applied, the strength of the magnetic field and the form of the electrodes.

G. L. WENDT.

Radium, uranium and vanadium. FRANK L. HESS. U. S. Geol. Survey, *Mineral Resources of U. S., 1914*, Pt. I, 943-6 (Separate 25, published Feb. 26, 1916).

E. J. C.

A tungsten target for X-ray tubes. J. H. GARDINER. *Nature* 97, 67-8(1916); cf. *J. Röntgen Soc.* 6, 83-97(1910).—Attention is directed to the exceptional properties of metallic W which makes it particularly suited for use in anticathodes for X-ray tubes. It is very tough, does not readily disintegrate by cathode discharge, and has a very high fusing point of about 3000°. In this way anticathodes made of W offer an advantage over those made of Ni covered with Pt foil, for under a heavy discharge the latter alloys with the Ni backing and is thus soon destroyed.

W. H. ROSS.

A difference between the action of light and of X-rays on the photographic plate (SALOMONSON) 5.

4. ELECTROCHEMISTRY.

COLIN G. FINK.

Electrochemical industries in Russia. H. G. *Chem. Ind.* 38, 532-3(1915).—A brief review. F. W. SMITHER.

Service requirements of the electric arc furnace. H. HOLLIS. *Elec. World* 67, 766(1916).—Generation, transmission and transformation of the power is discussed. The characteristics of a furnace load and its regulation are considered. As to the desirability of the elec. furnace load for central stations, H. looks upon it as a very favorable business for a plant of moderate capacity. W. E. RUDER.

Operating characteristics of a small electric furnace. J. C. MATHIEU. *Elec. World* 67, 262(1916).—Performance curves are given of a one-ton single-phase arc furnace (apparently of the Snyder type) for melting steel scrap. The av. load was 380 kw., input per ton of steel 660 kw.-hr., av. power-factor slightly over 55%. Current, power, and power-factor readings were fairly constant except when cold scrap or flux was added. F. A. STRAUSS.

Addition agents in the electrodeposition of silver from silver nitrate solutions. F. C. MATHERS AND J. R. KUEBLER. *Indiana Univ. Trans. Am. Electrochem. Soc.* 29, 131-43(1916).—The aim of the investigation was to discover a method of depositing solid, smooth and adherent Ag cathodes. Additions of glue, peptone, gum arabic, pyrogallol and tannin only partially restrained the characteristic, loosely adherent, cryst. structure of the Ag and did not produce smooth deposits. Additions of HPO_4 increased the hardness and non-cryst. character of the deposit, but the bath soon deteriorated. Additions of H_2PO_4 and HNO_3 , 2% of the nitrates of NH_4 , Na, K, Ba, Sr, Ca, Mg, $\text{H}_2\text{C}_4\text{O}_4$ and HNO_3 , succinic acid, lactic acid, picric acid, tannic acid and citric acid produced no beneficial results. From a bath containing 3% each of AgNO_3 , HNO_3 and tartaric acid, it was found that a smooth, hard and entirely adherent deposit of Ag could be obtained. By the simultaneous addition of 0.01% of glue every 12 hrs., it was found that the amt. of tartaric acid could be reduced to 0.4%, and that the deposit obtained was much smoother and of a darker, more shiny color. The addition of 2% of $\text{Fe}(\text{NO}_3)_3$ to the above bath renders the deposit much smoother, darker, and more shiny; but deposits so obtained contain 0.086% of Fe. The best results were obtained when the above bath was only gently stirred, by a slow current of air bubbles, and a c. d. of 7.4 amp. per sq. ft. (0.8 amp. per sq. dcm.) employed. The total wt. of tartaric acid used up is 0.005 of the wt. of Ag refined. The consumption of tartaric acid and glue corresponds to a max. cost of 0.23 cent per lb. of refined Ag. As the deposit of Ag formed in this way is brittle, it is of no value in electroplating.

H. JERMAIN CREIGHTON.

The disintegration product of carbon anodes in acids. B. L. VANZETTI. *Ann. r. ist. Veneto* 72, II, 445-50; cf. *C. A.* 8, 281.—I. When an elec. current is passed between carbon electrodes in acid or alk. soln., the anode is attacked with the deposition of a black powder. V. finds that this substance is colloidal in nature and that it gives stable suspensions in pure H_2O or alk. solns. It is a negative colloid, as it is pptd. by acids and migrates to the cathode under the action of an elec. current. II. *Ibid* 1057-71.—Carbon electrodes were purified by heating to a high temp. in a current of Cl. This treatment, however, was not sufficient to remove traces of Fe and Si. The black powder formed at the anode on passing an elec. current between the C electrodes

in acid soln. was treated with dil. KOH soln., filtered, HCl added to the filtrate and the black ppt. which sepd. on acidification washed several times with HCl to remove traces of Fe. The black substance was evapd. at 100° and finally heated to 110° for several hrs. A small quantity of adsorbed Fe and HCl was extremely difficult to remove. By this treatment a friable black mass was obtained which easily formed a colloidal soln. in dil. alkali. Heated *in vacuo* this powder liberated CO and CO₂. After this latter treatment the residue no longer had the property of forming a colloidal soln. in dil. alkali. III. *Ibid* 1065-71.—Detns. were made of the compn. of the gases evolved at anode and cathode in acid soln. during the passage of the elec. current. At the anode, the principal gases evolved were CO₂ and CO with traces of O and H. At the cathode the principal gas was H with some CO₂ and CO. V. concludes that the product formed by the disintegration of the anode adsorbs relatively large quantities of the two principal gases CO and CO₂. On heating the substance *in vacuo* the adsorbed gases are given off. IV. *Ibid* 73, II, 767-74.—Various expts. were made to det. the chemical individuality of the anode substance. The suspension in alk. soln. was treated with dil. HCl and the ppt. thoroughly washed and analyzed. The results agree with the formula proposed by Bartoli and Papasogli—C₁₁H₂O₄. The anode substance was added to concd. KOH soln. and dialyzed until no further trace of KOH could be detected. Part of the suspension was then evapd. in a Pt dish and the K content found to be 17-18%. The neutral soln. of the K salt gave ppts. with the solns. of a number of metallic salts. The salts were analyzed and the calcns. made of the acid equiv. show good agreement. The substances obtained by pptn. with metallic salts however, are amorphous in appearance. V. considers this to furnish reasonable doubt as to the chemical individuality of the anode product.

L. T. FAIRHALL.

Minimizing electrolysis of cable sheaths. ANON. *Elec. World* 67, 769(1916).—The best method to accomplish this end is to improve the return circuits of all grounded systems in the vicinity, minimize the opportunities for stray currents to reach the cable sheaths and provide high conductivity paths for sheath currents where they tend to leave the cable. Methods used by the Edison Co. of Brooklyn to accomplish these ends are described.

W. E. RUDER.

High current transmission with zinc cables. L. LICHTENSTEIN. *Elektrotechn. Z.* 37, 4(1916).—Calcns. are made showing the comparative conditions for the use of Zn in the place of Cu for transmission. Expts. show that Zn does not deteriorate appreciably when very much overloaded. Heating to $200-350^{\circ}$ for short periods did not alter the ductility to a prohibitive point and the surface appearance showed no change until the m. p. was approached.

W. E. RUDER.

A history of the lightning arrester. A. J. WURTS. *Elec. J.* 13, 168(1916).—A detailed illustrated exposition starting with the early types of 1890. W. found that in the spark gap type there were 5 metals, Bi, Sb, Cd, Hg and Zn, which were particularly serviceable on account of their non-arcing property; Hg is the most effective and quick-acting.

C. G. F.

Photometry of gas-filled lamps. G. W. MIDDLEKAUFF AND J. F. SKOGLAND. *Bur. Standards, Sci. Paper* No. 264, 587-604(1916).

C. G. F.

Life testing of incandescent lamps at the Bureau of Standards. G. W. MIDDLEKAUFF, B. MULLIGAN AND J. F. SKOGLAND. *Bur. Standards, Sci. Paper* No. 265, 605-30(1916).

C. G. F.

Candle power measurements of series gas-filled incandescent tungsten lamps. R. C. ROBINSON. *Trans. Illum. Eng. Soc.* 11, 187-91(1916).—For comparing lamps and expressing temps. the watts per spherical c. p. should be used. The horizontal

c. p. readings are very much effected by changes in the design of the mounting of the filament.
C. G. F.

Chemical, electrochemical and metallurgical industries of Scandinavia 18. Characteristics of tungsten filaments as functions of temperature (LANGMUIR) 2. Cellon and cellon varnish 26.

Dry battery cell. V. G. APPLE. U. S., 1,174,798, Mar. 7. Structural features.

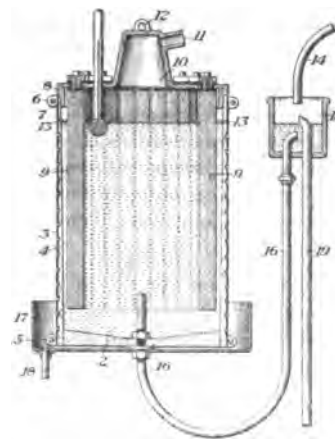
Storage battery. J. O. LUTHY. U. S., 1,175,280, Mar. 14. Structural features.

Storage battery electrode. W. MORRISON. U. S., 1,175,370, Mar. 14. Pb electrodes are superficially permeated with a Ti compd. deposited electrically from H_2SO_4 soln., to increase their durability.

Electrolytic apparatus for preparing bleaching liquor from sodium and magnesium chlorides. J. F. WEBB and W. W. WILLIAMS. U. S., 1,175,572, Mar. 14.

Cell for electrolyzing alkali chloride solutions. K. HEINEMANN. U. S., 1,176,551, Mar. 21. A flowing Hg cathode is used and the bottom plate of the cell is provided with obstructions more inclined on the side directed against the flow of Hg than on the other side, to effect a uniform mixing of the amalgam.

Electrolysis of alkali metal chloride solutions. A. E. GIBBS. U. S., 1,176,540-1, Mar. 21. Soln. is fed from the cup 15 (the height of which is adjusted to give the best efficiency of feed at different periods during the life of the cell) and passes through the permeable diaphragm 4 to the cathode 3 upon the projections of which the greater part of the electrolysis takes place. The caustic alkali produced is carried out through holes in the cathode and is washed down by electrolyte overflowing through perforations 13 in the upper portion of the diaphragm. The anodes 9 are C rods. 11 is a gas outlet.



Electrolysis. H. C. JENKINS, H. F. PARTISON and R. WELLESLEY. Brit., 22,867, Nov. 21, 1914. In app. of the "bell" type, as that described in 25,415, 1913 (C. A. 9, 1155), the floor of the cell is made with a ridge beneath each bell and with intermediate depressions at the bottoms of which are grooves communicating with outlets at one side of the cell. The electrodes, generally the cathodes,

which are outside the bells, consist of pairs of vertical plates sepd. by successively wider spaces from the lowest upwards. Liquid products can thus pass between the plates to the groove beneath them, and thence to the outlets, without disturbing the main body of electrolyte. Gases, if evolved, may be collected by a cover.

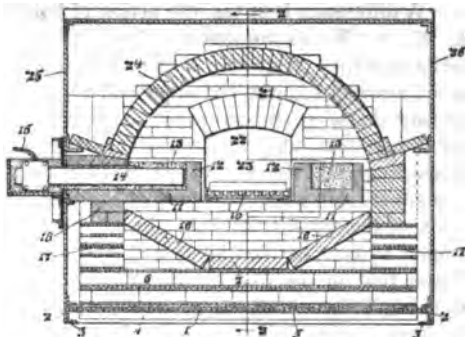
Electrodeposition of copper. S. C. BABCOCK and E. W. HAGMAIER. U. S., 1,174,466, Mar. 7. In depositing Cu electrolytically from $CuSO_4$ soln., about 0.2% of phenol-sulfonic acid or similar compd. is added to the soln. to accelerate the deposition and obtain a perfect and dense deposit.

Chromium alloy for electrical resistance elements. W. B. DRIVER. U. S., 1,175,724, Mar. 14. An alloy of Cu, Ni and Mn, which may be in about the proportions of 30:50:10, resp., is combined with 2-10% of Cr to increase resistance to oxidation.

Electric resistance furnace. T. F. BAILY and F. T. COPPE. U. S., 1,176,018, Mar. 21. Hollow blocks 6 support the bottom wall 7 of the furnace. Heat is furnished

by granular C or other resistance material, 13 in troughs supplied with current by electrodes 14 and heat rays are deflected to the hearth 10 by both the upper arched roof 24 and the inclined brick walls 16 below the hearth, to conc. the heat upon the latter.

Cyanides and cyanamides; electric furnaces. J. E. BUCHER. Brit., 23,292, Nov. 30, 1914. Modification of the process of 27,713, 1912 (C. A. 8, 1857), for the fixation of N with the aid of a catalyst such as Fe. The materials, *e. g.*, Na_2CO_3 , C and Fe, may be used in the form of small briquets or in a single mass with channels formed in it, or even in the form of powder, and the heating to a temp. below that at which the catalyst fuses is effected by elec. current passed through the material, the material being first sufficiently heated to render it conducting. A suitable furnace is shown.



Cyanides and cyanates; ammonia; electric furnaces. A. R. LINDBLAD. Brit., 22,852, Nov. 21, 1914. Cyanogen compds., such as cyanides and cyanates of alkalis and alk.-earths, are produced by the reaction of N on solid charges in elec. furnaces having one or more shafts or openings for feeding in the charge, and a melting chamber having such a form, *e. g.*, a frustro-conical form, that at one or several places the charge spreads itself to produce inclined surfaces, at which it contacts with the electrodes, which enter the melting chamber at its upper part.

Controlling the load of a diaphragm. ELEKTRO-OSMOSE, AKT.-GES. (GRAF SCHWERIN GES.). Aust., 70,744, Dec. 27, 1915. The extent and character of the adsorptions are varied during the process.

Galvanized tires. COLUMBUS-WERKE G. M. B. H. Ger., 283,399, Dec. 5, 1912. Addition to 281,499. Arrangement of the anode according to the principal patent.

Tungsten. GLÜHFADENFABRIK, AARAU AKT.-GES. Brit., 23,496, Dec. 3, 1914. Pure W is obtained in massive, malleable, and ductile form by fusing the powder completely and then rapidly cooling it. The W is packed in a tube heated elec. in the manner described in 23,495, 1914, and after fusion, the resistances are raised and blasts of cold air from funnels are caused to impinge upon the tube.

Compacting tungsten. J. A. WILLIAMS. U. S., 1,174,646, Mar. 7. Bars of W are formed from the finely divided metal by exhausting the air from a mass of the W and subjecting it *in vacuo* to pressure in a hydraulic press. A very dense metal is obtained by sintering, swaging and heating the compressed bars.

5. PHOTOGRAPHY.

LOUIS DERR.

Physiological aspect of photographic safe light screens. H. HARTRIDGE. Cambridge. *J. Physiol.* 50, 95-100(1915).—A screen made up of red and green components which transmitted a spectrum extending from $\lambda 680$ to $\lambda 530$ while photographically safe gave much better visual effects than did the ordinary orange and red screens. The colors of objects are only slightly modified by this light. Although it contains no blue rays, blue objects appear blue.

J. F. LYMAN.

A difference between the action of light and of X-rays on the photographic plate. L. K. A. W. SALOMONSON. *Proc. Akad. Wetenschappen* 18, 671-82(1916).—In a series of expts. "exposure scales" were obtained in the ordinary way, half the plate being exposed to light, the other half to X-rays, and from measurements of the optical density characteristic curves of the plates were drawn. In each case the curve obtained for X-rays was different from that obtained with light, the latter curve in each case having a greater slope. It is pointed out that in the case of a sensitive medium such as a photographic plate the effect of incident waves will be a function of the absorption coeff. of the film for the waves in question; on this basis an expression for the density, similar to that derived by Hurter and Driffield, is obtained. On this basis it should follow that in the case of the same density, a light-negative should contain less Ag than an X-ray negative, and analyses of a number of films confirmed this conclusion. It should further follow that the slopes of the characteristic curves obtained with light of different wave lengths should be different, a conclusion which is verified by reference to the literature.

GEORGE W. MORREY.

Photography on porcelain or on glass 19. Manufacture of "photo" papers 23.

Mixed-color coatings for photographic plates. W. F. BLECKER. U. S., 1,175,224. Mar. 14. Powdered glass or other fusible material of different colors is allowed to fall into the flame of a blast burner by which the particles are melted to spherical form and projected into a settling chamber where particles of different colors are mixed for use in coatings for color-photography plates.

6. INORGANIC CHEMISTRY.

H. I. SCHLESINGER.

The constitution of ultramarine. H. PUCHNER. Weihenstephan. *Kolloid-Z.* 17, 119-23(1915).—In support of the view that the color of ultramarine is due to an adsorption compound and not to a definite chemical individual, P. quotes the results of expts. in which three different types of soil were first impregnated with NaCl then allowed to adsorb water; finally the water-soluble portion was evapd. to dryness and ignited. The soils used were a quartz sand, weakly humus; gypsum containing loam; and humus gypsum lime sand containing fragments of Al_2O_3 and Al silicate and much Ca humate. On igniting the residue from the water soln., the 3rd soil only gave blue residues and that only when the water ext. was not taken from the surface layer of the soil. The blue residue goes gradually to gray on heating and with HCl gives H_2S , and on analysis shows the presence of the lazurite or ultramarine radical in each case, though frequently in only small amt. Replacing NaCl with KCl interferes with the appearance of the blue residue. The concn. of the nitrates on the surface of the soil interferes with the ultramarine formation by preventing the reduction of the S compounds by the humus.

H. I. MATTELL.

The forms of dispersion of metallic silver. R. E. LIESEGANG. Frankfurt. *Kolloid-Z.* 17, 141-5(1915).—The diffusion of $AgNO_3$ and hydroquinone in gelatin gels shows that, within certain concn. ratios, the law of Pringsheim that a ppt. cannot form on both sides of the interface, does not hold. If $AgNO_3$ soln. is allowed to diffuse into gelatin gel containing $FeSO_4$, there results, depending on the concn. of the $FeSO_4$, a flocculent Ag ppt. which appears very black, or by slightly increasing the $FeSO_4$ concn. a banding of green and gray Ag of very complicated structure, or finally by still greater $FeSO_4$ concn. macroscopic glistening leaves. The latter is the densest form, the black

form is the least dense. Similar reaction with FeCl_2 beside forming much AgCl leads to so highly dispersed reduction product of Ag that it may escape observation.

H. I. MATTILL.

Preparation of chloroplatinic acid and chlorides of gold and palladium. ENRIQUE V. ZAPPI. *Anales soc. quim. Argentina* 3, 68-9(1915).—Z. proposes the following method of prepg. H_2PtCl_6 , thus avoiding the necessity of eliminating the last traces of N oxides (present as $\text{PtCl}_4 \cdot 2\text{NOCl}$) which remain when H_2PtCl_6 is prepd. by action of *aqua regia* on Pt. The Pt (as sponge or thin sheets) is placed in a flask and covered with HCl (d. 1.19) and 2.5 cc. of HClO_3 (d. 1.55° Bé.) to each g. of Pt are added in small portions; the nascent Cl produced in this manner attacks the Pt as readily as does *aqua regia*. The action is rapid on Pt sponge even in the cold, but is slower when Pt sheets or wire are used, depending on the area of the surface presented; the temp. should be raised to 50–60° in order to accelerate the reaction. After the reaction is complete the resulting soln. is evapd. to dryness on a H_2O bath, pure H_2PtCl_6 being obtained. This procedure may be extended to the prepn. of chlorides of Au and Pd.

H. S. PAINE.

Preparation of potassium chloroplatinite. ENRIQUE V. ZAPPI. Buenos Aires. *Anales soc. quim. Argentina* 3, 186-8(1915).— K_2PtCl_6 was completely reduced by K oxalate even in the absence of Ir chloride, although the catalytic action of the latter greatly decreases the time required for reduction as stated by Klason; Pt black as a catalyst was as effective as Ir. In order to prepare K_2PtCl_6 free from Ir, PtCl_4 was transformed into K_2PtCl_6 which was washed with hot H_2O and reduced to metallic Pt by boiling with NaOH and glycerol; the Pt thus pptd. was ignited in order to render the Ir insol. and again transformed into PtCl_4 by soln. in *aqua regia* and finally into K_2PtCl_6 , the entire process being twice repeated. The residue of Pt black (free from Ir) was transformed into pure PtCl_4 by soln. in a mixt. of HCl and HClO_3 and finally into K_2PtCl_6 (cf. preceding abstract). K_2PtCl_6 was then prepd. by reduction in the following mixt.: 3.53 g. pure K_2PtCl_6 (prepd. as above), 1.3 g. $\text{K}_2\text{C}_2\text{O}_4$ and 50 g. H_2O . All the K_2PtCl_6 dissolved in 9 hrs., thus completing the reaction, when the mixt. was boiled under a reflux condenser; when 0.1 g. of Pt black was added, there was violent evolution of CO_2 and the reaction was completed in less than 15 mins. under otherwise the same conditions, all the K_2PtCl_6 being dissolved. In order to recover the Pt from the mother liquors resulting from crystn. of K_2PtCl_6 these mother liquors were acidulated with HCl and an excess of KClO_3 was added, thus causing the immediate pptn. of K_2PtCl_6 .

H. S. PAINE.

Reduction of metallic oxides with hydrogen at high pressures. E. NEWBERRY AND J. N. PRING. *Proc. Roy. Soc. London (A)* 92, 276-85(1916).—A wire of W 0.5 mm. in diam. was wound around the magnesia crucible contg. the oxide to be reduced, and the furnace was packed in ignited magnesia and placed in a pressure app. capable of withstanding 150 atm. Commercial H (contg. a small amt. of N as impurity) was pumped in until this pressure was reached, and the oxide was heated to 2500° or below while H_2O vapor was partly removed by Na metal. Cr_2O_3 and MnO_2 were reduced to metals, V_2O_5 to VO , TiO_2 to TiO , Nb_2O_5 to NbO , CeO_2 to Ce_2O_3 and U_3O_8 to UO_2 . Al_2O_3 , MgO , ZrO_2 , Y_2O_3 and ThO_2 were unchanged. The metals obtained, Cr and Mn, are probably purer than those prepd. by any of the methods hitherto used, as was shown by the sharp m. ps. detd. with them. This has not been observed with metals prepd. before.

E. B. MILLARD.

Some reactions of carbonates of calcium, strontium, zinc and magnesium. W. Ö. DE CONINCK. Univ. Montpellier. *Rev. gén. chim.* 19, 27-8(1916).—The action of sol. salts on insol. salts has been studied. Satd. solns. of K_2SO_4 , KHSO_4 , and KNO_3 mixed with

finely pulverized CaCO_3 at room temp. gave in 1-4 weeks in the first 2 expts., CaSO_4 in the last, $\text{Ca}(\text{NO}_3)_2$. Under similar conditions NH_4NO_3 reacted with SrCO_3 ; KNO_3 and NH_4Cl with BaCO_3 ; KHSO_4 with ZnCO_3 and NH_4Cl with MgCO_3 . But KHSO_4 did not react with either SrCO_3 or BaCO_3 . The reactions are hastened at 100° .

L. H. CHERNOFF.

Displacement of acids by hydrogen peroxide. VI. JOACHIM SPERBER. *Schweiz. Anst. Ztg.* 53, 717-20(1915); cf. *C. A.* 8, 1327, 2778.— H_2O_2 ("peraquatic acid") will set free HNO_3 from $\text{Ca}(\text{NO}_3)_2$ and H_2SO_4 from Na_2SO_4 . In presence of pure Cu foil, a brown ppt. is formed of partly hydrated CuO if H_2O_2 is in excess, or green $\text{Cu}(\text{OH})_2$ if H_2O is in excess. Intermediate products are, resp., Na_2O_2 , CaO_2 (peraquates), NaOH , $\text{Ca}(\text{OH})_2$ (aquates), $\text{Cu}(\text{NO}_3)_2$ and CuSO_4 . Also some O is set free. By direct interaction of CuSO_4 and H_2O_2 , the brown ppt. is again formed. H_2O_2 and CuSO_4 in excess, form a green, and with excess of H_2O_2 a brown hydrosol which is gradually pptd. Exceptional ppts. are black CuO , and yellow CuO_2 . The conditions for obtaining these colors were not detd. $\text{Cu}(\text{NO}_3)_2$ gives similar reactions. The pptd. $\text{CuO} \cdot x\text{H}_2\text{O}$ on standing redissolves in the liberated acids.

S. WALDBOTT.

Thallic-thallous compounds. ALFRED BENRATH. *Bonn. Z. anorg. allgem. Chem.* 93, 161-9(1915).—Previous results (*C. A.* 9, 1723) had seemed to indicate the possibility of a specific effect of certain light waves on the equil. in the system TlBr_3 - TlBr - H_2O , and also a specific effect of $\text{H}_2\text{C}_2\text{O}_4$ in the light. To decide the point, the equil. was studied by satg. solns. of various TlBr_3 content with TlBr at boiling, decanting, and then cooling the soln. By slowly heating the cryst. mixture so obtained, the temp. at which the reactions $3\text{TlBr}_3 \cdot \text{TlBr}(\text{yellow}) \rightleftharpoons \text{TlBr}_3 \cdot 3\text{TlBr}(\text{red}) + 2\text{TlBr}$ and $\text{TlBr}_3 \cdot 3\text{TlBr} \rightleftharpoons \text{TlBr}_3 + 3\text{TlBr}$ ceased would be detd. by noting the temps. of disappearance of the yellow or red crystals, resp. These temps., plotted against the initial TlBr_3 content, gave curves tending to intersect at a little above 100° . From the results it follows that when a soln. containing more than 0.3 mol. TlBr_3 per l. is satd. with TlBr at boiling, as above described, $\text{TlBr}_3 \cdot \text{TlBr}$ seps. on cooling; when the soln. contains from 0.15 to 0.3 mol., first TlBr , then $\text{TlBr}_3 \cdot 3\text{TlBr}$, then $\text{TlBr}_3 \cdot \text{TlBr}$ are formed; when the soln. contains less than 0.15 mol., first TlBr , then $\text{TlBr}_3 \cdot \text{TlBr}$ seps. The results previously obtained are those to be expected from the ordinary phase rule relations, assumptions in regard to a specific effect of sunlight or $\text{H}_2\text{C}_2\text{O}_4$ being unnecessary. Results similar to those previously obtained with $\text{H}_2\text{C}_2\text{O}_4$ were obtained with $(\text{NH}_4)_2\text{C}_2\text{O}_4$, but tartaric acid acts much more slowly than either of the above. The compds. $\text{TiCl}_3 \cdot 3\text{TiCl}$ and $\text{TiCl}_3 \cdot \text{TiCl}$ are less affected by temp. change, and the latter can be recrystd. from hot H_2O . With a large excess of TiCl_3 , $\text{TiCl}_3 \cdot 3\text{TiCl}$ is transformed into $\text{TiCl}_3 \cdot \text{TiCl}$, contrary to statements in the literature. Crystn. of solns. containing TiCl and TlBr_3 in varying amt. gave mixts. of varying Br content, showing formation of mixed crystals; the numerous double chlorides described in the literature do not exist.

GEORGE W. MOREY.

The passivification of iron by nitric acid (YOUNG) 9.

7. ANALYTICAL CHEMISTRY.

F. G. R. ARDAGH.

Volumetric determination of sulfuric acid. U. S. BORGHI AND T. SOTOLA. *Atti r. ist. Veneto* 72, II, 1097-1117(1912).—The authors modified Andrews' method, which depends upon the pptn. of H_2SO_4 by BaCrO_4 in HCl soln., and subsequent detn. of excess BaCrO_4 . In a flask or beaker of about 800 cc. a measured quantity of the

factory results on the detn. of inorg. P in blood, brain, flesh and liver, and was adopted in 1914 as official by the Association of Official Agricultural Chemists.

R. C. ROARK.

A new method for determining iodine in organic preparations. E. RUPP AND F. LEHMANN. Univ. Koenigsberg. *Arch. Pharm.* 253, 443-5(1916).—Recognizing the fact that only in exceptional cases is a direct detn. of I possible, numerous expts. were carried out to improve the very excellent method of Baubigny and Chavanne (Emde, *C. A.* 5, 2473), whereby I is estd. as AgI in the presence of Br and Cl. The procedure finally elaborated is as follows: In a 500 cc. Kjeldahl flask mix 25 cc. 0.1 N AgNO₃ with 20 cc. concd. H₂SO₄ and heat until the flask is filled with white acid fumes. After cooling add 2.5 g. finely powdered KMnO₄, then introduce the accurately weighed sample (contained in a small weighing capsule) into the oxidizing mixt. Should no energetic evolution of gas be immediately apparent, add 5 cc. H₂O, otherwise defer such addition until the reaction has nearly ceased. After the addition of H₂O, agitate vigorously 1-2 min., then allow the mixt. to stand 15 min. with occasional stirring. Now heat the flask (partially closed with a small funnel) in a slightly inclined position at first gently until the liquid boils, then strongly. By frequently turning the flask, any particles previously projected on to the neck are washed down again. Continue the heating until the MnO₂ has nearly disappeared and the liquid assumes a deep blue color. Allow to cool, pour on to the mixt. at one time a freshly prepd. soln. of 5 g. cryst. FeSO₄ in 100 cc. H₂O, shaking the product vigorously for some min. until the AgI has sepd. in cheesy masses and the supernatant liquor becomes clear. Transfer the contents of the flask to a large beaker, wash out the flask with 20-30 cc. H₂O in small portions and titrate *via* Volhard the unexpended AgNO₃ with 0.1 N KCNS. 1 cc. 0.1 N AgNO₃ = 0.0127 g. I.

W. O. E.

Formaldehyde containing copper. HERMANN KUNZ-KRAUSE. *Apoth. Ztg.* 31, 66-7(1916).—The adsorptive action of finely divided cellulose may be employed to detect every minute quantity of Cu in HCHO. Thus, on passing the sample (containing the metal possibly as formate) through a folded filter, that portion of the paper untouched by the liquid remains perfectly colorless, while the wetted portion shows after drying and especially in transmitted light a beautiful greenish blue sheen.

W. O. E.

Estimation of phenol (FORBING) 17. Notes on the treatment of stannite ore at Zeehan, Tas. (LEVINGS) 9.

8. MINERALOGICAL AND GEOLOGICAL CHEMISTRY.

EDGAR T. WHERRY.

A modification of the reaction of Meigen for differentiating between calcite and aragonite. E. QUERCIGH. Univ. Turin. *Atti accad. Lincei* 24, I, 1231-5(1915).—The Meigen test for aragonite (*Centr. Min. Geol.* 1901, 577) depends on a lilac coloration when the powdered mineral is boiled a few min. with dil. CoCl₂ soln. With calcite a faint bluish deposit is formed. With aragonite (Meigen, *Z. Kryst. Min.* 44, 312(1908); *C. A.* 2, 519, 520) the deposit is 2CoCO₃ + 3Co(OH)₂ + H₂O; with calcite it is CoCO₃ + 3Co(OH)₂. Kreutz (*C. A.* 4, 1283) found that the ppt. on calcite is easily sol. in NH₄Cl soln. while that on aragonite is nearly insol., but Q. finds that if there is a difference in the soly. it is too slight to be of value. The Thugutt test (*C. A.* 5, 1382) with 0.1 N AgNO₃ and then with K₂Cr₂O₇ depends on the same principle as the Meigen test: the more rapid soln., and thus reaction, of the less stable phase. There are at least 2 weaknesses in the Meigen test: (1) It can not be effective with a mixt. of arago-

nite and calcite since, as was shown by Panebianco (*Riv. min. crist. ital.* 28, 5(1902)), 1 part aragonite in 19 of calcite gives the lilac tint. (2) It is only effective when the mineral is no more than slightly colored in such a way as to mask the lilac color and fails with the many specimens that are yellow or brown. Moreover it can not be known by this method whether calcite is present or not. Q.'s change in order to avoid these disadvantages is to transform the basic CoCO_3 into sulfide on the mineral, which with aragonite gives a black coloration very quickly and with calcite a gray coloration slowly. In a mixt. of the 2 minerals the granules are easily distinguished even with the unaided eye. 0.1 to 0.2 g. of the mineral are used but a few milligrams are sufficient. Pieces 0.2 to 0.4 mm. are used; they are boiled 1 min. with 5% $\text{Co}(\text{NO}_3)_2$ soln.; any concn. of Na_2S or $(\text{NH}_4)_2\text{S}$ soln. may be used. By this method many specimens gave a test for aragonite after Meigen's original test had failed. This test applied (prolonged action) to a washed and polished 110 face of a large crystal of Sicilian aragonite partly transformed into calcite showed distinctly the portions of the face so transformed. This test is now more satisfactory than Thugutt's. E. J. WITZEMANN.

Strongly thermophosphorescent calcite. F. PISANI. *Bull. soc. franc. min.* 38, 24-7(1915); *Chem. Zentr.* 1915, II, 673.—Continuing work in this field (cf. C. A. 8, 2136), P. announces that he has observed strong thermophosphorescence with only 4 additional specimens of calcite. These were obtained from Louverne (Mayenne), Andreasberg, Derbyshire, and from the vicinity of the Puy. E. A. TSCHUDY.

Reaumurite. A. LACROIX. *Bull. soc. franc. min.* 38, 16-21(1915); *Chem. Zentr.* 1915, II, 672-3.—Reaumur's porcelain was found to have been formed through the softening of glass vessels by molten lava during the destruction of St. Pierre in 1906. L. apparently considers this sufficient evidence that the substance is a true mineral. The piece of porcelain from St. Pierre had the following compn.: SiO_2 68.10, Al_2O_3 1.25, Fe_2O_3 0.15, FeO 0.22, MgO 0.03, CaO 16.96, Na_2O 11.38, P_2O_5 0.06, H_2O (105°) 0.60, H_2O (red ht.) 0.36, sum 99.11. The analysis leads to the adoption of the formula $2\text{SiO}_2(\text{Ca}, \text{Na}_2)\text{O} = (\text{Ca}, \text{Na}_2)\text{Si}_2\text{O}_6$. The rivaite of Zambonini (C. A. 9, 774) may possibly be identical with reaumurite. E. A. TSCHUDY.

Elba petalite. PROBO COMUCCI. Florence. *Atti accad. Lincei* 24, I, 1141-6 (1915).—The crystallographic measurements are given for this petalite. Chem. analysis showed SiO_2 77.58, Al_2O_3 18.25, Fe_2O_3 0.58, Li_2O 3.08, K_2O 0.38%. Calcg. the Fe as substituted isomorphously for Al_2O_3 , the latter becomes 18.62%. In ordinary petalite the $\text{Al}_2\text{O}_3:\text{Li}_2\text{O}$ ratio is 1:1 but in this it is 2:1. If 2 silicates are present ordinary petalite would be $(6\text{SiO}_2.\text{Al}_2\text{O}_3)(2\text{SiO}_2.\text{Li}_2\text{O})$ and this one $2(6\text{SiO}_2.\text{Al}_2\text{O}_3).(2\text{SiO}_2.\text{Li}_2\text{O})$. The supposed isomorphism between this petalite and spodumene could not be fully confirmed. [The above analysis yields approximately the usual petalite ratios. ABSTR.] E. J. WITZEMANN.

Ilvaite and other minerals from Perdu Niedda nell'Oriddese (Sardinia). ERNESTO MANASSE. *Atti accad. Lincei* 24, II, 285-9(1915).—The important Fe-bearing deposits of this region have been described by A. Ciampi (*Rass. min.* 30, 14(1909)). Some of the contact minerals which were supplied by C. are described. Ilvaite occurs in compact masses or with a radiating structure, pitch-black in color. On analysis it gives: H_2O 2.66, SiO_2 29.37, Al_2O_3 0.67, Fe_2O_3 19.47, FeO 27.74, MnO 6.48, CaO 13.25, MgO 0.51%, corresponding to $\text{Ca}(\text{Fe}^{\text{II}}, \text{Mn}^{\text{II}})_2(\text{Fe}^{\text{III}}(\text{OH}))(\text{SiO}_4)_2$ in which $\text{Mn}:\text{Fe} = 1:4$. Garnet is more abundant in these contact zones than ilvaite and occurs associated also with wollastonite and actinolite in segregation veins. The garnet is mostly dark green but sometimes rosin colored. The latter shows: SiO_2 35.09, Al_2O_3 2.01, Fe_2O_3 29.82, MnO 0.53, CaO 33.10, MgO 0.48%, no TiO_2 or Cr_2O_3 , corresponding to $\text{Ca}_3\text{Fe}_2^{\text{III}}(\text{SiO}_4)_3$. The wollastonite, occurring in white masses with a radiating fibrous structure,

shows H_2O 0.85, SiO_2 50.49, Al_2O_3 trace, Fe_2O_3 0.54, CaO 47.72 and MgO 0.51%, and corresponds closely to $\text{Ca}(\text{SiO}_3)$.
E. J. WITZEMANN.

Titanite and its pseudomorphs. A. LACROIX. *Bull. soc. franc. min.* 38, 21-4 (1915); *Chem. Zentr.* 1915, II, 671.—Large crystals of titanite from Ambalavaokely, Madagascar, had the following compn.: SiO_2 31.00, TiO_2 35.40, Al_2O_3 4.00, Ce_2O_3 0.40, FeO 1.60, CaO 27.20, loss on ignition 0.66, sum 100.26%. They originated in a pegmatite vein consisting of epidote and microcline. The upper surface of the crystals has undergone a change. A clear yellow substance (colloidal) in concentric layers has formed. This substance contains much Ti and some Ca. Its nature has as yet not been completely investigated. Pseudomorphs of titanite were found in a pegmatite deposit at Ambatofotsy associated with needles of rutile, small quartz crystals and mica scales. They had the following compn.: SiO_2 31.20, TiO_2 47.20, Al_2O_3 10.80, Fe_2O_3 6.60, MgO 1.84, K_2O 0.56, loss on ignition 1.30, sum 99.50. Xanthitane from North Carolina has a different compn.
E. A. TSCHUDY.

Brazilian anthosiderite and the similar pseudomorphs of Madagascar quartzite, containing magnetite. A. LACROIX. *Bull. soc. franc. min.* 38, 9-15(1915); *Chem. Zentr.* 1915, II, 672.—The anthosiderite of Hausmann is considered by Zirkel as a mixt. of biotite and fibrolite. According to Groth, it consists of andalusite and biotite. Dana, however, places it with hisingerite as a distinct species. An examn. of old museum material showed that the question resolves itself into a consideration of Fe-bearing pseudomorphs similar to cummingtonite in which most of the SiO_2 exists as primary quartz. The griqualandite of Hepburn is quoted in support of this conclusion. In certain quartzites from Madagascar golden-yellow fibers were found, being in some places so numerous that the rock had a silky appearance. In this case it was proved that the material in question consisted of completely transformed cummingtonite, containing grünerite and possibly hudsonite. The grünerite was easily identified optically.
E. A. TSCHUDY.

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F. W. SMITHER.

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WILLIAM BRADY, WILLIAM T. HALL.

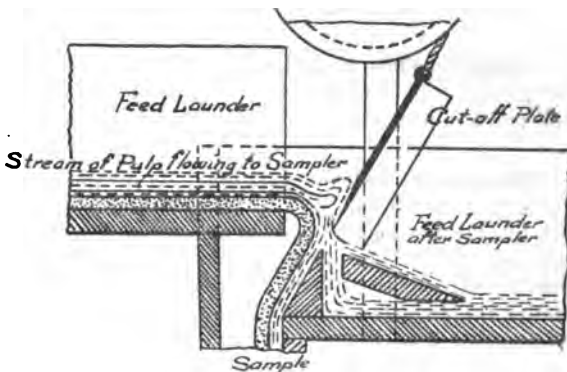
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Taylor's pulp sampler. W. H. TREWARTHA-JAMES. *Bull. Inst. Mining & Met.* No. 137, 23-33.—Both the sample chamber and the cut-off plate are wider than the pulp stream so that on either side of it there is a free air space offering a line of least resistance down which flows a considerable proportion of the top part of the stream in the moment during which the plate is passing through the stream. Apparent theoretical discrepancies are compensated by other conditions, in such a way as to give a sample sufficiently accurate for com. purposes provided the pulp stream is not too deep.



L. P. WEBBERT.

Recovery of gallium from spelter in the United States. W. F. HILLEBRAND AND J. A. SCHERRER. *J. Ind. Eng. Chem.* 8, 225(1916).—Continuous distn. of 12,000 lbs. of Oklahoma spelter, carried out with the purpose of obtaining a high grade product, left a residue containing a few grams of Ga alloyed with In and small quantities of Zn. The alloy resembles Hg in appearance but wets glass and porcelain. It is volatile at the temp. of the ore furnace, 1350°, but resists redistn. for weeks at the temp. of the redistg. furnaces, 1000°. Other samples of Zn ore from Idaho, Colorado, Missouri and Utah, received by the Bureau of Standards, showed on spectroscopic examn. the presence of Ge and Ga.

H. L. OLIN.

Notes on the treatment of stannite ore at Zeehan, Tas. J. H. LEVINGS. *Proc. Australasian Inst. Min. Eng.* 1915, 183-8.—The stannite at the Oonah mine occurs in a graphitic slate. In the upper levels the lode is of a patchy nature but in the bottom levels a big strong formation of primary sulfides occurs, consisting of Fe pyrite, stannite and arsenical pyrite. Bulk samples assayed Ag 14 oz., Cu 3.5%, Sn 2.0%, As 2.0%. Pyrite smelting in the blast furnace was undertaken when the reverberatory process proved to be unsatisfactory. The Sn loss through volatilization was 50%.

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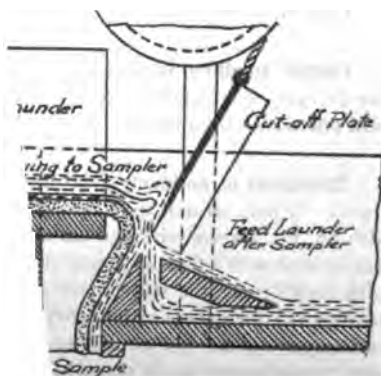
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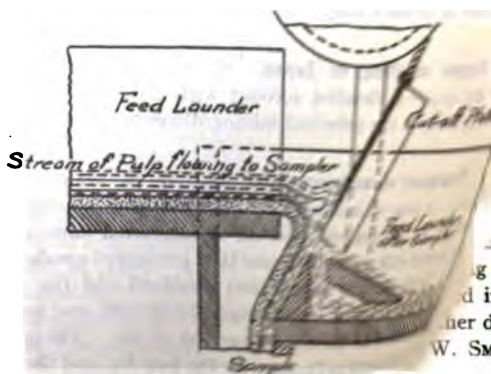
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Exhaustion of ore reserves and the failure of the reverberatory process which used up the funds for development work caused cessation of mining. L. outlines the following procedure for future treatment of stannite ore based on the experience at Zeehan and on lab. expts.: (1) A preliminary roast in mechanical furnaces, in part, or wholly, of the stannite ore, to be followed by blast roasting. (2) Smelting of the roasted products under reducing conditions producing Sn-Cu alloy, and sufficient 30% mat for the next operation. (3) Blowing the alloy and mat in the usual Cu converter into Ag-Cu bullion and volatilized SnO_2 , the latter to be collected in flue-chambers, which should be sufficient without a bag-house. (4) Reduction of the SnO_2 in a reverberatory or disposal to a smelter. *Analytical.* The usual scorification assay for Cu ores gives reliable results when run with a good fire and a little extra test Pb and borax. *Copper.* Treat with HNO_3 , evap. until pasty, dil., boil and decant through a filter, add a little HNO_3 and hot H_2O , stir the ppt. thoroughly, boil, let settle and decant through the same filter, wash the ppt. on to the filter and then wash several times with hot H_2O . Add H_2SO_4 to the filtrate containing Cu, take to fumes and proceed in the usual manner. *Tin.* Ignite the ppt. and fuse in a Ni crucible with Na_2O_2 , cool, dissolve out with H_2O , make acid with concd. HCl , then add 50 cc. in excess. Boil with about 25 g. Ni foil for 40 min., add a piece of marble, cool rapidly, add starch soln. and titrate with standard I soln.

L. P. WEBBERT.

Uses of furnace slag. H. LANG. *Mining Sci. Press* 112, 443-5 (1916).—A review.

F. W. SMITHER.

Copper smelting in Japan. M. EISSLER. *Trans. Am. Inst. Mining Eng.* 51, 700-42 (1915).—A detailed account with drawings, tables, analyses, etc., of metallurgical practice in the principal mining districts of the Japanese Empire.

F. W. SMITHER.

Treatment of antimony-gold ore. W. S. MANN. *Mining Sci. Press* 112, 433-4 (1916).—A note on mill-tests made in southern Mexico. The ore carried Au and Ag, with Sb, Pb, arsenopyrite and Cu as associated minerals. The free Au in the tailing was covered with a film of stibnite that prevented amalgamation with Hg. By treating with NaOH soln. the stibnite was dissolved and the Au readily amalgamated. By treating the original ore with a strong NaOH soln. and washing, it cyanided easily with a consumption of 2.6 lbs. cyanide per ton of ore. The ore was crushed in a 5% NaOH soln., amalgamated on Cu plates for the free Au, and then concd. The tailing from the concentrating tables passed through a long box with a traveling belt, which separated the sand from slime. The water was afterward removed from the fines in a spitzkasten and returned to one of 2 battery storage-tanks, where the Sb was pptd. The NaOH soln. was then brought up to strength and used over again. The sand was cyanided by percolation and the slime by agitation and decantation. The Cu, which went into soln., was taken care of by immersing the Zn shavings in a 10% (AcO), Pb soln. By maintaining the plates dry the tendency of the Pb to keep the amalgam soft was overcome.

F. W. SMITHER.

Effect of Zn_2Ag_2 upon the desilverization of lead. F. C. NEWTON. *Trans. Am. Inst. Mining Eng.* 51, 786-93 (1916).—Since the freezing-point curve of Carpenter upon Zn and Ag shows the existence of a definite chem. compd., Zn_2Ag_2 , with a freezing-point of 665° , large-scale expts. were undertaken with a view to forcing this compd. into the crust, hoping thereby to obtain a higher concn. than formerly. The expts. are reported in detail with tables and curves, from which N. concludes that, as a commercial project, the slight increase in doré contents of the crust, which might be obtained from zincing at the greater heat, is more than counterbalanced by the attendant disadvantages. The current practice dictated more or less by the question of fuel economy and better life of kettles, has been justified as a practical and efficient procedure from the standpoint

of concn. For comfort of operation, effect upon the men, etc., all arguments favor zincing at a lower temp. F. W. SMITHER.

Lead poisoning in the smelting and refining of lead. A. HAMILTON. U. S. Dept. Labor, *Bur. Labor Statistics*, Whole No. 141, 97 pp. (Feb., 1914); cf. C. A. 5, 2437; 7, 653; 9, 1878.—A detailed report and discussion based on a study of 20 U. S. plants. The methods employed vary according to the character of the ore handled, and the difference in hygienic conditions seems to depend more upon the different methods used than upon different standards in the management. Only 2 plants were found in which neglect and indifference were conspicuous, but no plant was found in which every obvious precaution had been used. The plants which have the greatest incidence of Pb poisoning are those in which unusually dangerous processes are used (2 exceptions due to carelessness in management). During 1912 the number of cases of Pb poisoning reported was 1769 (a rate of almost 22 for every 100 employed). The processes used in Pb smelting and refining in the U. S., the various furnaces used, and the flue dust system are described with 15 plates. Relative dangers of breathing Pb dust and of getting Pb on food, poisons other than Pb encountered in Pb smelting, Pb poisoning in the smelting industry in Great Britain, Germany, Austria, and U. S. are discussed. Appendices contain the N. J. Dept. of Labor regulations, together with the English, German and French regulations. Numerous references to the literature are given. Cf. Oliver, C. A. 7, 4012; 8, 3126. Clifford, C. A. 7, 1922. Stitt, C. A. 6, 2651. Thompson, C. A. 6, 2966. Thomason, C. A. 5, 513. Anon., C. A. 9, 1201. F. W. SMITHER.

The solubility of lead sulfide ores and of lead sulfide in human gastric juice. A. WOELFEL AND A. J. CARLSON. U. S. Dept. Labor, *Bur. Labor Statistics*, Whole No. 141, 82-4 (1914), Appendix 1; cf. C. A. 8, 3328.—The general plan of the tests is the same as that followed in the previous tests with white lead (cf. C. A. 7, 3519), with the exception of feeding expts. on animals. The PbS ores used contained 70.1 to 73.4% Pb. The expts. show that: (1) PbS is sol. in human gastric juice (averages about 2.5% for the ore; PbS from chem. dealers, 4.6%). (2) The soly. of PbS is less than that of basic lead sulfate (9.5%) or basic lead carbonate (46%), but the PbS is sufficiently sol. to be dangerous to the health of persons engaged in mining and milling PbS ore, if the processes involve the production of dust. (3) The persons engaged in mining and milling PbS ore should be protected in the same way as workers in other dangerous Pb industries. References to the literature are given. F. W. SMITHER.

Amalgamating copper plates. A. McLAREN. *Eng. Mining J.* 101, 647 (1916).—The following scheme of prepn. is suggested when it becomes necessary to use raw Cu plates with no supply of cyanide on hand. Scour the plate with tailings and wash clean. Dissolve a piece of Ag about the size of a dime in 20 cc. of HNO₃, boil until the red fumes are expelled, and add 150 cc. of H₂O. Pour this soln. over the plate, the surface of which becomes blackened. A few drops of Hg thrown on the plate and rubbed lightly will then produce a properly amalgamated surface quickly and easily. This procedure makes it possible to utilize old plates or sheets of raw Cu. F. W. S.

Tilting crucible furnace. ANON. *Engineering* 101, 276 (1916).—The crucible melting furnaces of the tilting type, described with illustrations, are designed primarily for oil-firing, but can also be used with coke and gas. The special features are the combustion chamber, the method of tilting the furnace, and the const. vertical pouring point. F. W. SMITHER.

Effect of borax in mat fusion. G. E. JOHNSON. *Eng. Mining J.* 101, 648-50 (1916).—The investigation, reported in detail with tables, curves, and discussion, was undertaken in order to prove (1) that borax acts as an acid flux and, as such, can be used to replace SiO₂; (2) that borax does not dissolve or hold in soln. the Ag. A Cu mat

containing 35% Cu and 17.3 oz. Ag was taken as the basis for the expt. Three types of charges were used: (a) Livingstone's charges for Cu mats (cf. *Eng. Mining J.* 98, 23(1913)); (b) L.'s charges in which borax glass replaces the SiO_2 ; (c) L.'s charges with enough borax added to raise the silicate-borate degree one unit. The conclusions are that borax will replace SiO_2 in a mat fusion without loss of Ag values, and that the silicate degree should lie between a $1/8$ silicate and a monosilicate. F. W. SMITHER.

Antimony in Hunan Province, southern China. A. S. WHEELER. *Eng. Mining J.* 101, 637-41(1916); *Mining Eng. World* 44, 697-9, 739-41(1916).—Excerpts from a paper read before the Institution of Mining and Metallurgy, London, Feb. 24, 1916. A review. The most important mines are in dolomitic limestone in the vicinity of Hsin-hua in the Hsi-k'eng-shan field. The world's annual production of Sb has risen from less than 18,000 tons in 1910 to probably over 40,000 tons at present. Also in *Mining Eng. World* 44, 697-9, 739-41(1916). F. W. SMITHER.

Metallurgy of the ores from Cobalt, Ont. R. W. BRIDGES. *Canadian Mining J.*, Jan. 15, 1916; *Eng. Mining J.* 101, 646-7(1916).—An account of the operations of the Co plant of the Canadian Copper Co., Copper Cliff, Ont. The works were remodeled and designed to smelt and treat ores and concentrates from the Cobalt Ag district. The ore is crushed and ground in Krupp ball mills to pass 30-mesh; for sampling about 6% was cut by a Snyder sampler. The ore was charged with suitable fluxes into 32×72 in. blast furnaces having a capacity of 25 to 30 tons per 24 hrs. Michigan limestone was used as the basic flux, low grade Crown-Reserve ore as the acid flux. The products of the blast furnaces were: (1) flue dust and crude As, (2) slag, (3) Ag bullion, (4) speiss. The crude As and flue dust from the blast furnaces and roasting furnaces were collected in suitable condensing chambers; the dust was recharged to the blast furnaces, and the crude As sublimed from As refining furnace ready for packing. Pure white As_2O_3 assayed 99.98% As_2O_3 with about 0.03 oz. of Ag per ton. The slag from the blast furnaces during ore runs was rejected except when it contained more than 10 oz. of Ag per ton, in which case it was returned to the blast furnaces. The slag produced while smelting speiss to remove the Fe was all used on ore runs owing to its high Ag and Co content. Assays of the slags showed in oz.: ore slag: Ag 8.8, As 0.13, Co 0.44, Ni 0.29, Fe_2O_3 11.63, Al_2O_3 14.15, CaO 22.78, MgO 8.67, SiO_2 41.13; speiss slag (same sequence): 32.8, 0.47, 13.97, 1.28, 28.54, 9.75, 6.50, 4.68, 34.03. About 75% of the Ag in the ore charged was obtained as buttons, which were easily sepd. from the speiss and charged into an oil-fired cupeling furnace of 30,000 oz. capacity. The crude Ag assayed about 860 fine. After about 24 hrs. in the cupeling furnace it was ladeled out 994 fine and sent to the Balbach Smelting and Refining Co. The speiss was brittle as a rule, and easily broken with a hammer. After crushing it was ground in the ball mill to 30-mesh, 20% of NaCl being added as the speiss was charged to the mill. This high-Fe speiss was roasted in 8 Edwards reverberatory furnaces fitted with mechanical rabblers and having a capacity of 2400 lbs. per 24 hrs. The compn. averaged: 25.2% Co, 15.3 Ni, 31.3 As, 16.1 Fe and 1480 oz. Ag per ton. The product of the roasting (a chloridized speiss) was transferred from the smelter to the hypo-leaching building, and treated in a large agitation cylinder first with cold H_2O to dissolve out the undecomposed NaCl and the sol. salts of Co, Ni, and Cu. This H_2O soln. was decanted onto scrap Fe to ppt. the Cu and then pumped to another tank, where the Co and Ni were pptd. as hydroxides by NaOH. This ppt. was dried, calcined to oxides, ground and barreled for shipment. It assayed: Ag 15.0 oz., As 0.3%, Co 40, Ni 3%. As Ni is less easily converted to a sol. salt in the chloridizing roast, it is lower than the usual proportion of Ni to Co. After the H_2O wash, the speiss is treated 4 times with $\text{Na}_2\text{S}_2\text{O}_3$ soln. to dissolve the AgCl, giving the "first hypo residue," which contains 20 to 30 oz. of Ag. The Ag was pptd. from the $\text{Na}_2\text{S}_2\text{O}_3$ soln. as Ag_2S , collected in a filter

press, dried, mixed with NaNO_3 and Na_2CO_3 , roasted in an oil-fired furnace, and leached in hot H_2O . The residue (a sponge-like mass of Ag) was charged to the Ag-refining furnace. The "first hypo residue" was returned to the smelter, mixed with quartz and run through the blast furnaces to remove Fe (the selling contract calling for less than 5% of Fe in the "crude Co material"), the resulting green speiss ("low Fe speiss") carrying about Co 28.9%, Ni 27.8, As 29.5, Fe 3.5%, Ag 1341 oz. This speiss was milled with NaCl and roasted just as the "high Fe" speiss, washed with H_2O , and treated with $\text{Na}_2\text{S}_2\text{O}_3$, giving the "second hypo residue." It was dried, mixed with 20% NaNO_3 and 10% Na_2CO_3 , and roasted in a reverberatory furnace, converting the As to Na_3AsO_4 , which was leached out with hot H_2O . The dried residue was sold to German refineries as "crude Co material;" average analysis: Co 30.7%, Ni 28.5, As 1.1%, Ag 34.6 oz. per ton. Elec. power was used. From Dec., 1905, to Feb., 1913, more than 40 mil. oz. of Ag, 2.2 mil. lbs. of Co, 1.5 mil. lb. of Ni, and 4.5 mil. lbs. of pure As_2O_3 were produced.

F. W. SMITHER.

Metal cutting with oxy-acetylene gas. S. W. MILLER. *Machinery* 22, 682-3 (1916).—A review of practice of cutting metals with C_2H_2 or oxy-H flame.

C. G. F.

Foundry problems. W. J. REARDON. *Metal Ind.* 14, 155-8 (1916).—Problems incidental to the successful melting of metals are considered from the viewpoint of a brass-foundry man.

W. T. H.

Lubricants for metals. P. W. BLAIR. *Metal Ind.* 14, 158-9 (1916).—The uses and values of oils in a metal and brass working plant are discussed.

W. T. H.

Speed of testing machines. G. B. WATERHOUSE. *Iron Age* 97, 780 (1916).—The ratio of elastic limit to ultimate stress is decreased steadily as the speed is reduced. The ultimate stress also decreases and the effect is more marked in the smaller pieces. The decrease in elastic limit is greater proportionately than that of the ultimate stress. The effect of elongation and reduction of area is very slight.

W. T. H.

Standard test specimens of zinc bronze. I. Preparation of specifications. C. P. KARR. *Bur. Standards Tech. Papers*, No. 59, 5-45 (1915); see C. A. 9, 588.

W. T. H.

Standard test specimens of zinc bronze. II. Microstructure. H. S. RAWDON. *Bur. Standards Tech. Papers*, No. 59, 47-67 (1915); see C. A. 9, 3208.

W. T. H.

The resistance to wear of cast iron liners and cylinders. ANON. *Engineering* 101, 149-50 (1916).—The microscopic appearance of worn surfaces is shown and conditions governing resistance to wear are discussed.

W. T. H.

The passivification of iron by nitric acid. S. W. YOUNG AND E. M. HOGG. *J. Phys. Chem.* 19, 617-49 (1915).—An extensive series of velocity detns. of the reaction between Fe wire and HNO_3 were made. The d. of the acid ranged from 1.025 to 1.400; the measurements were duplicated for 0° , 10° and 20° . As the results at 0° do not differ materially from those at 10° or 20° , satisfactory conclusions may be drawn from the data at 0° . A. *Passivification by HNO_3* : (1) The value of the velocity const. for the reaction between Fe and HNO_3 decreased with increasing concn. of acid; (2) this decrease is not uniform, but shows a rapid drop when the d. of the acid is 1.260; (3) In concns. greater than 1.260 the velocity const. decreases with the time—an indication of passivity; (4) this concn. 1.260, called the point of "passive break," is the point at which progressive passivification begins, and also the point at which a rapid decrease in the reaction rate takes place; the "passive break" is not independent of the temp., it falls from 0° to 10° and rises to 20° ; (6) passivifying acids, no matter how concd., slowly but steadily dissolve Fe. B. *Passivification by NO_2* : (1) Dry NO_2 is a stronger passivifying agent than HNO_3 ; NO is without effect; (2) passivifying acids contain

more or less of the higher oxides of N, while activifying acids are generally water-white; (3) activifying acids lose their power on repeated use, due presumably to the accumulation of dissolved NO_3 ; bubbling NO_2 through activifying acids, or adding nitrites, produces passivity; (4) Fe, passivified in NO_2 , absorbs some of the gas; (5) it is likely that but little NO_2 is necessary for passivification. *C. Conception of the Passive State:* (1) The passive state is not definite, since there exist an indefinitely great number of degrees of passivity; (2) the state seems to be the result of an equil. between Fe and NO_2 —Fe absorbs NO_2 from any soln. in which it is produced, and the rate of reaction is thereby inhibited; (3) since Fe passivified by dry NO_2 is more passive than that which is passivified in HNO_3 , it would seem that Fe absorbs little NO_2 from even concd. HNO_3 ; the "passive break" may be regarded as that concn. at which the reaction begins to develop relatively large amounts of NO_2 . D. B.

Effects of blooming on rails. M. H. WICKHORST. *Iron Age* 96, 1317(1915).—The influence on rails of the manner in which the bloom is rolled was studied, particularly with reference to the transverse ductility of the bottom of the base of the rail. It was found that rails rolled *top in top* gave about the same results as those rolled *top in web* in the drop tests, transverse tests of the base, and tensile tests. The results were also about the same for the various rates of reduction in making the bloom, except that in the drop tests with the base in tension there was a general decrease in ductility as the rate of initial reduction increased; there was, however, considerable irregularity in the results. W. T. H.

Commercial production of sound ingots. W. D. BRADFORD. *Iron Age* 96, 1464-7(1915).—Freedom from segregation and pipes is obtained by the use of a mold of special design. The making of shrapnel in Canada is described. W. T. H.

An alloy steel of special composition. J. B. RHODES. *Iron Age* 96, 1553-4(1915).—A steel with 0.30-0.35% C, 0.25-0.35% Si, less than 0.05% P, 1.00-1.20% Mn, 1.5-1.8% Cr and 0.50-0.80% Cu has been found to furnish high grade castings and forgings from the same mix and at a comparatively low cost. W. T. H.

A flexible heat-treating installation. ANON. *Iron Age* 96, 507-10(1915).

W. T. H.

The unreliability of brass and bronze. ALFRED D. FLINN. *Iron Age* 96, 1292-3(1915).

W. T. H.

The initial structure of steel castings. EDWIN F. CONE. *Iron Age* 96, 1294-6(1915).—The slower the cooling and the greater the bulk of metal, the greater is the tendency to produce large crystals or octahedral structures called ingotism. There is no ingotism to correct if the sand cooling is rapid and is followed by annealing at the recalescence temp. On the other hand, if the sand cooling is slow, ingotism is not easily remedied and a heavy test section will show more of it than a thin one. W. T. H.

An investigation of ladle test ingots. ROBERT W. HUNT. *Iron Age* 96, 1303-5(1915).—It is recommended that rail specifications should provide a standard shape and size for ladle test ingots with directions as to size of drill and locations of the borings from which the chem. analysis is to be made and that Al, preferably in the dipper, should be added when necessary to insure a sound setting steel in the ladle test ingot with freedom from blow holes. Unsoundness of the ingot renders the chem. analysis inaccurate. The location of the test ingot in the heat with respect to the regular ingots cast is also worthy of consideration. The reasons for arriving at the above conclusions are discussed at length. W. T. H.

The Bontempi rust-proofing process. ANON. *Engineering* 100, 602(1915).

W. T. H.

Volume changes during the hardening of steel. E. H. SCHULZ. *Engineering* 100, 596-7(1915).—It was found that the d. of annealed steel decreased as C increased. The d. was decreased by quenching, the more as the C content was high. The vol. changes produced by oil quenching were always less than with H₂O. On the whole, the results obtained by S. agree with the observations of Heyn and Bauer on the soly. of steel in acids but they do not fit the allotropic theory. On quenching, martensite needles are formed in austenite, which is at first compressed by them; but the decompn. of martensite begins at 100° and above 150° austenite becomes able to take up the compression stress and is itself decomposed in the range 250-450° in which the martensite decompn. is completed. On the other hand, rising temp. expands both martensite and austenite and as the expansion predominates in the interior, which is still in the annealed state, while contraction goes on in the cooled surface, hardness cracks are developed. Stresses play an important part in hardening. These are either purely physical or thermal, or else they are brought about by the different natures and vols. of the different constituents and their textures. The complete relieving of these stresses will only be accomplished in small pieces. Eutectoid steels are very likely to develop hardness cracks because all the transformations take place at 700° and not in several stages.

W. T. H.

Chisels. HENRY FOWLER. *Engineering* 101, 195(1916).—The Midland Railway (English) specifies that chisels should contain 0.75-0.85% C with other constituents present in normal amts. A satisfactory chisel was found to contain 0.75% C, 0.38% Mn, 0.16% Si, 0.028% S, 0.026% P. The chisels are hardened by heating to 730° followed by quenching to a depth of $\frac{3}{8}$ to $\frac{1}{2}$ in. from the point in water and then cooling in linseed oil which is surrounded by running water. The hard point is then immersed in oil at 215-220° until the desired temper is obtained and then the chisel is removed, cleaned in saw dust and cooled in a tray.

W. T. H.

Stress distributions in engineering materials. J. PERRY, *et al.* *Engineering* 100, 379-80(1915).—The physical properties of mild steel are discussed and considerable data concerning the strength of the material is given.

W. T. H.

The influence of oxygen on some properties of pure iron. WESLEY AUSTIN. *Engineering* 100, 455-6(1915).—Highly oxygenated alloys were prepared by melting Fe and Fe₂O₃ in a small Girod furnace using a bundle of Fe rods as the movable electrode. The Fe was oxidized by the air during melting and additions of Fe₂O₃, MgO and CaO were made from time to time. The melt was cast in a clay pot; when cool was sawed through the center and the two halves forged into sq. billets, which were subsequently rolled into flat bars. The alloys were analyzed by heating in pure H and weighing the resulting H₂O. None of the material thus prepared contained more than 0.29% O. The m. p. was not noticeably different from that of pure, electrolytic Fe. Cooling curves taken *in vacuo* failed to show the pearlite point. The alloy resisted atm. corrosion very well but corroded more than mild steel in dil. acids and in sea water and more than wrought Fe in sea water. Photomicrographs show that the O is present in mechanical admixture.

W. T. H.

The use of alloy steels. ANON. *Engineering* 100, 548-9(1915). W. T. H.

The chemical and mechanical relations of iron, molybdenum and carbon. J. O. ARNOLD AND A. A. READ. *Engineering* 100, 555-7(1915); cf. C. A. 9, 1295, 1742.—Mo steels were prepared from Swedish bar-Fe and pure Mo in the ordinary commercial manner. The ingots were cast into molds about 2 in. sq. and when cold were reheated and hammered into bars $\frac{3}{4}$ in. round. The bars were annealed at 800°. From the steel, carbides were isolated by the electrolytic method. The chem. analysis was accomplished volumetrically with KMnO₄ after reducing both Fe⁺⁺⁺ and Mo⁺⁺⁺ with amal-

gamated Zn and at another time only Fe^{+++} with SO_4 . When about 18.25% Mo is present, Fe_3C disappears from the alloys and a double carbide, $\text{Fe}_3\text{Mo}_3\text{C}_3$, takes its place which is non-magnetic and is characterized by remarkable stability. Hardening expts. served to convert all the C into solid soln. Besides the double carbide, 2 other micro-constituents have been discovered in Mo-steels, namely Fe-Mo-pearlite and Fe-Mo-hardenite. The effect of Mo on steel resembles that of W only as regards the similarity in the thermal range of the transformation of pearlite into hardenite, which begins at about 925° and is completed at about 1100° . The steel-hardening power of Mo is 2 or 3 times that of W but the latter element is much more reliable in its action. Annealed Mo-steels are distinctly inferior in mechanical properties to annealed W-steels. Unlike W-steels, Mo-steels liberate the double carbide pure with a weak electrolyte and low current d. Within the limits tested, Mo does not appear to form a definite molybde of Fe corresponding to the tungstide Fe_3W . Just as high V facilitates the segregation of V-cementite, so high Mo appears to favor segregation of Fe-Mo-cementite in annealed steels. Fe-Mi-hardenite also resembles Fe-V-hardenite in brittleness when quenched above the temp. of complete transformation. W. T. H.

Heat treatment of steel. E. D. CAMPBELL. *Eng.* 100, 681-3(1915); *Electrician* 76, 27-30(1916).—Bars of different steels were heated electrically and quenched in ice-water; the spec. resistances were measured at 20° . One set was quenched from 1103° , the other from 892° . The latter were reheated to temps. varying from 105 to 800° . The results indicate that the sp. resistance increases with the temp. of quenching, as would be expected if the mol. wt. of the dissolved carbides is lowered by progressive dissociation. Another indication is the increase in sp. resistance of hypo-eutectoid steel when reheated to 800° and slowly cooled, when compared with the results on the same sample reheated to 600 or 700° . This is understood if one remembers that in samples reheated to 700° the carbides are slowly precipitating from a homogeneous, unsatd. solid soln., and while this pptn. would probably not be quite as complete as on cooling slowly from 800° , the carbides which do ppt. would give a higher mol. wt. than those from a satd. soln. and would contain little or no Fe in solid soln. In the case of a metal cooled from 800° , sepn. of nearly pure ferrite would take place before the recalescence was reached, so that the carbides pptd. during recalescence would do so from a satd. soln. The resulting cementite would consist of a satd. solid soln. of Fe in Fe carbides, tending to increase the sp. resistance. A steel bar was heated to 892° , quenched, and reheated to various temp. After each heat treatment drillings were taken and examd. colorimetrically for the amt. of dinitro derivatives due to carbides in solid soln. Clear correlation exists between the sp. resistance and the concd. carbides in solid soln. Applying the theory of dissociation in aq. soln. to solid soln., we may consider that the solute dissociates into "ionoids." In a metallic soln. practically all the conductance is through the solvent and undissociated solutes, while the "ionoids," although tending like ions to acquire energy in the form of elec. charges, are unable to retain the latter because of the nature of the solvent; therefore this energy is dissipated in the form of heat. Thus the elec. energy transformed into heat by the "ionoids" may be expressed in terms of sp. resistance; hence the ionic concn. in solid soln. may be detd. by deducting from the total sp. resistance that due to the solvent and undissociated solutes. D. B.

The heat treatment of iron and steel in a neutral atmosphere. ALFRED H. WHITE and HOMER T. HOOD. *Am. Gas Light J.* 103, 310-1, 314-5; *J. Gas Lighting* 132, 138-40; *Chem. Eng.* 23, 33-7(1915).—It is shown experimentally that it is possible to heat Fe and steel in an internally fired muffle, even to forging temp., without any oxidation or formation of scale on the surface of the metal. A neutral atm. is obtained by mixing illuminating gas with twice its vol. of air; the mixture will not burn unless

preheated. A slight decarburization takes place in steel heated in this gaseous mixture but at the temps. ordinarily used in the heat treatment of steel the effect is negligible.

W. T. H.

The application of X-rays to metallurgy. ANON. *Mel. Chem. Eng.* 14, 345(1916).

W. T. H.

Research on the corrosion resistance of copper steel. D. M. BUCK AND J. O. HANDY. *J. Ind. Eng. Chem.* 8, 209-16(1916); see *C. A.* 9, 3211. W. T. H.

Gas as a case-hardening agent. ALFRED H. WHITE AND HOMER T. HOOD. *Am. Gas Light J.* 103, 259-63, 66; *J. Gas Lighting* 132, 312-5(1915).—Illuminating gas is a good carburizing agent but it has been claimed that the case is too hard and too sharply defined when the carburization is effected with gas at a high temp. and for a short time. If, however, the gas is turned off and the hot metal allowed to *soak* in the furnace, there will be diffusion of C toward the interior of the piece of metal and any desired type of case-hardening can be effected. The use of NH_3 is not recommended on account of the danger of producing a brittle nitride of Fe.

W. T. H.

The microstructural changes accompanying the annealing of bronze (Cu 0.88, Sn 0.10, Zn 0.20). H. S. RAWDON. *J. Ind. Eng. Chem.* 8, 109-14(1916); *Bur. Standards, Tech. Paper No. 60*, 17 pp.(1915); see *C. A.* 9, 3205. W. T. H.

The occurrence and influence of nitrogen in iron and steel. N. TSCHISCHESWSKI. *Engineering* 101, 171-3, 217-9(1916).—When Fe, Mn or Al is heated and exposed to the action of NH_3 , considerable N is absorbed with the formation of nitrides. With Fe the temp. optimum is about 600° and about 8.9% N will be taken up at this temp. In the case of Fe nitride, the N is obtained almost entirely as NH_4Cl when the metal is dissolved in HCl. To det. N, therefore, T. dissolves 0.3-0.7 g. of the sample in a small, covered Erlenmeyer flask with 10 cc. concd. HCl, heating slightly after the greater part of the Fe has dissolved. The soln. is rinsed into a 500 cc. flask which is connected with a condenser that leads to a receiver containing 25 cc. of 0.1 N H_2SO_4 . The HCl soln. is treated with 14 cc. KOH (1:1) and 40 cc. of satd. $\text{Ca}(\text{OH})_2$ soln. which serves to prevent bumping during the distillation. About 200 cc. of distillate is collected, or the distillation is continued, until the runnings give no test with Nessler's reagent. The distillate is then titrated with 0.1 N NaOH or it is treated with iodide-iodate soln. (250 cc. H_2O , 2.2 g. KIO_3 , 5.5 g. KI) and the liberated I titrated with $\text{Na}_2\text{S}_2\text{O}_3$ soln. The latter method is not recommended when more than 0.5% N is present. The Nessler test is not always reliable for when much C is present some amines are likely to form which have varying effects upon the Nessler test. With 98% Mn, 20% N was absorbed by heating with NH_3 ; this corresponds to the formation of MnN and the optimum temp. is $600-800^\circ$. When detd. by titration only 14.4% N was obtained and considerable N was evolved as such. Expts. proved that MnN dissolves to some extent in steel. At 1400° Si heated in N forms the very stable Si_3N_4 . This compd. is scarcely affected by dil. acids. When Si is present, therefore, considerable error is introduced into the N detn. unless the insol. residue is examined. With Al it was found possible to obtain AlN and the presence of this compd. appears to be a cause of bad steel. Under the microscope, crystals of Fe_3N with 2.02% N were noticed in the examn. of steel. This substance forms a solid soln. with Fe and on cooling steel this soln. separates into ferrite and Fe_3N . The solid soln. is very hard and brittle. The effect of N is more apparent, therefore, in steel which is to be tempered. Mechanical tests proved that the presence of N has a considerable effect especially with regard to the elongation. The hardness of the metal is increased and the elasticity reduced when the solid soln. is present. Commercial Fe and steel contains much less N than the specimens used in

these expts. but it is shown that even a little N has a considerable influence upon the desirable mechanical qualities. W. T. H.

Chemical, electrochemical and metallurgical industries of Scandinavia 18. Production of radium, uranium and vanadium (Hess) 3.

Ore-separator. G. H. DAVIS. U. S., 1,175,616, Mar. 14.

Apparatus for separating ores by flotation. F. B. KOLLBERG and M. KRAUT. U. S., 1,174,737, Mar. 7.

Flotation separation of ores. J. M. CALLOW. U. S., 1,176,428, Mar. 21. H_2O , frothing material and comminuted ore are placed in a closed flotation tank with pipes extending from its bottom into a shallow H_2O -seal and by applying suction to the top of the tank bubbles of air are drawn through the soln. and as they burst at the surface they carry off the floated particles.

Extracting and concentrating ore values. E. R. HOLDEN. U. S., 1,175,867, Mar. 14. Pulverized ore mixed with a solvent liquid is given a rotary motion in a tank so that various constituents of the ore, according to compn. and size are elevated to different levels in the tank by the rotating liquid and different portions or levels of the soln. and suspension are successively withdrawn, beginning at the top.

Concentrating ores. E. GAYFORD and G. CREER. U. S., 1,176,441, Mar. 21. Ore mixed with H_2O and a frothing agent is ground successively in a series of ball or pebble mills and between each grinding and the succeeding one the mixt. is aerated and the concentrates are floated off.

Concentrating copper in tailings. R. M. ATWATER, JR. U. S., 1,175,331, Mar. 14. Heaps of Cu tailings are treated with crude H_2SO_4 equal in wt. to the Cu present and exposed to the action of sunlight in a dry atm. until the Cu dissolved comes to the surface by capillarity and forms a solid concentrate at the surface which may be sepd.

Furnace for nodulizing ores. A. G. JONES and J. T. JONES. U. S., 1,174,727, Mar. 7. Sulfide, oxide or carbonate ores to be nodulized or reduced are mixed with wood, coal, coke or charcoal and fed from a hopper through a preheater, into a vertical shaft furnace into the upper end of which a limited supply of air is injected by a blower. Combustion gases are discharged into the stack and nodulized ore, ash, etc. is discharged into a water bath in which the ore and metal settles and is thus partly sepd. from ash.

Furnace for roasting ores. J. LÖTJENS and W. LUDEWIG. U. S., 1,176,070, Mar. 21. Superposed vaulted hearths are provided with stirring arms and rabblers curved to conform to the curvature of the hearths.

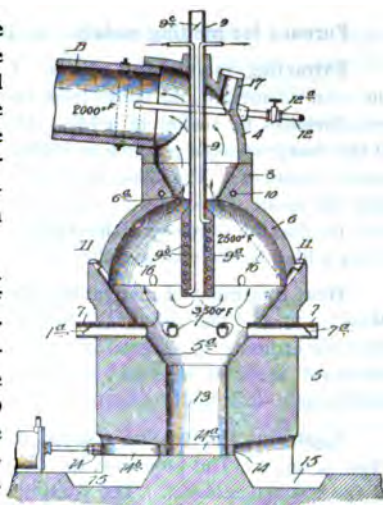
Furnace for reducing iron or copper ores. A. G. JONES. U. S., 1,174,728, Mar. 7. Oxide or carbonate ore mixed with wood or coal is fed through a revolving preheater into the furnace. Air is supplied to produce a reducing flame. Pb and Zn ores may be treated by adding a condenser to the app.

Apparatus for reducing copper ores. T. J. LOVETT. U. S., 1,175,966, Mar. 21. The ore is carried on rotating bed-plates while treated with pressure plates to sep. free Cu from gang.

Recovering copper, iron or other metals from ores. A. G. JONES. U. S., 1,174,729, Mar. 7. Oxide or carbonate ore of Fe, Cu, Mn, Ag, Pb or Zn mixed with fuel is fed

through a rotating preheater *B* into the furnace *C*, which is supplied with air through the tuyère *9* (cooled at its lower end with a water coil) and lower tuyères *7*. Combustible gases from the furnace are burned with air fed through the pipe *12* to maintain the temp. of the preheater and a slide *14a* controls the discharge of reduction products. In treating volatile metals such as Pb or Zn a condenser may be used.

Reducing ores of lead and zinc. A. G. JONES. U. S., 1,174,730, Mar. 7. A mixt. of fuel with Pb or Zn ore is fed from the hopper *7* into the furnace chamber *2* until the upper surface of the charge is in the position of the lines *15*. Air is supplied through tuyères *9* and volatilized Zn or Pb is led off through the outlets *3a* and *3b* to a condenser. Metal remaining in the furnace passes from the depression *6* into the collecting pit *6b* and a slide *4*



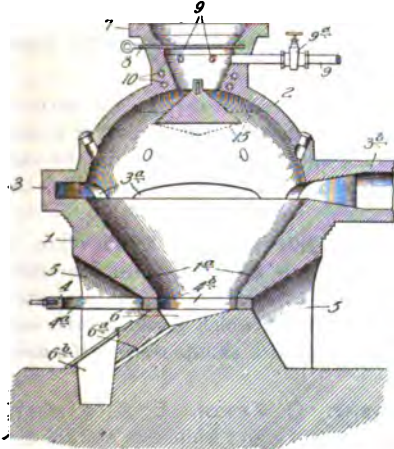
regulates the discharge of gang through the openings *5*. Any excess of coke discharged with the gang is used with a succeeding charge to recover any metal which it may have absorbed. *10* is a cooling coil.

Reducing lead or zinc ores. J. T. JONES and A. G. JONES. U. S., 1,174,731, Mar. 7. A furnace of the structure shown in Pat. 1,174,730 (*supra*) is used for heating the ore with fuel under such temp. conditions as to volatilize the metal values without fusing the gang. Combustible gases from the furnace are burned with air from a tuyère and volatilized metal values passing into chambers are washed by sprinkling jets into the collecting pit. The stack is so proportioned as to permit operation by natural draft.

Furnace for reducing ores. J. T. JONES and A. G. JONES. U. S., 1,174,732, Mar. 7. Ore is supplied from a hopper through an inclined chute passing through a chimney through a rotating preheater to a furnace of the structure shown in Pat. 1,174,729 (*supra*).

Refining copper mat containing lead. N. V. HYBINETTE. U. S., 1,175,266, Mar. 14. Cu mat containing sulfides of Pb and other metals is melted and successively passed from one to another of a series of separating kettles. Pb is drawn off from the bottom of the first kettle and the mat from the last kettle is bessemerized and then passed in a reverse direction through the separating kettles.

Reducing ores. F. E. AGNEW. U. S., 1,174,464, Mar. 7. Ores of Cu, Pb, Fe or Sb or other metals are reduced in a continuous process by first preheating the ore, with exclusion of air, to the reduction temp. of the metal which it contains and then passing it into a heat-insulated reduction furnace, from which also air is excluded and to which vaporized oil or other gaseous hydrocarbon is supplied at ordinary temp. After reduction the material is passed through a cooler in a non-oxidizing atm.



Furnace for melting metals. E. BOSSHARDT. Fr., 477,961, Mar. 8, 1915.

Extracting metals and alloys. E. KARDOS. Brit., 22,946, Nov. 23, 1914. In the extn. of metals and alloys from the ore by injecting a charge of powdered material into furnaces by means of a blast, the blast is controlled with respect to the compn. of the charge so as to generate reducing gas only, and the reaction is completed in a single closed chamber. The blast may be enriched with O or admixed with a reducing gas, and the spent gases may be returned to the chamber or used for industrial purposes. The production of alloys of Fe with Ni, Cr, and W is mentioned, the additional metals being added to the charge either in the free or combined state.

Heat treatment of manganese steel. MANGANESE STEEL RAIL CO. Fr., 477,880, Mar. 4, 1915. The product is heated up to or slightly above the critical point (825–850° for ordinary Mn steels) in order to redissolve the elements which have sepd. from the cryst. mixt. of steel and Mn, maintained at the max. temp. until equil. has been established, and finally cooled rapidly to the ordinary temp.

Apparatus for treating roasted minerals with liquids. A. RAMÉN. Fr., 477,906, Mar. 5, 1915. The process is devised with a view to facilitating the subsequent extn. of the roasted mineral. The roasted product, while hot, is placed in a finely divided state, on a movable table, and is sprinkled with a suitable quantity, distributed as uniformly as possible over the surface, of liquid from a previous extn. The substances rendered sol. by the liquid, as a result of the chem. or physical action on the roast, are recovered separately by subsequent extn.

Pure aluminium. A. LAMBERT. Fr., 477,988, July 10, 1914. In the extn. of the total Al, in a pure state, from bauxite, this mineral is decomposed by CaO or CaCO₃ in sufficient quantity to convert all the Al into Ca aluminate, operating in the elec. furnace, the Ca aluminate being then converted into sol. aluminate from which Al(OH)₃ can be pptd.

Pure aluminium. M. BUCHNER. Fr., 477,925, July 7, 1914. In the extn. of pure Al from argillaceous and other aluminiferous materials, especially those containing SiO₂ and Fe₂O₃ as impurities, the material, disintegrated by means of an acid, is treated, after removal by filtration of the silicic acid, with NH₄OH which gives an NH₄ salt, the ppt. is sepd. by means of an alkali and the Al is extd. with an alk. soln. in the usual manner.

Protecting copper from corrosion by sea water. G. KURTH. U. S., 1,176,571, Mar. 21. Fe filings are rolled into the surface of Cu or Cu alloys while cold and the surfaces are then subjected to electrolytic action to protect them from corrosive action by sea water.

Aluminium alloy for resisting sea water. W. N. NAYLOR and S. P. HUTTON. U. S., 1,175,655. Mar. 14. Al, Mg and phosphor-Sn are combined, preferably in about the proportions 1000:4:1. A small addition of Na may be made to form a dental alloy.

Alloy for valves of internal-combustion engines. W. E. OAKLEY. U. S., 1,175,172, Mar. 14. Internal-combustion engine valves are formed of an alloy of Ni 67, Cu 28–32 and Fe 1–5 parts, nearly free from C. The alloy has approx. the same coeff. of expansion as the cast Fe of the engine cylinders and is but slightly affected by the highly heated gases.

Tungsten welding contacts. A. M. STANLEY. U. S., 1,176,614, Mar. 21. Contact points of W or Mo are used for electrically welding sheets of metal under high pressure. The point is mounted in a carrier block of Cu and is but slightly affected by the O of the air at the high temps. to which it is exposed.

"Fix compound" for use in puddling and basic open hearth furnaces. J. F. DEAY. U. S., 1,175,933. Mar. 21. A mixt. of comminuted Fe 9, Portland cement 2 and CaO 1 part is used to form blocks or lumps to supply CaO to the metal for purifying it.

Zinc-surfaced bearings. J. RIDDELL. U. S., 1,176,603, Mar. 21. Bearings of Fe or steel are superficially alloyed with Zn, to produce a thin alloyed wearing surface, by sherardizing.

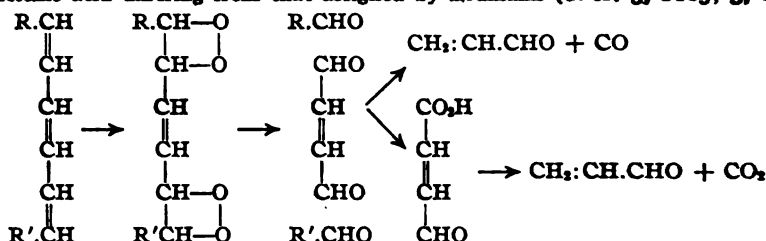
10. ORGANIC CHEMISTRY.

C. A. ROULLER.

Nitromercaptides and their reaction with the alkyl iodides. Compounds of the disulfonium series. PRAFULLA C. RAY. Calcutta. *J. Chem. Soc.* 109, 131-8(1916); cf. *C. A.* 9, 2889.—A study of the action of $\text{Hg}(\text{NO}_3)_2$ on mercaptans and of the action of alkyl iodides on the compds. formed. A dil. alc. soln. of the mercaptan is added, with stirring to a fairly concd. soln. of an excess of Na Hg nitrite. The soln. becomes warm, N_2O_3 is liberated, and nacreous crystals are deposited. *Methyl nitromercaptide* (A), MeSHgNO_2 ; *ethyl nitromercaptide* (B), faintly yellow, almost insol. in H_2O , sol. in HCl with evolution of N_2O_3 and the garlic-like RSH odor. (B) and excess of EtI on the H_2O bath for 2-3 hrs. give 2 layers, the upper yielding EtI, EtNO_2 , EtONO , and a dark brown syrup, while the lower deposits crystals of at least 3 substances. These are dissolved in acetone and a small first fraction, *ethylidisulfonium mercuriiodide*, $\text{Et}_2\text{S}_2\text{HgI}_2\text{EtI}$, pptd. with Et_2O , yellow crystals, m. 112° ; the structure EtISEt-SEtI.HgI is assigned. The analysis was made by heating in a stream of CO_2 , absorbing the evolved I in powdered Cu, and boiling this with aq. NaOH to yield NaI. (B) and MeI gave the compound $\text{Et}_2\text{S}_2\text{HgI}_2\text{MeI}$, pale yellow crystals, m. 86° . (A) and EtI gave 3 layers, from the middle of which, on soln. in acetone and pptn. with Et_2O , was obtained the *disulfonium compound*, $\text{Me}_2\text{S}_2\text{HgI.EtI}$, yellow crystals, m. $69-71^\circ$; no other definite products were isolated. *Compound*, $\text{Et}_2\text{S}_2\text{HgI.PrI}$, pale yellow crystals, m. $75-8^\circ$; *compound*, $\text{Me}_2\text{S}_2\text{HgI.PrI}$, yellow crystals, m. $99-102^\circ$. On stirring an alc. soln. of Et_2S_2 into $\text{Hg}(\text{NO}_3)_2$ soln., N_2O_3 is evolved and needles of the compound $\text{Et}_2\text{S}_2\text{Hg}(\text{NO}_3)_2\text{HgO}$ are deposited. The reaction is supposed to take place by the addition of 2 mols. $\text{Hg}(\text{NO}_3)_2$ to the Et_2S_2 , followed by evolution of N_2O_3 and deposition of the resulting $\text{EtS}(\text{HgNO}_3)\text{SEt}(\text{NO}_3)\text{Hg.O}$. M. HEDLBERGER.

Oxidation of unsaturated fatty oils and unsaturated fatty acids. I. Formation of acrolein by the oxidation of linseed oil and linolenic acid. ARTHUR H. SALWAY. Port Sunlight. *J. Chem. Soc.* 109, 138-45(1916).—It is held that one reason for the failure to obtain conclusive results as to the nature of the processes taking place during the oxidation of linseed oil is the fact that the oil is a mixt. of glycerides, and that a study of the pure unsatd. glycerides contained in the oil, or a study of the pure fatty acids obtained from these, would be more likely to yield definite results. It is proposed to carry out investigations along these lines. The oxidation expts. were carried out at 100° in a U-shaped pipette with O under 2 atms. pressure, the pipette being mechanically agitated. When the pressure had been reduced to 1 atm. the gaseous products of the oxidation were passed through H_2O and the process repeated until the absorption of O had almost ceased. The absorption of O was slow for the first 20 min. but then continued rapidly until about 5 l. O per 100 g. linseed oil had been absorbed. The wash water was free from acid and had the characteristic odor of acrolein (A), which was further identified by oxidation with Ag_2O and isolation of the Ag acrylate. Dunlop and Shenk (*J. Am. Chem. Soc.* 25, 826(1903)) considered the odor of (A) noted by them to be due to the action of O on the glycerol in the oil, but that this is due to

the linolenic acid itself is shown by the fact that, while neither glycerol nor oleic acid yields (A), linolenic acid does. The mixed fatty acids from the oil gave a still higher yield of Ag acrylate. The formation of (A) is explained as follows, using a structure for linolenic acid differing from that assigned by Erdmann (C. A. 3, 2165; 5, 1086):



This view also accounts for the evolution of CO and CO₂ observed by Gardner (C. A. 8, 1677) and King (C. A. 9, 1848). The theory is also advanced that the aldehydes formed in the first stage of the oxidation, including also (CHO)₂, which is a possible oxidation product, polymerize in great part, and that these polymerized aldehydes, together with unchanged oil, form the well-known elastic varnish—linoxyn.

M. HEIDELBERGER.

Coloring matter of cotton flowers. III. ARTHUR G. PERKIN. *J. Chem. Soc.* 109, 145-54 (1916); cf. C. A. 4, 1033; 7, 2385.—An attempt to ascertain if there is any chem. distinction not only between the Egyptian and ordinary Indian yellow cotton flower, *Gossypium herbaceum*, but also between these and the red, pink, and colorless petals of other varieties; also whether the red coloring matter in the red and yellow flowers is due to the red oxidation products of either gossypetin or gossypitrin. Red cotton flowers, *G. arboreum*, Linn.: The red alc. ext. of 1600 g. flowers was concd., dild. with hot H₂O, and the alc. evapd. off. After extn. with Et₂O the liq. was boiled with Pb(OAc)₂ soln. and the greenish brown ppt. decompd. with H₂S. Filtration of the maroon liquid and evapn. *in vacuo* for several days gave a red, semi-gelatinous product from which was isolated isoquercetin. Other flavone glucosides could not be detected, thus showing a marked difference from the yellow Egyptian flowers. The red, viscous mass obtained by concg. *in vacuo* the filtrate from the isoquercetin did not yield the typical color reactions of gossypitone after hydrolysis with boiling 1% H₂SO₄ and removal of quercetin by dissolving in C₆H₆N and pptg. with Et₂O, repeating the process, indicating that the color may be due rather to a true anthocyanin. Yellow flowers, *G. neglectum*: The concd. alc. ext., on long keeping, gradually gave a ppt., which, dissolved in hot H₂O, treated with Pb(OAc)₂, decompd. with H₂S, and concd. *in vacuo*, gave a semi-gelatinous mass, which, recrystd. first from dil. alc., then from boiling H₂O, yielded gossypitrin (A), m. 240-2°, whereas the (A) isolated from the Egyptian flowers (*loc. cit.*) m. 200-2°. It was found that by boiling the higher m. variety with acetone, finer needles with 1 H₂O were formed, and that these m. 200-2° whether anhydrous or not. This form is converted into the higher m. variety by boiling with H₂O. The mother liquors from the crude (A), on further evapn. *in vacuo*, gave a small amt. of a sol. glucoside which yielded quercetin on hydrolysis, while the final mother liquors contained a readily sol. quercetin glucoside, from which, by the methods described for the red flowers, was finally sepd. a small amt. of a red powder very similar to that isolated from the *G. arboreum*. The filtrate from the Pb ppt., treated with Pb(OH)OAc, gave a ppt. which yielded isoquercetin when decompd. as usual. The ordinary yellow Indian cotton flower, *G. herbaceum*, gave the same results as the *G. neglectum*, the surprising feature being the absence of quercimeritria, an important constituent of the Egyptian yellow flowers. The white and pink Indian

flowers yielded no definite results. Like gossypetin, (A) and $O:C_6H_4:O$ in alc., when gently warmed, yielded maroon needles of *gossypitrone*, $C_{21}H_{18}O_{11}$, gradually decomps. above 200° , m. about $255-9^\circ$, dyes Al-mordanted cotton green. Like the red cotton petals, it gives a greenish brown ppt. with $Pb(OAc)_2$. The ease with which it is reduced to (A) by SO_2 indicates that it is the quinone of (A). On wool the shades were identical with those produced by (A), thus showing the reverse properties of those of gossypetin and its quinone. Heated to boiling with 7% H_2SO_4 it is both hydrolyzed and reduced, the main product being apparently gossypetin; this is an important difference from the behavior of the red product obtained above from the red petals, indicating that the 2 are not identical.

M. HEIDELBERGER.

Non-aromatic diazonium salts. V. Diazo derivatives of aminotriazoles. GILBERT T. MORGAN AND JOSEPH REILLY. Dublin. *J. Chem. Soc.* 109, 155-60(1916).—Thiele and Manchot were the first to point out that the aminotriazoles form diazo salts capable of coupling with aromatic bases (*Ann.* 303, 41(1898)). 10 g. aminoguanidine carbonate were converted into the nitrate by evapg. dry on the H_2O bath with the calcd. amt. HNO_3 , then into the Ac deriv. by heating 24 hrs. under a reflux with 20 cc. H_2O and 10 cc. $HOAc$, adding H_2O or dil. $HOAc$ from time to time to keep the product in soln., and evapg. dry. The salt, taken up with H_2O , evapd. dry with 0.5 mol. Na_2CO_3 , extd. repeatedly with abs. alc., this distd., and the residue purified by extn. in a Soxhlet with $EtOAc$, gave quant. 5-amino-3-methyl-1,2,4-triazole (A), $N:CMe.N:C(NH_2).NH$. The diazonium salt obtained in dil. HCl decompd. rapidly,

even at 0° , yielding the 5-Cl deriv. In dil. HNO_3 the salt is much more stable and couples readily with alc. $\beta-C_{10}H_7OH$, the resulting 3-methyl-1,2,4-triazole-5-azo- β -naphthol forming dark orange-brown plates and needles, m. $213-5^\circ$, sol. in H_2SO_4 with a purple color, sol. in cold dil. KOH , probably due to the acidic NH in the triazole nucleus. The diazonium salt, in dil. HNO_3 , gives an almost quant. yield of 5-diazo-3-methyl-1,2,4-triazole chloraurate, prisms, stable at room temp., effervesces when slowly heated, explodes on heating rapidly to 100° , changes to a red substance in aq. soln. (A), diazotized in dil. HNO_3 with excess of $EtONO$, and evapd. dry at room temp. over KOH , gives 3-methyl-1,2,4-triazole-5-isodiazohydroxide, colorless crystals, stable at 100° , intumesces 120° , seps. from alc. as needles with 1 $EtOH$, does not couple with $\beta-C_{10}H_7OH$, but is converted into the normal diazo salt on dissolving in concd. H_2SO_4 or HNO_3 (2:1). 5-Amino-1,2,4-triazole (B) was prepd. similarly to the 3-Me deriv., using HCO_2H instead of $HOAc$. In dil. HCl the diazonium salt was very unstable, but was more stable, although less so than that from (A), when prepd. in dil. HNO_3 . 1,2,4-Triazole-5-azo- β -naphthol, orange crystals, m. $252-5^\circ$, sol. in H_2SO_4 with a bluish purple color, sol. in cold dil. aq. KOH . 1,2,4-Triazole-5-azo- β -naphthylamine, dark brown-red plates, m. $243-5^\circ$, gives a brown-yellow color with H_2SO_4 and dissolves in cold dil. aq. KOH . (B), diazotized with $NaNO_2$ in dil. H_2SO_4 , gives 5-diazo-1,2,4-triazole chloraurate, opaque crystals. A somewhat impure isodiazio deriv. was also prepd.

M. HEIDELBERGER.

Interaction of tetranitromethane and potassium ferrocyanide. FREDERICK D. CHATTAWAY AND JOHN M. HARRISON. Oxford. *J. Chem. Soc.* 109, 171-4(1916).—90 g. $K_4Fe(CN)_6$ in 300 cc. H_2O were shaken vigorously with 3 g. $C(NO_2)_4$ for 1 hr., the soln. becoming intensely yellow, changing to brown, and depositing crystals of K aci-trinitromethane, according to the equation $C(NO_2)_4 + 2K_4Fe(CN)_6 \longrightarrow C(NO_2)_3:NO.OK + KNO_3 + 2K_2Fe(CN)_6$. In order to det. the max. yield, the filtrate, now satd. with the salt, was shaken again with 10 g. $C(NO_2)_4$, the yield being 9.4 g. (theory, 9.6 g.). From the filtrate obtained after shaking with an excess of $C(NO_2)_4$ were obtained $K_2Fe(CN)_6$ and, on acidification, N_2O_4 . This is a much safer way of

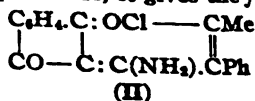
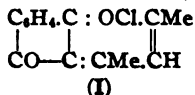
prepg. the salt than that described by Macbeth (*C. A.* 7, 3973). $\text{BrC}(\text{NO}_2)_3$ reacts similarly with a satd. soln. of $\text{K}_4\text{Fe}(\text{CN})_6$, while Cl_3CNO_2 and Br_3CNO_2 do not react at all. The relative spaces occupied by the C atom and the NO_2 groups are such that only 3 of the latter can approach sufficiently near the center of attraction to receive the max. attractive force. A 4th group, if sufficiently large, would force the others away from the center of attraction, making it possible for 1 to be detached by a suitable reagent. If the spaces occupied by the first 3 groups are less, the 4th group will not have this effect, this being, apparently, the case with the last 2 substances.

M. HEIDELBERGER.

Preparation of diethylamine. WILLIAM E. GARNER AND DANIEL TYLER. Univ. Coll., London. *J. Chem. Soc.* 109, 174-5 (1916).—A modification of Hofmann's method. While H. could not sep. a mixt. of Et_2NH , Et_3NH , and Et_4N , G. and T. have found that practically pure Et_2NH may be fractionated from a mixt. of the 3. 8000 cc. alc. and 3000 g. EtBr were satd. with NH_3 several times during the day, the temp. gradually rising to 30° , and NH_4Br crystg. out. After 24 hrs. the soln. was sep'd from the salt, and the alc. and unchanged EtBr distd. off, adding H_2O and boiling to remove the last traces of alc. Conc'd. NaOH was then added and the amines distd. off. The alc. NH_3 - EtBr was used in the prepn. of a new lot. Using a 10-bulb column, there was no difficulty in segg. the amines. Yields, 10.9% Et_2NH , 17.9% Et_3NH , 19.1% Et_4N . About 80% of the Et_2NH (b. within 1°) can be obtained by 2 fractional distns. The crude Et_2NH fraction was worked up as follows: 500 g. (containing about 10% Et_3NH) were dissolved in 2500 cc. alc. and 1000 g. EtBr added, cooling with ice. After 24 hrs. 200 g. NH_4Br were added to fix any free amines present, and the soln. was treated as above. Yields, 38.7% Et_2NH , 30.1% Et_3NH , 17.3% Et_4N . As the Et_2NH can be again used, about 50% of this can be converted into Et_4N .

M. HEIDELBERGER.

Synthesis of ketoindopyranols. SOSALE G. SASTRY AND BROJENDRA N. GHOSH. Univ. Coll., London. *J. Chem. Soc.* 109, 175-80 (1916); cf. *C. A.* 10, 41.—An extension of previous work. 7 g. $\text{C}_6\text{H}_4(\text{CO})_2\text{CH}_3$ and 5 g. AcCH_2Ac did not condense in the presence of alkali, but dissolved in a little MeOH and treated with a rapid current of HCl for 4-5 hrs. the soln. reddens, and after 3 days crystals begin to sep. The yield is increased if the soln. is satd. with HCl from time to time and the ppt. collected after 7 days. The resulting 4'-keto-4-methylene-6-methyl-2,3-indenopyrane(1,4) hydrochloride (I) forms brown needles, m. 120° ; in alc. with aq. NaOAc , it gives the free base, brown



prisms, m. 182° , sol. in H_2SO_4 with a dark red color, insol. in cold NaOH , but sol. on warming with a purple color. Similarly in HOAc , BzCH_2Ac gave, after 36 hrs., 4'-keto-6-phenyl-4-methylene-2,3-indenopyrane(1,4) hydrochloride, brown prisms, m. $190-200^\circ$; in $\text{C}_6\text{H}_5\text{N}$, followed by H_2O , it gives the free base, brown prisms, m. 219° (decompn.). AcPhCHCN (cf. *C. A.* 10, 1031) gave, after 24 hrs., 4-imino-4'-keto-5-phenyl-6-methyl-2,3-indenopyrane(1,4) hydrochloride (II), dark red needles, m. 210° (decompn.); free base, brown prisms, m. 222° (decompn.), sol. in H_2SO_4 with a dark red color, in boiling NaOH with a red color and evoln. of NH_3 . (II), boiled 4-5 hrs. with 10% H_2SO_4 gives 4,4'-diketo-5-phenyl-6-methyl-2,3-indenopyrane, pale yellow needles, m. 236° , sol. in boiling dil. NaOH with a dark red color.

M. HEIDELBERGER.

Saponification of benzoylated cyanohydrins by acetic acid in the presence of metallic salts. J. ALOY AND CHARLES RABAUT. *Bull. soc. chim.* 19, 44-6 (1916); cf. *C. A.* 6, 1750; 7, 3115.— $\text{PhCH}(\text{OBz})\text{CN}$, $p\text{-HOC}_6\text{H}_4\text{CH}(\text{OBz})\text{CN}$ and $p\text{-MeOC}_6\text{H}_4\text{CH}$

$\text{CH}(\text{OBz})\text{CN}$ (A) in AcOH, when treated with Zn, gave rise to the corresponding amides. The amide of (A), $4\text{-MeOC}_6\text{H}_4\text{CH}(\text{OBz})\text{CONH}_2$, m. 155° . In the above reactions, ZnO or $\text{Zn}(\text{OAc})_2$ may be substituted for Zn. The reaction is best carried out under the following conditions: A mixt. of 4 g. of the cyanohydrin in 25 cc. 80% AcOH and 1 g. ZnO is gently heated for 1-2 hrs. The product is poured into 500 cc. H_2O and the pptd. amide crystd. from alc. Ordinarily the yields exceed 50%. HgO , Ag_2O , NiO , CoO and CuO may be used instead of ZnO; PbO , CdO , Al_2O_3 , Fe_2O_3 , Cr_2O_3 , ThO_2 , and the oxides of alkalis and alk. earths are inactive. MnO_2 shows slight activity. ZnSO_4 and CuSO_4 may replace ZnO, but CoCl_2 is inactive. Controls with AcOH and the cyanohydrins alone gave inappreciable yields. LOUIS E. WISE.

Alkaloids of the calabar bean. V. Action of phenyl isocyanate. Phenylic homologs of eserine and geneserine. MAX POLONOVSKI. *Bull. soc. chim.* 19, 46-59 (1916); cf. C. A. 10, 1165.—(Correction: Part IV of this series consisted solely of Polonovski's work. Nitzberg's name as joint author was due to an error in *Bull. soc. chim.*) Eseroline (A) in Et_2O in the presence of traces of Na reacted with PhNCO to form pheneserine (B) (eseroline phenylurethan), $\text{PhNHCO}_2(\text{C}_{18}\text{H}_{17}\text{N}_2)$, prisms, m. 150° , $\alpha_D -80^\circ$ (in abs. alc.), quite basic, decomp. when heated with $\text{Ba}(\text{OH})_2$ or NaOH into (A), CO_2 and PhNH_2 . (B) dissolves in aq. acids, forming salts whose solns. when evapd. to dryness leave varnishes. The salicylate of (B) cannot be crystd. The picrate, amorphous yellow powder, softens 80° , m. about 100° . The methiodide of (B), needles, m. 198° , $[\alpha]_D -92.8^\circ$ (n alc.). (As the elementary analyses of PhNCO , of (A) and of their condensation products give nearly identical C, H and N figures, P. has characterized derivs. by detg. the approx. amt. of CO_2 liberated by sapong. the condensation products with $\text{Ba}(\text{OH})_2$.) A mixt. of 1 g. (A) and 1.1 g. PhNCO and 20 cc. benzine, when heated in a sealed tube at 100° for 4 hrs., yielded dipheneserine, $\text{PhNHCONC}_{18}\text{H}_{18}\text{NOCONHPh}$ (C), microneedles from EtOH, m. 184° , $\alpha_D -244^\circ$ (in CHCl_3), insol. in NaOH. By treating (B) with PhNCO , (C) was also formed. A mixt. of 1 mol. (A) and 1 mol. PhNCO in anhydrous Et_2O , if filtered immediately after the formation of the first cryst. deposit, yielded eseroline phenylisocyanate (D), $(\text{C}_{18}\text{H}_{17}\text{N}_2\text{O})(\text{PhNCO})$, m. poorly $110-5^\circ$, which, when heated in benzine, yields a mixt. of (A), (B) and (C). A very similar mixt. was obtained when the Et_2O mother liquors formed in the synthesis of (D) were evapd. to dryness and heated with benzine, and when (A) was heated with an equimol. amt. of PhNCO . Geneseroline (E), reacting with PhNCO in Et_2O in the presence of traces of Na, yielded as the sole product, phenogeneserine (geneseroline phenylurethan), $(\text{C}_{18}\text{H}_{17}\text{ON}_2)\text{OCONHPh}$, m. 164° , α_D (in CHCl_3) -125.5° , readily converted into (B) when reduced with Zn in AcOH. Variations in the conditions of reaction between (E) and PhNCO gave rise to no further addition or condensation products. PhNCO when treated with an equimol. amt. of eserine (F) in Et_2O yielded only an oil. Condensation between (F) and PhNCO in benzine in the presence of Na carried out in a sealed tube at 100° gave rise to an amorphous substance and a small amt. of (B). Heated with 2 mols. PhNCO , (F) in the presence of traces of AcONa in a sealed tube yielded an addition product, $(\text{C}_{18}\text{H}_{17}\text{N}_2\text{O}_3) \cdot 2\text{PhNCO}$, non-cryst., m. about 100° , $\alpha_D -220^\circ$ (in benzine), yielding, when heated with NaOH, MeNH_2 , $(\text{PhNH})_2\text{CO}$ and (A). Eserethol and PhNCO , reacting in the presence of AcONa , yield an addition product, an oil with 2 mols PhNCO . Neither geneserine nor geneserethol give compds. with PhNCO . The striking analogies between the action of MeNCO and PhNCO are clearly shown by means of tables. LOUIS E. WISE.

Berberine. III. Azo derivatives of 1-R-dihydroberberine. MARTIN FREUND AND KARL FLEISCHER. Univ. Frankfurt. *Ann.* 411, 1-13 (1916); cf. C. A. 9, 2872. —1-R-Dihydroberberine (A) (but not berberine) contains a reactive H atom in position 4 which may be replaced by Me by the action of MeI. The present work shows

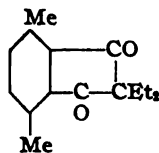
that this H may be replaced by other groups. While Na is without effect upon a C_6H_5 soln. of (A) yet it reacts with $PhN:NX$, the diazo group entering position 4. The $(PhN:N)_2SO_4$ from 9.3 g. $PhNH_2$, 19.5 g. concd. H_2SO_4 , 50 cc. 2N $NaNO_3$, and 150 g. ice is poured into an ice-cold soln. of 42.7 g. benzylidihydroberberine (B) in 300 cc. 50% AcOH and the intensely red soln. satd. with NH_3 . *Benzeneazo-4-[1-benzylidihydroberberine]* (C), seps. as a deep red ppt., dark red rhombic plates from $EtOH-CHCl_3$, m. 185° . *Hydrochloride*, yellow-brown tables, darken 140° , m. 146° (decompn.). *Sulfate*, yellowish red rectangular tables, m. 180° (decompn.). Both salts darken in the light. *Methiodide*, by heating 1.5 g. (C) and 2 cc. MeI 3 hrs. in a tube, deep red tables, m. 213° (decompn.). 1 g. (C), in 10 cc. AcOH and 5 cc. H_2O , treated with 2 g. Zn and heated 4 min., gave (B). The same mixt., warmed 1.75 hrs., gave a mixt. of (B) and benzyltetrahydroberberine (D). 10 g. (C), in 400 cc. $EtOH$, 200 cc. H_2O and 55 cc. 30% H_2SO_4 , reduced with a Pb cathode with 10-13 amp. at $30-40^\circ$, and adding during the reduction (4.5 hrs.) 20 cc. 30% acid, gave 8 g. base from which 3.6 g. (D) and 1.4 g. pseudo base were isolated. The fact that an NH_3 compd. is not obtained indicates the probable presence of a conjugated double bond, $-N:N-C:C-$, which upon reduction gives $-NH-N:C-CH-$. Upon hydrolysis

this yields the 4-HO compd., which is then reduced to (B) or (D). *Benzeneazo-4-[1-ethylidihydroberberine]* was prepd. by mixing 3.7 g. 1-ethylidihydroberberine in 40 cc. 50% AcOH and 30 cc. cold diazo soln. (from 0.93 g. $PhNH_2$) and adding 20 g. $AcONa$, deep red rectangular columns with a Cu luster, m. 216° . *p-Benzene-sulfo-4-[1-benzylidihydroberberine]*, by treating the diazo soln. from 4.2 g. $p-H_2NC_6H_4SO_3H$ with 8.5 g. (B) in 80 cc. 50% AcOH and liberating the base with dil. H_2SO_4 , reddish yellow spears from hot AcOH, decomp. 274° ; it is very sensitive towards light. α -*Naphthaleneazo-4-[1-benzylidihydroberberine]*, obtained by treating the diazo soln. from 2.9 g. $\alpha-H_2NC_{10}H_7$ with 8.5 g. (B) and satg. with NH_3 , dark brown needles with a greenish luster from $EtOH-CHCl_3$, m. 218° . In the same way β -*naphthaleneazo-4-[1-benzylidihydroberberine]* was obtained as a dark red amorphous powder; *sulfate*, reddish yellow needles from dil. alc., decomp. 190° . *Biphenyl-p,p'-di[azo-4-(1-benzylidihydroberberine)]*, prepd. from 1.8 g. benzidine, and 8.5 g. (B), brownish black, amorphous powder from $EtOH-CHCl_3$, sinters 180° , m. over 200° . The AcOH soln. is bluish red. *p-Arsenobenzeneazo-4-[1-benzylidihydroberberine]*, obtained from the diazo soln. from 5.6 g. atoxyl and 8.5 g. (B), reddish yellow powder from dil. alc., does not m. 275° . The alk. soln. is deep red. *Sodium salt*, deep red cryst. powder, sol. in H_2O with neutral reaction and red color. 4.3 g. (B) and 2.7 g. Michler's ketone heated with 10 cc. $POCl_3$ for 5 hrs. at 100° , gave a dark amorphous powder, sol. in $EtOH$ or $CHCl_3$ with violet-red color, in dil. HCl with emerald-green and in dil. AcOH with brownish red color.

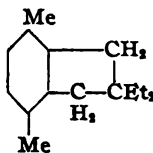
C. J. WEST.

Indandione. V. Constitution of mellophanic and prehnitic acids. MARTIN FREUND, KARL FLEISCHER AND MAX PRAETORIUS. Univ. Frankfurt. *Ann.* 411, 14-38(1916); cf. C. A. 9, 2874.—Baeyer's formulas for mellophanic and prehnitic acids, 1,2,3,4- and 1,2,3,5- $C_6H_2(CO_2H)_4$, which were questioned by Jacobsen (*Ber.* 17, 2517(1884)) have been confirmed by Bamford and Simonsen (C. A. 5, 479). In the present work these acids have been prepd. from indandiones and Baeyer's formulas further confirmed. *Benzo-4,7-dimethyl-2-diethylindan-1,3-dione* (I) is prepd. by treating a soln. of 21.2 g. $p-C_6H_4Me_2$ and 39.2 g. $Et_2C(COCl)_2$ in 100 cc. CS_2 with 50-60 g. $AlCl_3$ in 5 portions, and warming on the H_2O bath until evolution of HCl ceases; decompd. in the usual way, the resulting oil is freed from a small amt. of acid-reacting liquid (fatty acid odor) by heating to 200° , and then distd. at $164-5^\circ$ under 14 mm.; 6-sided leaflets from dil. alc., m. $51-2^\circ$. 23 g. (I), when heated with 60 cc. 50% KOH

until a K salt seps. and the product taken up in H_2O and acidified, gives 20 g. 2,5-dimethyl-6-diethylacetylbenzoic acid (A), quadratic leaflets from ligroin, m. 150° . It causes coughing and sneezing. Conc'd. H_2SO_4 gives a deep yellow soln. with a yellowish green fluorescence. It is not esterified with MeOH and HCl, does not react with $PhNHNH_2$, and does not form a lactone when heated above its m. p. Oxidized with HNO_3 by heating 12.4 g. (A) with 120 g. HNO_3 (d. 1.4) for 2 hrs. on a H_2O bath, 3,6-dimethylbenzene-1,2-dicarboxylic anhydride (B) is formed, needles from abs. alc., m. 143° , on sublimation, m. 145.5° . Heated with 10% NaOH until soln. results, 3,6-dimethylbenzene-1,2-dicarboxylic acid (C) is formed, prismatic spears, m. 145° (Gucci and Grassi-Cristaldi, *Jahrb.*, [2] 1891, 2156, give 96°). Attempts to cryst. (C) always gave a mixt. of anhydride and acid. Mellophanic acid (D) was obtained (1), by oxidation of 5 g. (I) with 5 cc. fuming HNO_3 and 2.5 cc. H_2O in a tube at 140° for 7.5 hrs.; (2),

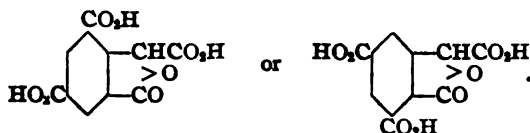


(I)



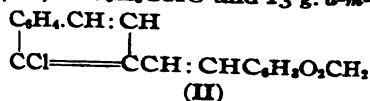
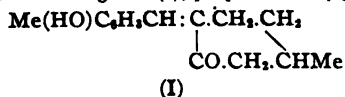
(II)

by oxidizing 2 g. (A) with 2 cc. fuming HNO_3 and 1 cc. H_2O in a tube 7-8 hrs. at 140° , or (3) by oxidizing 2 g. (B) with 2 cc. fuming HNO_3 and 1 cc. H_2O 7-8 hrs. at 140° . The acid was identical with that described by Baeyer. (D), heated to $245-50^\circ$, gives the dianhydride (cf. *Ann.* 166, 344), rhomboid crystals from ligroin and C_6H_6 , sinters 185° , m. $193-6^\circ$. Upon standing for some time in closed vessels, the m. p. changes ($175-220^\circ$); the substance is then insol. in ligroin- C_6H_6 , but is sol. in H_2O . 20 g. (I), boiled with 140 g. amalgamated Zn and 500 cc. HCl (d. 1.19), and then distd. with steam, gives 2-diethyl-4,7-dimethylhydrindene (II), b_{11} $140-1^\circ$, d. 0.923, n 1.52592. Benzo-4,6-dimethyl-2-diethylindan-1,3-dione (D), prepd. from m - $C_6H_4Me_2$, $Et_3C(COCl)_2$ and $AlCl_3$ as above, yellow aromatic oil, b_{11} $168-71^\circ$, d. 1.055. 3,5-Dimethyl-2-diethylacetylbenzoic acid (E), 6-sided flat plates from ligroin, sinters, 121° , m. $126-7^\circ$. The soln. in conc'd. H_2SO_4 is a pale yellow. This compd. also causes sneezing and coughing. It does not form a lactone and does not react with $PhNHNH_2$. Methyl ester, m. $69-71^\circ$. 3,5-Dimethylbenzene-1,2-dicarboxylic acid (F), prepd. by oxidation of 4 g. (E) in 30 cc. AcOH with 8 cc. HNO_3 (d. 1.4) by heating 2 hrs. on the H_2O bath, and isolated partly as the anhydride, m. $113-6^\circ$ (Noyes, *Am. Chem. J.* 20, 810(1898)), and partly as the free acid, needles from H_2O , m. 181° , forming the anhydride. (F) was also obtained by heating 2 g. (E) with 2 cc. HNO_3 and 1 cc. H_2O 8 hrs. at 140° . Prehnitic acid (G) was obtained by the oxidation of (D) with HNO_3 in a sealed tube at $145-50^\circ$ for 8 hrs., or of the anhydride of (F); it was identical with Baeyer's acid. Upon reduction of (D) with Zn and HCl, 4,6-dimethyl-2-diethylhydrindene was obtained in one expt., b. $260-70^\circ$. Other expts. gave a product b_{11} $136-40^\circ$, which analyzes for $C_{14}H_{16}$; this is probably formed by the opening of the 5-membered ring with the addition of 2 H. From the results of this work it follows that the phthalidetricarboxylic acid of Döbner's (*Ann.* 311, 135(1900)) is a deriv. of (G) and has one of the two formulas

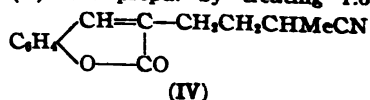
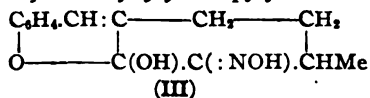


C. J. Wessr.

Oxonium compounds. II. Oxonium compounds with reactive methylene groups. W. BORSCHÉ AND K. WUNDER. Univ. Göttingen. *Ann.* **411**, 38–72 (1916); cf. C. A. 7, 782.—The hypothesis of an active methylene group in the pyrylium salts is further extended to a number of similar compds. The reactions used were the condensation with an aldehyde, the product being isolated as the chloride or the FeCl_3 salt, and the action of HNO_3 . The latter has not proved satisfactory. 4-[5-Methylsalicylal]-1-methyl-R-hexan-3-one (I), prepd. from 27 g. 2,5-(HO) $\text{MeC}_6\text{H}_3\text{CHO}$ and 23 g. *d-m*-methyl-



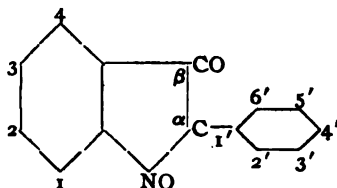
R-hexanone, yellow needles from MeOH, compact prisms from C_6H_6 , m. 142° . Dissolved in 8 parts AcOH-HCl (satd.) and the red soln. treated with FeCl_3 , 3,13-dimethyl-1,2,3,4-tetrahydroxanthylum chloride-ferric chloride (A) seps. as long, light red needles, m. $104-5^\circ$. 4-[5-Chlorosalicylal]-1-methyl-R-hexan-3-one (B), from 31.4 g. 2,5-(HO) $\text{ClC}_6\text{H}_3\text{CHO}$ and 23 g. *d-m*-methyl-R-hexanone in 200 cc. alc. and 26 g. NaOH in 130 cc. H_2O , allowing the mixt. to stand 1 week, pptg. the neutral soln. with CO_2 and crystg. from MeOH or C_6H_6 , compact, yellow needles, m. 153° . 3-Methyl-13-chloro-1,2,3,4-tetrahydroxanthylum chloride-ferric chloride (C), long needles with green luster, m. $110-11^\circ$. 10-Methyl-12-hydroxy-1,2,3,4-tetrahydroxanthylum chloride (D), prepd. by treating a soln. of 11 g. *m*- $\text{C}_6\text{H}_4(\text{OH})_2$ and 14 g. α -acetyl-R-hexanone (E) in 14 cc. AcOH with dry HCl gas, and recrystg. the product from a mixt. of 70 parts alc., 20 parts H_2O and 10 parts concd. HCl, greenish yellow needles, m. $167-9^\circ$ (decompn.); yield, 75%. Ferric chloride salt, $3\text{C}_{14}\text{H}_{11}\text{O}_7\text{Cl}_2\cdot 2\text{FeCl}_3$, yellow needles, m. $161-2^\circ$. Picrate, $\text{C}_{14}\text{H}_{11}\text{O}_7\cdot \text{C}_6\text{H}_3\text{O}_7\text{N}_3$, brownish yellow iridescent crystals, darken at 155° , decomp. 170° . AcONa ppts. the carbinol from an alc. soln. of the chloride as bright red amorphous flakes. The pyrylium chlorides from trihydroxyphenols proved to be too insol. in AcOH-HCl to be used for condensations. 10-Methyl-11,12-dihydroxy-1,2,3,4-tetrahydroxanthylum chloride, from 5.2 g. pyrogallol and 5.6 g. (E) in 10 cc. AcOH and HCl gas, deep red needles, m. $250-1^\circ$. 10-Methyl-12,13-dihydroxy-1,2,3,4-tetrahydroxanthylum chloride, from 1.8 g. hydroxyquinol and 2 g. (E) in 6 cc. AcOH, fine, yellow needles, sinter 235° , m. 250° ; the alc. soln. has a green fluorescence. 10-Methyl-12,14-dihydroxy-1,2,3,4-tetrahydroxanthylum chloride, from 1.8 g. phloroglucinol and 2 g. (E) in 8 cc. AcOH, yellow crystals, m. $258-60^\circ$, quite insol. in AcOH-HCl- H_2O . 3,10-Dimethyl-12-hydroxy-1,2,3,4-tetrahydroxanthylum chloride, from 11 g. resorcinol and 15.4 g. *d*-1-methyl-4-acetyl-R-hexan-3-one in 18 cc. AcOH by satg. with HCl gas, allowing the mixt. to stand 1–2 days and completely pptg. with 40 cc. alc. and 40 cc. Et_2O , yellow needles, reddened at 130° , m. $180-2^\circ$. When dissolved in alc. and treated with AcONa, the xanthidrol is obtained as a light red amorphous powder, m. $150-5^\circ$; it analyzes for an anhydride, the formation of which may have taken place either in the pptn. or in the drying. In dil. NaOH it gives a light yellow soln., from which AcOH ppts. the xanthidrol. Boiling with 25% KOH does not decomp. the carbinol. Chloride-ferric chloride, $3\text{C}_{14}\text{H}_{11}\text{O}_7\text{Cl}_2\cdot 2\text{FeCl}_3$, yellow leaflets, m. 155° . 3,10-Dimethyl-12-methoxy-1,2,3,4-tetrahydroxanthylum chloride-ferric chloride, from 2.1 g. $\text{MeOC}_6\text{H}_4\text{OH}$ and 2.5 g. acetyl-*m*-methyl-R-hexanone in 5 g. AcOH (the reaction requires several weeks), fine, yellow needles, m. $101-2^\circ$. This has the normal compn. Condensation products with aldehydes. α -Methylbenzopyrylium chloride. α -Methylenedioxystrylbenzopyrylium chloride (II) was prepd. by treating 1.62 g.



o-hydroxybenzalacetone in 9 cc. AcOH with 9 cc. satd. AcOH-HCl and after 1 hr. with 1.48 g. piperonal; the soln. becomes a deep bluish red at once and a dark red powder seps., decomp. 195–200°. *Ferric chloride salt*, dark brown powder, m. 208°. *3-Methyl-1,2,3,4-tetrahydroxanthylum chloride*. *3-Methyl-4-benzal-1,2,3,4-tetrahydroxanthylum chloride-ferric chloride*, from 2.16 g. salicylal-*m*-methyl-*R*-hexanone and 1.1 g. BzH in 21 cc. AcOH-HCl and adding FeCl₃ after 2 days, flat, orange needles, m. 129–30°. *4-Cinnamal chloride-ferric chloride*, using 1.4 g. PhCH:CHCHO, deep bluish violet leaflets with Cu luster, m. 203–4° (decompn.). *4-p-Hydroxybenzal chloride*, from 1.2 g. *p*-HOC₆H₄CHO, bluish green needles, decomp. 127–8°. Recrystd. from AcOH-HCl it loses 0.5 mol. HCl. *Ferric chloride salt*, dark red crystals with golden luster, m. 153–4°. *4-p-Methoxybenzal chloride-ferric chloride*, from 1.4 g. MeOC₆H₄CHO, dark red needles with steel-blue luster, decomp. 170°, m. 177°. *4-Piperonylidene chloride-ferric chloride*, dark, flat needles with metallic green reflecting surfaces, giving a violet powder, m. 166–7°. *4-o,p-Dihydroxybenzal chloride*, dark red crystals with a metallic luster, decomp. 188–9°. *4-p-Nitrobenzal chloride-ferric chloride*, fine, orange-yellow needles, m. 144.5°. *3,13-Dimethyl-1,2,3,4-tetrahydroxanthylum chloride*. *3,13-Dimethyl-4-[5-methyl-2-hydroxybenzal]-1,2,3,4-tetrahydroxanthylum chloride*, prepd. by dissolving 2.3 g. (I) in 18 cc. AcOH-HCl and after 0.5 hr. adding 1.3 g. 2,5-(HO)MeC₆H₃CHO, dark red needles, m. 154°. *Ferric chloride salt*, nearly black needles with dark green schimmer, m. 179–80°. *4-p-Hydroxybenzal chloride*, golden green crystals, m. 175°. *4-Piperonylidene chloride-ferric chloride*, dark red needles with green metallic luster, m. 156–7°. The chloride (not analyzed), bluish red, m. 174–5°. *3-Methyl-13-chloro-1,2,3,4-tetrahydroxanthylum chloride*. *3-Methyl-4-benzal-13-chloro-1,2,3,4-tetrahydroxanthylum chloride-ferric chloride*, from 2.5 g. (B) and 1 g. BzH, brown crystals with green surface reflex, m. 140°. *5-Chlorosalicylal chloride*, using 1.56 g. 2,5-(HO)ClC₆H₃CHO, deep red, decomp. 150°. *4-Piperonylidene chloride-ferric chloride*, greenish golden crystals, giving a dark violet powder, decomp. 160°. *2,4-Dimethyl-9-hydroxypyrylium chloride*. *2,0-Hydroxystyryl-4-methyl-9-hydroxypyrylium chloride*, prepd. from 2.3 g. chloride and 1.22 g. HOC₆H₄CHO, red crystals, very insol. in boiling AcOH, decomp. 189°. *2-Methylenedioxystryryl chloride*, dark red, m. 215°. *Ferric chloride salt*, dark brown ppt., very insol. in AcOH, decomp. 190°. *2,4-Dihydroxystyryl chloride*, from 1.3 g. *o,p*-(HO)₂C₆H₃CHO, powder with metallic luster, m. 232°. *10-Methyl-4-p-hydroxybenzal-12-hydroxy-1,2,3,4-tetrahydroxanthylum chloride*, dark red-brown crystals, decomp. 205–6°. *3,10-Dimethyl-4-salicylal-12-hydroxy-1,2,3,4-tetrahydroxanthylum chloride*, bright red powder, m. 247–8°. *3,10-Dimethyl-4-[2,4-dihydroxybenzal]-12-hydroxy-1,2,3,4-tetrahydroxanthylum chloride*, obtained with 0.5 mol. H₂O if the components are dissolved in AcOH and the soln. satd. with HCl, dark red powder, decomp. 210–11°. But if the aldehyde is added after the AcOH is satd. with HCl, the compd. is obtained with 1.5 H₂O, black crystals, decomp. 239°. *3-Methyl-4-hydroximinio-1,2,3,4-tetrahydroxanthylum chloride*, prepd. by treating 10.8 g. salicylal-*m*-methyl-*R*-hexanone in 85 cc. AcOH-HCl with 7.5 g. iso-AmNO₂ and 22.5 cc. AcOH with cooling and recrystg. the product which seps. after 2 hrs. from 100 cc. AcOH, light yellow needles, color at 125°, explode at 194–5°. The dry substance m. 215–20°. *Ferric chloride salt*, dark yellow, thin prisms, very sol. in AcOH and Et₂O, sinters 100°, m. 120°. H₂O ppts. the carbinol (III) from a 10% soln. of the chloride in AcOH as reddish white amorphous flakes, which can be filtered if 10 g. AcONa are added for each 10 g. of chloride, m. 120°. Upon drying it loses 0.5 mol. H₂O, and then m. over 200°. With AcOH-HCl it gives the chloride. 6.1 g. of the dried carbinol, in 61 g. C₆H₅N and treated with 8–10 g. BzCl, gives *α*-methyl-*γ*-coumarinobutyronitrile (IV), isolated by pouring the mixt. into AcOH, washing the ppt. with Na₂CO₃ and crystg. from dil. alc., needles, m. 116°. Sapond. by heating

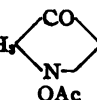
1 g. (IV) with 6 cc. 5-N HCl in a sealed tube 3 hrs. at 150°, the acid is obtained as needles, m. 141-2°. 3,13-Dimethyl-4-hydroximino-1,2,3,4-tetrahydroxanthylum chloride, $C_{14}H_{18}O_2ClN \cdot 2H_2O$, yellow needles, m. 204-5°, after drying, 218-20°. Ferric chloride salt, compact, yellow-brown needles, decomp. 165°. α -Methyl- γ^a -5-methylcoumarino-butyronitrile, from 5.2 g. carbinol, 52 g. C_4H_5N and 6 g. $BzCl$, needles, m. 105-6°. Acid, crystal powder from $MeOH-H_2O$, m. 142-3°. C. J. WEST.

Photochemical syntheses of indole derivatives. PAUL PFEIFFER, S. BRAUDE, R. FRITSCH, W. HALBERSTADT, G. KIRCHHOFF, J. KLÄBER AND P. WITTKOP. Univ. Zürich. *Ann.* 411, 72-158(1916); cf. *C. A.* 6, 2736.—*o*-Nitrostilbene chlorides, monochlorostilbenes or tolanes, exposed to the action of light in concd. C_4H_5N solns., are rearranged into isatogens with a yield of about 60%. In some cases of the tolanes the C_4H_5N soln. rearranges without light in a few hrs. at room temp. Only those compds. which contain the *o*- O_2N group will rearrange. The proof of the constitution of the reaction products follows from the reaction of Zn and AcOH, by which phenylindoxyls are formed, and the by reaction with NH_2OH , in which 2 isomeric isatogen monoximes are formed, a *C*- and an *N*-oxime. The isatogens are typical quinones, forming a new class of *m*-quinoid compds., in which the group $N:O$ plays the role of a CO group. These compds. are similar to those described by Baeyer (*Ber.* 13, 2258) and the new constitution is applied to them and the mechanism of their formation is cleared up. The following system of numbering the isatogens is used:



Phenylisatogen and monosubstituted compds. 2-Nitrostilbene chloride (A), $o-O_2NC_6H_4CHClCHClPh$, prepd. by satg. 5 g. $o-O_2NC_6H_4CH:CHPh$ in 30-40 cc. boiling CS_2 with Cl and recrystg. the yellowish product from alc., pale yellow needles, m. 71-117°. Fractional crystn. from MeOH seps. the product into an α -chloride, small compact yellow transparent crystals, m. 122°, and the β -chloride, compact, rhombic transparent crystals, m. 76-9°. 2-Nitrotolane (B) was prepd. by boiling 1.2 g. (A) in alc. with 1.7 g. NaOH in 15 cc. alc. and 15 cc. H_2O 0.5 hr., pouring into H_2O , acidifying and extg. with Et_2O , yellow prismatic needles or tables from hot MeOH, m. 50-2°. Concd. H_2SO_4 gives a deep violet color. Phenylisatogen (C), formed when 1.3 g. (A) in 8 cc. pure C_4H_5N are allowed to stand in the sunlight for several days, or by heating (B) in C_4H_5N several hrs. (also by the action of light), deep orange-red leaflets from hot MeOH, m. 186-7°. 0.5 g. (C) and 1 g. $NH_2OH \cdot HCl$, heated in alc. for 6-12 hrs. on a H_2O bath, gave 0.5 g. oxime, which is sepd. by crystn. from a little glacial AcOH. *C*-Oxime, seps. first, yellow-orange, glistening leaflets, m. 236°, identical with the oxime from *N*-hydroxyphenylindole (Angeli and Angelico, *Rend. accad. Lincei* [5] 15, II, 761(1907)). *N*-Oxime, light yellow prismatic crystals, m. 167-8°. 2-Nitrophenylisatogen (D) is formed from 2,4-dinitrotolane by heating its C_4H_5N soln. a few min. or in 3-4 hrs. at room temp. either in the dark or light. A $C_4H_9Me_3$ soln. is not changed by heating but if a few drops of C_4H_5N are added the soln. changes color in a few min. 2 g. (D) gave 1.2-1.5 g. *N*-oxime and 0.5-0.8 g. *C*-oxime. The *N*-oxime is insol. in NH_4OH (sepn. from the *C*-oxime); flat, yellow needles from AcOH, which contain 2 mols. AcOH; this is lost in the air and the product then m. 183°. Acetyl derivative, fine, light yellow needles from hot alc., m. 136-7°. The NH_4OH ext., acidified with HCl, ppts. the *C*-oxime, deep orange-red leaflets from

AcOH upon slow crystn., orange-yellow leaflets if quickly crystd., m. 250°. *Acetyl derivative*, orange-red leaflets, m. 226°. *2,6-Dinitrostilbene (E)*, m. 114°, not 86° (*Ber.* 39, 1306). *2,6-Dinitrostilbene α -chloride (F)*, prepd. by satg. a suspension of 10 g. (E) in 50 cc. CS₂ with dry Cl gas, yellowish tables from AcOH, m. 204-5° (decompn.). *β -Chloride*, from (E) and Cl gas in CHCl₃, transparent tables from AcOH, m. 161°. A mixt. of the 2 m. 143-6°. *2,6-Dinitrostilbene bromide (G)*, prepd. by allowing 20 g. (E) in 60 cc. CHCl₃ to stand with an excess of Br for 3 days, compact wine-yellow tables, m. 146-7°. A small amt. of a second bromide is obtained, m. 198°. 5 g. (F), heated 7 hrs. with 15 g. C₆H₅N at 150°, gives *2,6-dinitro- μ -chlorostilbene*, PhCH:CClC₆H₄(NO₂)₂, light yellow needles or prisms, m. 100-1°. *2,6-Dinitro- μ -bromostilbene*, prepd. by warming 10 g. (G) and 60 g. C₆H₅N 3 days on the H₂O bath, yellow transparent rhomboids, m. 110-1°. *4-Nitrophenylisatogen*, by the action of light upon (F) in C₆H₅N for several weeks, red leaflets, m. 194°. *2'-Nitrophenylisatogen*, yellowish orange tables, m. 202-3°. *2-Cyanophenylisatogen (H)*, by the action of light upon 4-cyano-2-nitro- μ -chlorostilbene, yellow-orange leaflets, m. 227°. *N-Oxime*, small yellow leaflets from alc., m. 212-3°, insol. in 12% NH₄OH (sepn. from the C-oxime). Upon reduction with Zn and AcOH it yields 2-cyanophenylindoxyl. *Acetyl derivative*, fine rose-colored needles, m. 151-1.5°. Since upon reduction it

yields 2-cyanophenylindoxyl the acetate must have the formula NCC_6H_4 

C-Oxime, yellow-orange leaflets from alc., m. 246°. *2-Cyanophenylindoxyl (I)*, formed by the reduction of (H) with Zn and AcOH, Ag-gray needles from dil. AcOH, containing 1 mol. H₂O, m. 215°. *Acetyl derivative*, needles, m. 190-1°. *Quinhydrone of 2-cyanophenylisatogen and 2-cyanophenylindoxyl*, prepd. by slowly cooling a soln. of 3 g. (I) and 0.7 g. (H) in 40 cc. AcOH, black glistening needles, m. 185-6° (decompn.). C₆H₅N gives a brownish yellow soln. Et₂O decomp. it, (I) crystg. out. *2-Carboxymethylphenylisatogen*, orange leaf-like needles from MeOH, m. 132-3°. *4-Carboxyethyl-2-nitrostilbene chloride (J)*, prepd. by satg. an alc. soln. of the corresponding nitrile with HCl, small crystals from alc., m. 88.5°. *2-Carboxyethylphenylisatogen* may be prepd. from (J), by esterifying the corresponding acid, or from (H), orange needles, m. 138°. *N-Oxime*, fine, nearly colorless needles, m. 191° (decompn.). *Acetyl derivative*, fine needles, m. 134°. *2-Carboxyethylphenylindoxyl*, prepd. by reducing the oxime in boiling alc. and HCl or in AcOH with Zn, small, yellowish leaflets, m. 183-8° (decompn.). *Acetyl derivative*, glistening leaflets or needles, m. 187-90°. *2-Nitro- μ -chlorostilbene-4-carboxylic acid* is best prepd. by sapon. the ester with dil. alc. Na₂CO₃. Treated in C₆H₅N soln. with direct sunlight, *phenylisatogen-2-carboxylic acid* is formed, orange powder, m. 231-3°. *Pyridine salt*, red-orange needles, m. 150-1°. The C₆H₅N is lost at 80-100°. *Acetic acid compound*, orange-red transparent prisms, forming an orange powder in the air. *Propionic acid compound*, orange-yellow powder, gradually changing into orange-red transparent needles; they are stable in the air for only a few hrs. *Disubstituted phenylisatogens*: *2,4,3'-Trinitrostilbene (K)*, obtained by warming 27 g. 2,4-(O₂N)₂C₆H₃Me, 26 g. m-O₂NC₆H₄CHO and 30 drops piperidine at 185° 2 hrs., yellow needles from AcOH and then C₆H₅N, m. 182-3°. *2,4,3'-Trinitrostilbene chloride (L)*, from (K) and Cl in CHCl₃, pale yellow transparent prisms, giving a white powder, m. 168°. *Bromide*, by treating finely divided (K) with Br vapors for 14 days, compact, transparent light yellow cryst. powder, m. 190-1°. *2,4,3'-Trinitro- μ -chlorostilbene*, by boiling (L) in C₆H₅N for 4 days, light yellow needles, m. 164°. *2,3'-Dinitrophenylisatogen*, orange needles, m. 234°. *2,4-Dinitro-4'-methylstilbene*, prepd. by heating 15 g. 2,4-(O₂N)₂C₆H₃Me and 10 g. p-MeC₆H₄CHO with 15-20 drops piperidine at 165-70° for 0.25 hr., yellow leaflets from AcOH or alc., sinter

187°, m. 197°. Yield, 17 g. *2,4-Dinitro-4'-methylstilbene α-chloride*, sepd. by its greater soly. in AcOH, slightly yellow short prismatic needles, m. 167–7.5°. *β-Chloride*, asbestos-like needles, m. 155°. *2,4-Dinitro-4'-methyl-μ-chlorostilbene*, by heating 4 g. crude chloride and 20–25 cc. C_6H_5N 12 hrs., fine yellow tables, m. 136°. Yield, 3 g. *2-Nitro-4'-methylphenylisatogen*, violet-red leaflets, m. 212°. *2,4-Dinitro-4'-methoxystilbene*, obtained in 67% yield by heating 50 g. $MeOC_6H_4CHO$ and 68 g. $2,4-(O_2N)_2C_6H_3Me$ with 75 drops piperidine at 180° until the mass turns brown, then at 150° for 2 hrs., orange-red, compact crystals with bluish reflecting faces, m. 163°. *Dichloride*, best prepd. by passing Cl into a soln. of the stilbene until the color changes from orange to light yellow and then evapg. as rapidly as possible. Longer treatment with Cl gives products with Cl in the nucleus. *2-Nitro-4'-methoxyphenylisatogen*, small, brown-violet leaflets from AcOH or $PhCO_2Et$, m. 248°. *2,4-Dinitro-4'-acetoxystilbene (M)*, obtained by warming a mixt. of 10 g. $p-HOC_6H_4CHO$ and 15 g. $2,4-(O_2N)_2C_6H_3Me$ with 10 drops piperidine 1.5 hrs. at 155° (temp. of bath), adding a slight excess Ac_2O and warming 2 hrs. on the H_2O bath, pure yellow needles, m. 148°; yield, 15 g. Unless care is taken, a resin is formed. *2,4-Dinitro-4'-acetoxystilbene α-chloride*, sepd. by its insoly. in alc., needles, m. 158°. The *β-chloride*, m. 125–30°, was probably not pure. *2-Nitro-4'-acetoxystilbene (O)*, orange leaflets, m. 235°. *2,4-Dinitro-4'-hydroxystilbene (N)*, prepd. by heating 1 g. $p-HOC_6H_4CHO$, 1.5 g. $2,4-(O_2N)_2C_6H_3Me$ and 3 drops piperidine 3 hrs. at 160° or better by sapon. 10 g. (M) with 300 cc. satd. $MeOH-K_2CO_3$, pouring the K salt into H_2O and acidifying with HCl, orange leaflets from H_2O or deep red small leaflets with blue surfaces from PhMe, m. 162°. Crystd. from dil. alc., the red crystals turn yellow; these become red again when crystd. from PhMe. The yellow alc. soln. becomes a deep violet-red when treated with NaOH. *2,4-Dinitro-4'-methylethylacetoxystilbene*, $2,4-(O_2N)_2C_6H_3CH:CHC_6H_4OCOCHMeEt$, by heating 10 g. (N) with 8 g. $MeEtCHCOCl$ at 100°, citron-yellow needles from alc., opalescent yellow leaflets from CCl_4 , m. 123°. The chloride was an oil, which would not cryst. *2-Nitro-4'-methylethylacetoxystilbene*, red leaflets from AcOH, m. 216°. $MeOH-Na_2CO_3$ gives a deep green soln., from which HCl ppts. a violet substance, sol. in dil. NH_4OH with a green color. *2,4-Dinitro-4'-benzoxystilbene*, yellow needles from AcOH, m. 170°. *2-Nitro-4'-benzoxystilbene*, red leaflets from C_6H_5Me , m. 252°. *2-Nitro-4'-hydroxyphenylisatogen*, obtained by sapon. of (O) with $MeOH-K_2CO_3$, deep violet leaflets, m. 235–6°. Dil. NH_4OH and Na_2CO_3 give a deep green soln. from which HCl ppts. the unchanged isatogen. Aq. KOH gives a greenish yellow soln., quickly changing to yellow, due to some decompn. HCl does not give a violet ppt. with this soln. *2,4-Dinitro-μ-chlorostilbene-4'-sulfonic acid (P)*, prepd. by warming 5 g. $2,4-(O_2N)_2C_6H_3CCl:CHPh$ in a mixt. of 27 g. concd. and 3 cc. 30% fuming H_2SO_4 for 0.25 hr. at 100°, and filtering into ice and HCl, light yellow crystals, with 1 mol. H_2O , from H_2O , which do not m. Yield, 2.9 g. *2-Nitrophenylisatogen-4'-sulfonic acid*, by the action of sunlight upon 2 g. (P) in a mixt. of 40 cc. H_2O and 10 cc. C_6H_5N for 0.5 hr., red leaflets from 60% aq. C_6H_5N ; yield, 1.4 g. The compd. contains 1 mol. C_6H_5N which is lost at 120°. *4-Cyano-2-nitro-4'-methylstilbene*, by heating a mixt. of 25 g. $2,4-O_2N(NC)C_6H_3Me$, 18 g. $p-MeC_6H_4CHO$ and 20–25 drops piperidine 1.5 hrs. at 160°, flat, yellow needles, m. 170°; yield, 28 g. *4-Carboxyethyl-2-nitro-4'-methylstilbene*, by sapon. the nitrile in EtOH with HCl, long, yellow needles, m. 99–100°. *4-Cyano-2-nitro-4'-methylstilbene chloride*, sepd. by crystn. from AcOH into the *α-chloride*, transparent prismatic needles, m. 175–6°, and the *β-chloride*, asbestos-like needles, m. 130–1° (more sol.). The principal product is the *α-chloride*. *4-Cyano-2-nitro-4'-methyl-μ-chlorostilbene*, by boiling the chloride in C_6H_5N 2 days, yellow leaflets or tables, m. 133–4°. *2-Cyano-4'-methylphenylisatogen*, red leaflets, m. 249°, from AcOH. *4-Cyano-2-nitro-4'-methoxystilbene*, prepd. by heat-

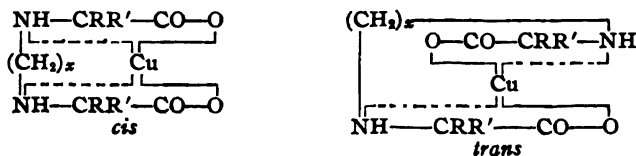
ing a mixt. of 8 g. 2,4-O₂N(NC) 7.2 g. *p*-MeOC₆H₄Me and several drops piperidine 1 to 1.5 hrs. at 140–50°, m. 157–8°; it occurs in a yellow and an orange form (C. A. 10, 336). 4-Cyano-2-nitro-4'-methoxystilbene chloride, light yellow crystals, m. 128–30°, from C₆H₆, which become brownish red in the light. 2-Cyano-4'-methoxyphenylisatogen, small, brownish violet leaflets from C₆H₅N or PhCO₂Et, m. 257°. Conc'd. H₂SO₄ gives a deep violet color. 2-Cyano-4'-methoxyphenylindoxyl, nearly colorless, prismatic needles, darken 180°, m. 203° (decompn.). Acetyl derivative, small needles, m. 204°. o-O₂NC₆H₄C:CCO₂H is best prepd. by treating 35 g. o-O₂NC₆H₄CHBr-CHBrCO₂H with 35 g. KOH in 1100 cc. H₂O for 24 hrs. at room temp., pptg. with HCl, taking the ppt. up in 700 cc. H₂O and again treating with 35 g. KOH; yield, 14.9 g. Methyl o-nitrophenylpropiolate, prepd. by dissolving 3 g. acid in 35 cc. 3% MeOH-HCl and allowing the soln. to stand overnight, light yellow leaflets from CCl₄, m. 87–8°. Heated 3 min. with C₆H₅N at 100°, or simply by allowing the soln. to stand overnight at room temp., methyl isatogenate is formed, orange-yellow crystals, m. 201°. Oxime, light yellow needles, m. 220–1° (decompn.). Ethyl o-nitrophenylpropiolate, prepd. by dissolving 1 g. acid in 15 cc. 3% MeOH-HCl and allowing to stand 48 hrs. at room temp., light yellow leaflets, m. 62°. Ethyl isatogenate (Baeyer, Ber. 15, 780), obtained by the use of H₂SO₄ or C₆H₅N, transparent, yellow prisms, m. 111°. o,p-Dinitrocinamic acid benzene compound, (O₂N)₂C₆H₃CH:CHCO₂H.C₆H₅, long slightly yellow prismatic needles, which quickly lose C₆H₅ in the air. Methyl ester, light yellow flat needles, m. 86–8°. Methyl o,p-dinitrodichlorohydrocinammate, prepd. by passing Cl into 40 g. Me ester in 400 g. CHCl₃ in the sunlight for several days, yellow needles, m. 120°, from MeOH. Methyl o,p-dinitro-μ-chlorocinnamate, by heating 2 g. of dichloride and 10 cc. C₆H₅N 3.5 hrs. at 100°, small yellow needles, m. 125–6°. o,p-Dinitrodibromohydrocinammic acid, yellow needles, m. 212°. Methyl ester, small needles, m. 126°. o,p-Dinitrophenylpropionic acid, by the action of 135 cc. 1.1% NaOH upon 3 g. of the dibromide for 4 hrs., light yellow, flat needles, with 1 mol. C₆H₆, m. 129°. In sunlight the acid quickly becomes yellow, then orange. Methyl ester, cm.-long thin needles, m. 103.5°. Conc'd. H₂SO₄ gives a yellow color. Methyl 2-nitroisatogenate, by the action of C₆H₅N in the cold, golden yellow leaflets, m. 179–80° (decompn.). If the temp. is above 0°, the heat of the reaction decomps. the compd.

C. J. WEST.

Action of ozone upon organic compounds. IV. Additions. C. HARRIS. Univ. Kiel. Ann. 411, 158–60(1916); cf. C. A. 9, 2877.—The cyclopentylcyclopentene prepd. by H. differs from that prepd. by Wallach (C. A. 6, 2078) in optical properties, probably because different agents were used for removing H₂O. The fact that different decompn. products were obtained from the distn. of hexamethylpentamethylenediammonium hydroxide than were obtained by v. Braun (C. A. 6, 982) is probably explained by a difference in the manner of distn.

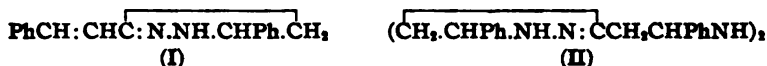
C. J. WEST.

Heptamethylenebis(α-imino acids) and stereoisomerism of their copper salts. N. A. SHLEZINGER. J. Russ. Phys. Chem. Soc. 47, 1811–9(1915).—Each of the Cu salts of the bisimino acids (C. A. 9, 2067, 3053) exists in 2 modifications, a blue and a violet, differing so radically from each other that the difference cannot be explained by "phys. variation" (cryst. form, fineness of powder, etc.). S. considers them *cis-trans* isomers, assuming the blue to have the *cis* and the violet the *trans* form:



When $x < 5$ only the *cis* compd. is stable; with increasing x the stability of the *cis* compd. gradually diminishes, while that of the *trans* compd. increases. When $x = 7$ the *cis* compd. becomes labile and the *trans* compd. stable, and they are mutually convertible into each other. The following new compds. were prepd.: *Heptamethylenebis- $[\alpha$ -iminoisobutyric nitrile]*, $(\text{CH}_3)_7[\text{NHC}(\text{CN})\text{Me}_2]_2$, very viscous, almost colorless oil. *Hydrochloride*, $\text{C}_{11}\text{H}_{22}\text{N}_4 \cdot 2\text{HCl}$, m. in sealed capillary 129° . The *acid*, $\text{C}_{11}\text{H}_{20}\text{N}_2\text{O}_4$, does not m. even above 310° . *Copper salt*, $\text{C}_{11}\text{H}_{22}\text{N}_4\text{O}_4\text{Cu} \cdot 0.5\text{H}_2\text{O}$ (by interaction of the acid with $\text{Cu}(\text{OH})_2$ in NH_4OH), red-violet crystals, sol. only in fused PhOH , giving a red soln. at low and a blue at elevated temps.; kept hot, the blue soln. slowly recovers the red color. When the red soln. is treated with much H_2O (to dissolve excess of PhOH) and the insol. part is dissolved in alc. the resulting soln. slowly turns blue, and upon addition of Et_2O deposits the blue modification which remains unchanged upon recrystn. from alc., but heating for 1 min. with H_2O reconverts it into the violet modification. *Heptamethylenebis- $[\alpha$ -iminophenylacetic nitrile]*, $(\text{CH}_3)_7[\text{NHCH}(\text{CN})\text{Ph}]_2$, thick oil. *Hydrochloride*, $\text{C}_{22}\text{H}_{22}\text{N}_4 \cdot 2\text{HCl}$, turns yellow 142° , m. 144° (decompn.), insol. in cold, decomd. by hot H_2O . The *acid*, $\text{C}_{22}\text{H}_{20}\text{N}_2\text{O}_4$, cryst., m. 231° . *Hydrochloride*, $\text{C}_{22}\text{H}_{20}\text{N}_2\text{O}_4 \cdot 2\text{HCl} \cdot \text{H}_2\text{O}$, has no definite m. p. *Copper salt*, $\text{C}_{22}\text{H}_{20}\text{N}_2\text{O}_4\text{Cu}$, blue, insol. in H_2O . *Methyl ester*, $\text{C}_{22}\text{H}_{24}\text{N}_2\text{O}_4$, very viscous oil, d_4^{20} 1.0854, n_D^{20} 1.5293. H. M. GORDIN.

Action of hydrazine on dibenzalacetone. Transformation into derivatives of cyclopropane and cyclopentane. N. KIZHNER. *J. Russ. Phys. Chem. Soc.* 47, 1819-48 (1915).—Notwithstanding their constitutional similarity, dibenzalacetone (a) reacts with N_2H_4 in a more complex manner than phorone (b) (C. A. 7, 3965). With 1 mol. of N_2H_4 (a) gives the normal compd. (I) which, however, upon warming yields (III),



and not a cyclopropane deriv. as is the case with (b). With an excess of N_2H_4 2 mols. of (I) unite with another mol. of N_2H_4 to form (II) which HCl decomp. with regeneration of (I) and N_2H_4 (both as HCl salts), but when heated (II) breaks up in 2 directions, one part again regenerating (I) which then further yields (III), while another part



gives the satd. base (IV) which under the conditions of reaction is very stable, but heating with KOH in presence of catalyzers decomp. it with formation of (V). The

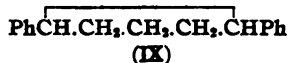


pyrasoline (I), yellow needles, m. $77-8^\circ$. When larger amts. of it are heated it decomp. with formation of (III). *Hydrochloride*, $\text{C}_{17}\text{H}_{18}\text{N}_2\text{HCl}$, yellow crystals, m. $169-70^\circ$ with evolution of HCl ; its soln. has an orange color, and when the salt is heated for some time it loses all of its HCl and isomerizes to (VII). The compound (II), white



needles, m. $55-60^\circ$, stable *in vacuo*, but deliquesces in the air, cannot be recrystd. without decompn. 1,2-Diphenyl-3-cyclopentene (III), b_{747} 321.5° , d_4^{20} 1.036, n_D^{20} 1.5881, forms a *dibromide* (VIII), rhombs, m. 119° . The *pyrasoline* (IV), thick liquid, b_{10} 222° , d_4^{20} 1.0625, n_D^{20} 1.5874, forms a liquid *hydrochloride* which turns violet in the air. The *hydrocarbon* (V), odorless liquid, had slightly different properties according to the

conditions of prepn., b_{10} 204.5°, d_4^{15} 0.9995, n_D^{15} 1.5666, or b_8 176°, d_4^{15} 1.0063, n_D^{15} 1.5718, forms a *nitroso compound* (VI) (light yellow needles, m. 151°) which unites with C_6H_6 to form the compound $(C_{17}H_{15}N_2O)_2 \cdot C_6H_6$, golden yellow needles, loses all of the C_6H_6 at 100°. The *pyrasoline* (VII), crystals, m. 97.5°, b_{10} 255°, b_{748} 424°, forms a *hydrochloride*, m. 202-4°. Reduction of (III) in presence of Pt black yields (IX) pre-



viously made by K. (C. A. 6, 84). When (V) is treated with HBr and the resulting *bromide* decompd. with KOH an unsatd. *hydrocarbon* $C_{17}H_{14}$ was obtained which most probably is $(\text{PhCH}_2\text{CH}_2\text{CH})_2$, though other formulas are possible, b_{748} 328°, b_{11} 180°, b_8 172°, d_4^{20} 1.0226, n_D^{20} 1.5872, forms a *dibromide*. H. M. GORDIN.

Interaction of benzoyl chloride with *m*-xylene in presence of some of the halides of the metals of the second group. B. N. MENSHTUKIN. *J. Russ. Phys. Chem. Soc.* 47, 1853-84 (1915).—In order to see whether other salts can take the place of AlCl_3 in the prepn. of ketones from acyl chlorides and aromatic hydrocarbons, M. examd. the interaction of BzCl with *m*-xylene in presence of CaCl_2 , CaBr_2 , SrCl_2 , SrBr_2 , BaCl_2 , BaBr_2 , CdCl_2 , CdBr_2 , MgCl_2 , ZnCl_2 , ZnBr_2 , HgCl_2 or HgBr_2 . The reaction: $\text{BzCl} + \text{Me}_2\text{C}_6\text{H}_4 = \text{BzC}_6\text{H}_4\text{Me}_2 + \text{HCl}$, being dimol., the usual equation for dimol. reactions was used, detg. the reaction velocity by detg. from time to time the amt. of HCl (absorbed in KOH) produced. Briefly summarized the results were as follows: In absence of any of these salts there was no noticeable reaction. If the salts were not completely dehydrated some HCl was liberated, but this was due to the action of the remaining H_2O on BzCl , the product consisting of BzOH only. In perfectly anhydrous state the salts favorably influenced the velocity of the reaction, but with the exception of the Zn and Hg salts all the above salts had such a negligibly slight influence as to make it reasonably certain that whatever HCl was evolved was due to incomplete dehydration. The Hg and the Zn salts, particularly the latter, make the formation of ketone go readily, but requiring a temp. of 140-50° to be effective cannot replace AlCl_3 for substances boiling below this temp. With all the halides of Zn and Hg the reaction does not start until a certain amt. of a black resinous substance is produced which seems to be the active agent and which must be brought into contact with the different parts of the reaction mixt. by vigorous stirring. For this reason when the salts used are in lumps the value of the velocity const. (K) at first continually grows, becoming const. only when sufficient of the black resin has been formed, while with the salts in very fine powder, offering a larger surface for the formation of the resin K is const. from the start for the Zn salts but not for the Hg salts. This is due to the high sp. gr. of the Hg salts making thorough mixing difficult. For each of the Zn and the Hg salts the value of K irregularly varies with the concn. up to a certain limit when increasing the salt concn. has no further effect on K . Expressed in mols. of salt for 1 mol. each of BzCl and *m*-xylene the limiting values of concn. are 0.38, 0.26, 0.18 and 0.26 for ZnCl_2 , ZnBr_2 , HgCl_2 and HgBr_2 , resp. In this respect there is thus a radical difference between these salts and SbCl_5 whose value of K is proportional to the square of its concn. (Menshutkin, "Influence of Substituents on Some Reactions of Benzene and Its Substituted Derivs.," Petrograd, 1912.) SbCl_5 forms with hydrocarbons stable compds. that are not decompd. even at 150°, hence it may be used even for substances boiling below this temp., the mixt. remaining homogeneous throughout the reaction, while ZnBr_2 forming no such compds. cannot be used for liquids boiling below this temp., volatilization causing them to go up into the condenser and by dropping back into the liquid making the mixt. inhomogeneous. A great many tables accompany H. M. GORDIN.

New methods of obtaining divinyl, isoprene, piperylene and dimethylethyrene. I. OSTROMUISLENSKII. *J. Russ. Phys. Chem. Soc.* 47, 1947-78(1915).—Aldol (a) was made by digesting AcH with K_2S at 16° for 12 hrs. and after removing the K_2S electrolyzing the (a) in presence of dil. H_2SO_4 . The (a) changes to butylene glycol which upon dehydration gave erythrene (b). A detailed table is given for concn., current strength, yield of glycol, etc. A general method for making (b) is based upon O.'s rule that open chain hydrocarbons with 1 double union and satd. cyclic hydrocarbons usually decomp. when heated to a high temp. in such a manner that all but 4 C atoms are eliminated as satd. hydrocarbons, the result being (b). Thus $Me_3CHCH:CH_2$ and $Me_3C:CHMe$ give $CH_4 + (b)$, and $MeEtCHCH:CH_2$ gives $Me_2 + (b)$. In the same way methylcyclohexane gives $Me_2 + C_2H_4 + (b)$. $Me_2CHCH_2CH_2OH$ gives at $500-600^\circ$ $H_2O + CH_4 + (b)$, while Me_2CClEt and $Me_2CHCH_2CH_2Cl$ give $HCl + CH_4 + (b)$. The pyrogenetic depolymerization of polymers gives monomers, so that dibutene gives (b), dipentene isoprene (c), and dihexene β,γ -dimethylethyrene (d). When pure limonene (e) is boiled for a long time part of it polymerizes to higher polyterpenes, while another part depolymerizes to (c). Na accelerates, while C_6H_6 prevents the reaction. When, however, a mixt. of the vapors of (e) and C_6H_6 , PhMe or petr. ether is heated to $500-600^\circ$ (c) is produced in large amts. That this is due to a lowering of the b. p. of (e) and not to mere diln. was shown by the low yield of (c) when the diluent had a high b. p., e. g., $C_{11}H_{22}$. Instead of (e) French or Russian oil of turpentine may be used. Myrcene and natural caoutchouc also give (c) under these conditions. This leads O. to setting up another rule that, unlike compds. with 1 double union, the polymers of diolefins, both cyclic and non-cyclic, give upon pyrogenetic depolymerization the corresponding diolefin monomers instead of (b). This shows that at least in reactions of depolymerizations the double union is more stable than the single union. In further search of methods for making (c) the action of several substances on $Me_2CClCH_2CH_2Cl$ (f) was tried. Fused KOH, Zn, CaO, BaO and numerous other reagents were found to be ineffective, while for amines the following rule was established: Amines of strong basicity react with (f) in no regular manner, but when their basicity is reduced to a certain degree they eliminate 2 HCl from it, changing it to (c). Thus $MeC_6H_4NH_2$ reacts with it with almost explosive violence, removing only 1 HCl and changing it to $Me_2C:CHCH_2Cl$ (g) which condenses with the amine to $MeC_6H_4NHCH_2CH:CM_2$ with elimination of another mol. of HCl. On the other hand, quinoline (h) readily converts (f) into (c). Even strong bases become suitable for the purpose when their basicity is reduced by the introduction of certain radicals. Thus $p\text{-}ClC_6H_4NH_2$ (i) and $p\text{-}BrC_6H_4NH_2$ (k), anisidine and tetramethyldiaminobenzophenone (l) give with (f) a good yield of (c). In the interaction of (f) with (h), (i), (k) or (l) the (c) is accompanied by basic dyes having the character of indicators, being colored red or violet by acids, but upon neutralization the color disappears with the pptn. of a gray amorphous substance. NO_2 groups lower the basicity of amines to such an extent that they do not react with (f). Both $CH_2:CM_2CH_2CH_2Cl$ (m) and (g) are changed by (h) to (c), the (g) evidently changing first to $Me_2C:C:CH_2$ (n) which then isomerizes to (c). Na stearate (p) also changes (m) to (c), but (g) it changes to (n) only, so that this reaction may serve to distinguish between (m) and (g). With (f), (p) hardly reacts at all. In presence of Al_2O_3 at $380-450^\circ$ iso-AmOAc gives (c) + AcOH. Dehydrated with Al_2O_3 at $400-50^\circ$ or with HPO_3 at 300° $Me_2C(OH)CH_2CH_2OH$ gives about 10% of (c). The conversion of piperylene into (c) was given in a former article (not yet abstrd.). A good method for obtaining (d) is by the dehydration of pinacol (q) by means of sulfanilic acid, HPO_3 or the acid salts of the latter. In general it was found that when an acid is capable of changing (q) to pinacolin (u) its acid salts

will dehydrate (*g*) to (*d*), and that NH_3 acids act like such salts. The acids reacting in this manner were found to be readily esterifiable, so that any agent facilitating esterification promotes the formation of (*d*) and (*u*). Thus a mixt. of (*f*) with phthalic anhydride and glacial H_2SO_4 or salts of the latter gave 13% of (*d*) and 74% of (*u*). The yield of (*d*) is improved when in Couturier's method (*Ann. chim. phys.* [6] 26, 433) the H_2SO_4 is dild. not with H_2O but with some org. solvent, *e. g.*, $\text{Me}_2\text{CHCO}_2\text{H}$, the latter partly reducing the H_2SO_4 to SO_2 which unites with the (*d*) to form $m(\text{SO}_2) \cdot n(\text{C}_6\text{H}_5)_2$. KHSO_3 gives with (*g*) 35%, acid toluidine sulfate about 30%, and neutral toluidine sulfate about 20% of (*d*), but in the latter case additional amts. of (*d*) may be obtained by repeated distn. of the residue. With both toluidine salts the reaction goes at a comparatively low temp., but there is so much resinification that the toluidine cannot be recovered from the residue without considerable loss. Many of the pyrogenetic reactions in this work were carried out in a special lamp of the parts of which cuts are given.

H. M. GORDIN.

Transformation of cyclobutane derivatives (monobromocyclobutane and cyclobutanol) into erythrene. Mechanism of removal of radicals in the positions 1 and 4. I. OSTROMUISLENSKII. *J. Russ. Phys. Chem. Soc.* 47, 1978-82 (1915).—Since $\text{CH}_2(\text{CH}_2\text{Br})_2$ reacts with Zn to form $\text{CH}_2\text{CH}_2\text{CH}_2$, and since the latter readily isom-

erizes to $\text{MeCH}:\text{CH}_2$, we are justified in assuming that the conversion of $\text{CH}_2\text{BrCH}:\text{CHCH}_2\text{Br}$ into $\text{CH}_2:\text{CHCH}:\text{CH}_2$ (*a*) by the action of Zn passes through $\text{CH}_2\text{CH}:\text{CH}:\text{CH}_2$ (*b*). If this view be correct Thiele's assumption that this change

is due to partial valences is superfluous, and any reaction in which (*b*) ought to be produced ought finally to give (*a*). This is corroborated by the formation of (*a*) by the elimination of HBr from monobromocyclobutane by means of quinoline, KOH in alc. or BaCl_2 , and of H_2O from cyclobutanol by means of Al_2O_3 . It may be expected that homologs of cyclobutane or cyclobutanol will give when heated or under the influence of catalyzers homologs of (*a*).

H. M. GORDIN.

Analysis, purification and qualitative reaction of isoprene. II. Structure of the benzene nucleus. I. OSTROMUISLENSKII. *J. Russ. Phys. Chem. Soc.* 47, 1983-8 (1915).—Isoprene (*a*) may be detected by adding 5-10 drops of it to 50 cc. of concd. aq. SO_2 and letting the mixt. stand for 2-30 hrs. in a tightly stoppered vessel. In presence of (*a*) a colorless, amorphous ppt. appears. The reaction is general for compds. with conjugated double unions, and the ppt. is a combination of diolefin and SO_2 . The ppt. is sol. in aromatic amines only, and when reprecipitated from such soln. by alc. is a snow-white colloid resembling caoutchouc. On prolonged standing in the air it gradually loses its elasticity and plasticity, becomes sticky, and finally falls to fine powder. Quantitatively (*a*) may be detd. by converting it into $\text{Me}_2\text{CClCH}_2\text{CH}_2\text{Cl}$ (*b*). For this purpose 200 g. of the crude (*a*) is mixed with 1.5 l. of 30% HCl and the mixt. shaken for 6 hrs. The black upper layer consisting of a mixt. of (*b*) with other chlorides is sepd., washed with a satd. soln. of NaCl , digested for 10-6 hrs. with CaCl_2 and fractionally distd. The fraction *b*. 142-3°, consisting of (*b*), is weighed and from its amt. the amt. of (*a*) is calcd. To purify (*a*) when mixed with amylene, etc., which interfere in its polymerization to caoutchouc the crude product is twice subjected to fractional distn., using a dephlegmator filled with Al shavings and collecting the fraction *b*. 42°. Further fractionation is useless, the (*a*) volatilizing with the amylenes. The product (3 kg.) is digested for 10-24 hrs. with Na wire (8-10 g.), then mixed with BaO_2 (100 g.), the mixt. boiled under reversed condenser for 1 hr. and distd. The product contains 90-100% of (*a*) and is free from amylenes, but may contain satd. hydrocarbons. Chem. pure (*a*) is obtained by the interaction of $\text{CH}_2\text{BrCHBrCMe}:$

BrCH_2Br in alc. with Zn dust. The bromide is made by acting with Br in CHCl_3 on (a) purified as above, and the Zn is taken in double the required amt. Pure (a) b. $33.2-3.8^\circ$. When warmed with Na it gives a peculiar (abnormal) caoutchouc different from the "Na isoprene caoutchouc" described by Matthewson and later by Harries. The lack of reactivity of halogen directly linked to the C_6H_5 ring O. explains by the observation that in general halogen situated at a double union is comparatively immobile even in the aliphatic series (O., "Theory of the C_6H_5 Nucleus and Ethylene Unions," Moscow, 1909). The analogy is supported by the fact that $\text{CH}_2\text{:CHBr}$ and MeCH:CHBr just as readily react with Na or Mg as aromatic halides (Austerweil, Ger. pat. 245,180, C. A. 6, 2334). Hence Armstrong-Baeyer's central formula for CH_2 devised for the sole purpose of accounting for the stability of the C_6H_5 ring in oxidation reactions must be rejected in favor of Kekulé's formula which makes C_6H_5 with its conjugated unions a complete analog of erythrene. H. M. GORDIN.

Transport of the elements of halogen acid from one organic radical to another. Mechanism of the action of chlorine on β -isoamylene. I. OSTROMUISLENSKII. *J. Russ. Phys. Chem. Soc.* 47, 1988-91(1915).—The chlorination of $\text{Me}_3\text{C:CHMe}$ (a) gives, among other things, $\text{C}_6\text{H}_{11}\text{Cl}$ (b). It is generally assumed that (b) results from the intermediate formation of trichloroisopentane (c) which gives off 1 mol. of HCl to unchanged (a), converting the latter into (b). A quant. examn. of the product obtained by chlorinating 100 g. of (a) showed the production of 50 g. of (b) but only 8 g. of (c). If the above view were correct 85 g. of (c) ought to have been produced. Hence O. explains the formation of (b) by assuming the intermediate formation of $\text{Me}_3\text{CClCHClMe}$ which transfers 1 mol. of HCl to 1 mol. of (a), converting the latter into (b) and itself changing to $\text{C}_6\text{H}_5\text{Cl}$. H. M. GORDIN.

New method of making esters of unsaturated alcohols from aldols. I. Crotonyl acetate. I. OSTROMUISLENSKII. *J. Russ. Phys. Chem. Soc.* 47, 1991-3(1915).—The interaction of aldol (50 g.) with Mg-Hg (12 g. Mg in excess of Hg) gave crotonyl acetate (a) (Charon, *Ann. chim. phys.* [7] 17, 249). In a short time the mixt., placed in a flask with a reflux condenser, becomes hot. To it C_6H_6 (100 g.) is added slowly, and when the spontaneous boiling ceases the mixt. is heated to about 100° for 4 hrs. The C_6H_6 soln. is filtered off through glass wool, the black residue decompd. with H_2O , and after warming on the H_2O bath for 2-3 hrs., extd. successively with aq. acetone, Et_2O and C_6H_6 . The last C_6H_6 ext. is united with the 1st C_6H_6 soln. and after washing with H_2O and drying with Na_2SO_4 , the C_6H_6 is distd. off. The residue consists of aldehyde resin (16 g.) and crude (a) (19 g.). The latter is purified by fractional distn. under 25 mm. It is supposed that part of the aldol decompd. into AcH which condenses with another part to form the monacetin of 1,3-butyleneglycol. The latter then loses H_2O , changing to (a): $\text{MeCH(OH)CH}_2\text{CHO} = 2\text{AcH}$; $\text{AcH} + \text{MeCH(OH)CH}_2\text{CHO} = \text{MeCH(OH)-CH}_2\text{CH}_2\text{OAc}$; $\text{MeCH(OH)CH}_2\text{CH}_2\text{OAc} = \text{H}_2\text{O} + \text{MeCH:CHCH}_2\text{OAc}$. Al_2O_3 changes (a) smoothly to erythrene (60-70%) and AcOH. Should the analogs and homologs of aldol behave in a similar manner the reaction would be available for making esters of unsatd. alcs. H. M. GORDIN.

Atomic refraction of phosphorus in some of its organic compounds. A. E. ARBUZOV AND A. A. IVANOV. *J. Russ. Phys. Chem. Soc.* 47, 2015-27(1915).—With a view to finding whether the n of P is the same in different homologous series and for its different valences, the n of P(OEt)_3 , EtPO(OEt)_2 , $\text{P(OEt)}_2\text{OH}$ and PO(OEt)_3 was detd. for different lines of the spectrum. It was found that for compds. with 3-valent P n is greater than for those with 5-valent P. The difference is 3 units if in the calcns. one O in the 5-valent P compds. is taken with a double union to P, and 2 units if all the O in these compds. are taken with single unions to P. Hence the formulas with one O doubly linked to P are to be preferred. The value of n for the compds. with 5-

valent P was not const. This is ascribed to differences in constitution, in the 2nd of the above compds. the P being linked to O and C, in the 3rd (written as $\text{PO}(\text{OEt})_2\text{H}$) to O and H, and in the 4th to O alone. While in simple compds. like hydrocarbons with only 2 different elements constitution has little influence, in compds. like the above with 4 different elements the influence of constitution is very pronounced. Owing to Zecchini's (*Z. physik. Chem.* 12, 504) having worked with an entirely different substance or possibly a mixt. of substances which he took for $\text{P}(\text{OEt})_3$, his results for the n of this compd. differ from those obtained by the authors. As was shown by A. the substance designated in Z.'s time Et phosphite was a complex of several esters (*J. Russ. Phys. Chem. Soc.* 38, 203). Detns. of the at. vol. of P gave no const. results for compds. with 5-valent P, but the ratio at. vol. : n was quite const. when the authors' values for both detns. were used.

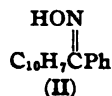
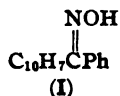
H. M. GORDIN.

The scission of some nitrogen compounds. A. ANGELI. Florence. *Atti accad. Lincei* 24, I, 1093-8(1915).—Some years ago A. (*Mem. accad. Lincei* 1905, 83) showed that the Na salt of nitrohydroxylamine, $\text{HON}:\text{NO}_2\text{Na}$, decomps. easily to give $\text{HNO} + \text{HNO}_2$ and that hydroxylaminesulfonic acid, $\text{HON}:\text{SO}_3(\text{OH})\text{H} \rightarrow \text{HNO} + \text{H}_2\text{SO}_4$ and $\text{HON}:(\text{Ph})\text{SO}_2\text{H} \rightarrow \text{HNO} + \text{PhSO}_2\text{H}$. These acids are derivs. of NH_2OH with HNO_2 , H_2SO_4 and PhHSO_3 which on breaking up give HNO_2 , H_2SO_4 and PhHSO_3 instead. Similar scissions will be expected from other elements that form acids in 2 stages of oxidation. These reactions are probably really hydrolytic processes, thus: $\text{PhSO}_2\text{NHOH} + \text{H}_2\text{O} \rightarrow \text{PhSO}_2\text{H} + \text{NH}(\text{OH})_2$, since the disubstituted derivs. undergo a similar decompn. that can only be represented thus: $(\text{PhSO}_2)_2\text{N}(\text{OH}) + \text{H}_2\text{O} \rightarrow \text{HNO}_2 + 2\text{PhSO}_2\text{H}$. Given the analogy in behavior of derivs. of NH_2OH , N_2H_4 (and H_2O_2) (cf. C. A. 5, 94) it appears that similar scissions may be foreseen in the derivs. of N_2H_4 and A. has studied the action of alkalis on $\text{PhSO}_2\text{NHNH}_2$. Raschig (C. A. 5, 3020) found the reaction complete at high temps. with the evolution of $\text{N}_2 + \text{H}_2$ and formulated it thus: $\text{PhSO}_2\text{NHNH}_2 + \text{H}_2\text{O} \rightarrow \text{PhSO}_2\text{H} + \text{NH}_2\text{NH}(\text{OH})$. The latter by loss of H_2O gives $\text{HN}:\text{NH}$ and this decomps., giving $\text{H}_2 + \text{N}_2$. Thiele (*Ann.* 271, 130) says that $\text{HN}:\text{NH}$ decomps. thus: $2\text{N}_2\text{H}_2 \rightarrow \text{N}_2 + \text{N}_2\text{H}_4$. But A. observed (C. A. 5, 94) that in the presence of dil. mineral acids $2\text{N}_2\text{H}_2 \rightarrow \text{HN}_2 + \text{NH}_3$ (analogous to $2\text{HNO} \rightarrow \text{N}_2\text{O} + \text{H}_2\text{O}$). The latter interpretation is accepted by Diels (C. A. 7, 2948). A. has shown (C. A. 4, 1620) that $\text{PhSO}_2\text{NHNHPh}$ loses PhSO_2H by the action of alkali and the $\text{PhN}:\text{NH}$ formed reacts immediately with BzH for example. If in the absence of BzH the alk. liquid is agitated with Et_2O the $\text{PhN}:\text{NH}$ reacts with the unchanged $\text{PhSO}_2\text{NHNHPh}$ to give $\text{PhN}:\text{NSO}_2\text{Ph} + \text{PhNHNH}_2$. On the basis of this it was expected that N_2H_4 derivs. containing 2 sulfonyl groups united 1 each to the 2 N atoms would undergo a similar reaction. Hinsberg (*Ber.* 27, 601(1894)) prepd. $(\text{NHSO}_2\text{Ph})_2$, which gave a K salt which by heating decomps., giving PhSO_2H and N_2 . It seems that $(\text{NHOH})_2$ may be intermediate here and decomps. to give $\text{N}_2 + 2\text{H}_2\text{O}$. The reaction may be $(\text{NHSO}_2\text{Ph})_2 \rightarrow \text{N}_2 + 2\text{PhSO}_2\text{H}$ in which $\text{HONHNHSO}_2\text{Ph}$ is an intermediate. In the study of this reaction the same method was used as in the study of the decompn. of benzenesulfohydroxamic acid in which the $\text{NH}(\text{OH})_2$ was fixed with aldehydes or PhNO ; with the latter $\text{PhN}(:\text{O}):\text{NOH}$ was formed. PhNO reacting with $(\text{NHSO}_2\text{Ph})_2$ in alk. soln. gives $\text{PhSO}_2\text{NHN}:\text{N}(:\text{O})\text{Ph}$ as colorless crystals, exploding at 102° as well as by percussion. Since it is acid the salts are probably derived from the tautomer $\text{PhSO}(\text{OH}):\text{NN}:\text{N}(:\text{O})\text{Ph}$. With Fe^{III} and Cu it gives complexes similar to those of "cupferon." By the action of alk. it loses another mol. of PhSO_2H and gives a product, probably $\text{PhN}(:\text{O}):\text{N}:\text{N}$, that decomps. into $\text{PhNO} + \text{N}_2$. The reactions are being studied further.

E. J. WITZERMANN.

The stereoisomeric oxime of β -naphthyl phenyl ketone. PASQUALE POCCIANI. Florence. *Atti accad. Lincei* 24, I, 1135-7(1915); complete in *Gazz. chim. ital.* 45

II, 111-20(1915).—In a preceding paper Betti and P. (*C. A.* 9, 3021) showed the existence of 2 stereoisomers of α - $C_{10}H_7CPh:NOH$, one of which m. 127° , the other 161° , of which the 1st may be transformed into the 2nd. Kegel (*Ann.* 247, 181(1888)) described a β - $C_{10}H_7CPh:NOH$, m. $174-6^\circ$. Perrier and Caille (*C. A.* 2, 2693) cite the expts. of Rousset (*Thèse Lyon*, 1896) who obtained an oxime, m. 133° . P. has found that β - $C_{10}H_7Bz$ (α) forms 2 oximes of which one crysts. from EtOH in small regular rhombohedra, m. 157° , the other crysts. in long, silky needles, m. 174° . The latter corresponds to that obtained by K. although P. could not obtain solely this form under the conditions described by him: there was always some of the other formed. The oxime, m. 133° , could not be obtained under the conditions described by P. and C. even when modified: a mixt. of the 2 forms, m. $140-5^\circ$, was always obtained. It was found, as was expected, that NH_2OH acts on the β - more easily than on the α -ketone since the CO group is in the α -position. Besides in the case of the β -oxime the transformation of 1 into the other isomer is more difficult; in fact it could not be done. This is shown by the fact that 2 Bz derivs. were obtained, while with the α -deriv. only one could be obtained: the *benzoyl derivative* of the oxime (m. 174°), m. 168° , that of the oxime (m. 157°) m. 172° . Also with $PhNCO$ 2 different addition products were obtained. In alkalis about an equal amt. of both isomers is formed. The configuration of the 2 oximes was detd. by Beckmann rearrangements with PCl_5 : the oxime, m. 174° , in this way gave β - $C_{10}H_7CONHPh$; the oxime, m. 157° , gave β - $C_{10}H_7NHBz$, thus showing that the 1st is (I) and the 2nd (II). The reduction of these 2 oximes takes place



with difficulty not found with the α -derivs. and gives an oily base that easily combines with CO_2 from the air, and of which the following compds. have been obtained: *hydrochloride*, white rosetts, m. $265-70^\circ$ (decompn.); the *acetate*, white silky needles, m. 127° ; *benzoyl deriv.*, small needles, m. 182° . This base is β -naphthylphenylaminomethane, $PHCH(NH_2)C_{10}H_7$, analogous to the amine obtained from the α -derivs. This work clears up the isomeric oximes of the naphthyl phenyl ketones about which the literature has been uncertain and contradictory. The (α) used was obtained from the mother liquors in the prepn. of α - $C_{10}H_7Bz$. The 1st sepn. of the α - and β -derivs. was done mechanically by decanting the needles of β -crystals from the heavy prisms of the α -crystals. The sepn. was completed by forming the picrate (Rousset, *Bull. soc. chim.* [3] 15, 71). 3 g. (α) in 25 cc. EtOH treated with 1.5 g. $NH_2OH.HCl$ + 1.7 g. $NaOAc$ in 5 cc. H_2O and heated 45 min. on the H_2O bath, cooled, filtered, the ppt. washed to remove $NaCl$ and crystd. from EtOH gave a mixt. of the 2 oximes m. 140° : one as white silky rosetts, m. 174° ; the other as tufts of long needles, m. 157° . Sepd. mechanically and recrystd. it gave the pure oxime. A mixt. of the pure oximes, m. 140° . 3 g. (α) in 15 cc. EtOH + 1.2 g. $NH_2OH.HCl$ in the sealed tube at $100-10^\circ$ for 5-6 hrs. gives most of the isomer that m. 174° . The same repeated with 8 cc. of 20% $NaOH$ gives nearly equal amts. of the 2 isomers. Heating the isomer that m. 157° (presumably the more unstable) in EtOH containing HCl gave no transformation into the other isomer. The Bz deriv. of the oxime m. 174° was obtained as small shining prisms from EtOH, m. 168° ; the other as small, shining needles, m. 172° ; on sapon. both gave the original oximes, resp. 0.5 g. of oxime, m. 174° , treated with 1.5 cc. $PhNCO$ in a sealed tube gave at $70-80^\circ$ for some hrs. a ppt. of the *carbanilide derivative*, cryst. powder, m. 192° . The oxime, m. 157° , similarly treated gave a *carbanilide derivative*, tufts of colorless crystals, m. 160° . Angeli and Alessandri (*Atti accad. Lincei* 22, I, 735(1913)) noted that certain oximes decomp. on heating to give N_2 and NH_3 . These oximes decomp. at the m. p.

but give no gas. They decomp. spontaneously in sealed tubes, giving nitrous fumes and a yellow-red semi-oily substance.

E. J. WITZEMANN.

The oxidation of azoketones and azonitriles. A. ANGELI. Florence. *Atti accad. Lincei* 24, I, 1185-90(1915).—In order to extend his expts. on the action of peracetic acid on the azo derivs. A. has studied its action on $\text{RN}:\text{NC}_6\text{H}_4\text{Ac}$, $\text{RN}:\text{NC}_6\text{H}_4\text{CN}$, $\text{RN}:\text{NC}_6\text{H}_4\text{CH}_2\text{CN}$, $\text{RN}:\text{NC}_6\text{H}_4\text{NMe}_2$, $\text{RN}:\text{NCN}$, and $\text{RN}:\text{N}:\text{N}$ in which R for the present is an aromatic residue. The results with the ketones and nitriles are reported here. It was found that in order to limit the oxidation to the azo group it was necessary to work in dil. AcOH at not high temps. In this way $\text{PhN}:\text{NC}_6\text{H}_4\text{Ac}$ gives $\text{PhN}(\text{:O}):\text{NC}_6\text{H}_4\text{Ac}$ (a), m. 92° , and $\text{PhN}:\text{N}(\text{:O})\text{C}_6\text{H}_4\text{Ac}$ (b), m. 132° , and $\text{PhN}:\text{NC}_6\text{H}_4\text{CH}_2\text{CN}$ gives $\text{PhN}(\text{:O})\text{NC}_6\text{H}_4\text{CH}_2\text{CN}$ (c), m. 94° , and $\text{PhN}:\text{N}(\text{:O})\text{C}_6\text{H}_4\text{CH}_2\text{CN}$ (d), m. 132° . Their structure was easily detd. by oxidizing with KMnO_4 in alk. soln. by which the side chains were transformed into CO_2H and the acids $\text{PhN}(\text{:O})\text{NC}_6\text{H}_4\text{CO}_2\text{H}$ and $\text{PhN}:\text{N}(\text{:O})\text{C}_6\text{H}_4\text{CO}_2\text{H}$ were obtained which were identical with those previously obtained by the oxidation of the azo acid (A. and Valori, C. A. 7, 2223). The azoketone, $\text{PhN}:\text{NC}_6\text{H}_4\text{Ac}$, prepd. by condensing equimol. amts. of PhNO and $p\text{-NH}_2\text{C}_6\text{H}_4\text{Ac}$ in AcOH, rose laminas from EtOH, m. 115° ; with NH_2OH it gives an oxime, $\text{PhN}_2\text{C}_6\text{H}_4\text{C}(\text{:NOH})\text{Me}$, m. 169° . The azoketone oxidized in AcOH with perhydrol gave 2 isomeric azoxy compounds that were sepd. by their different soly. in EtOH; the less sol. (b) recrystd. from C_6H_6 , m. 132° ; the other (a) purified from ligroin, m. 92° . (b) gave an oxime, m. 181° . (b) oxidized with KMnO_4 in the presence of a little KOH gave a yellow liquid which on treatment with dil. H_2SO_4 sepd. $\text{PhN}:\text{N}(\text{:O})\text{C}_6\text{H}_4\text{CO}_2\text{H}$, which for better identification was converted with Br into $p\text{-BrC}_6\text{H}_4\text{N}:\text{N}(\text{:O})\text{C}_6\text{H}_4\text{CO}_2\text{H}$. Both (a) and (b) give on treatment with H_2SO_4 $p\text{-HOC}_6\text{H}_4\text{N}_2\text{C}_6\text{H}_4\text{Ac}$; red, sol. in alkalis, m. 134° . Similarly condensation of PhNO with $p\text{-H}_2\text{NC}_6\text{H}_4\text{Bz}$ gives the azoketone $\text{PhN}:\text{NC}_6\text{H}_4\text{Bz}$, m. 106° , which with H_2O_2 gives an azoxy compd., m. 72° . Lack of material prevented a further study. The azonitrile, $\text{PhN}:\text{NC}_6\text{H}_4\text{CH}_2\text{CN}$, was obtained by condensing PhNO with $p\text{-H}_2\text{NC}_6\text{H}_4\text{CH}_2\text{CN}$, as orange-red laminas, m. 127° . Oxidized with H_2O_2 it gave 2 isomeric azoxy compounds, (c) and (d), that were purified by recrystn. from C_6H_6 . The more sol. one (c) m. 94° and the less sol. one (d) m. 132° . (d) oxidized with KMnO_4 gives $\text{PhN}:\text{N}(\text{:O})\text{C}_6\text{H}_4\text{CO}_2\text{H}$ which thus detcs. the structure of these isomers.

E. J. WITZEMANN.

The oxidation of dimethylaminoazobenzene. A. ANGELI. Florence. *Atti accad. Lincei* 24, I, 1190-2(1915).—Numerous expts. have shown that compds. containing $\text{RN}:\text{NR}$ are transformed by the action of peracetic acid into $\text{RN}(\text{:O}):\text{NR}$ and take up only 1 atom of O. Working under more energetic conditions it would be possible to obtain products of more profound oxidation but certainly not $\text{RN}(\text{:O}):\text{N}(\text{:O})\text{R}$ since this is the dimol. form of RNO which is easily oxidized to RNO_2 . If the azo compd. contains a 3rd atom of trivalent N the reaction is quite different. If the 3rd N is an NH_2 it undergoes oxidation probably through the NHOH deriv. to the NO_2 deriv. and is in part transformed into compds. containing new azo and azoxy groups. With a disubstituted amine the case is simpler. A. used $p\text{-Me}_2\text{NC}_6\text{H}_4\text{N}:\text{NPh}$, (a), which suspended in glacial AcOH gave a rose-colored liquid to which perhydrol was added in excess and allowed to stand several days at room temp., after which the liquid became yellow-brown. Dilg. with H_2O and treating with dil. H_2SO_4 sepd. a ppt. of the sulfate, $(\text{C}_{14}\text{H}_{15}\text{N}_3\text{O}_2)_2\cdot\text{H}_2\text{SO}_4$, of the new base in orange-yellow laminas, m. 156° (decompn.). Dissolved in H_2O and treated with Na_2CO_3 it seps. bright golden laminas of the compd. (b), $\text{C}_{14}\text{H}_{15}\text{N}_3\text{O}_2$, m. 127° (decompn.), sol. in most solvents. (b) treated with H_2S gives (a); the same result is obtained with $\text{NH}_2\text{OH}\cdot\text{HCl}$ or $\text{N}_2\text{H}_4\cdot\text{H}_2\text{SO}_4$. There are 2 possible formulas for (b): (1) $\text{PhN}:\text{N}(\text{:O})\text{C}_6\text{H}_4\text{N}(\text{:O})\text{Me}_2$ and (2) $\text{PhN}(\text{:O})\text{NC}_6\text{H}_4\text{N}(\text{:O})\text{Me}_2$. (b) treated with Br and then reduced with $\text{Sn} + \text{HCl}$ gave a base which

with BzCl gave $p\text{-BzNHC}_6\text{H}_4\text{Br}$, thus proving that (b) is (1). A. considers the sulfate as probably an oxonium salt of the $\text{-N}(\text{:O})\text{Me}_2$ group. Since (a) is yellow and its salts red, Hantzsch (*Ber.* 46, 1149(1913)) considers the free form RN:Ar:N.NPh.R

and the salts as derivs. of $\text{PhNH.N:ArX} \rightleftharpoons \text{NR}_2$. Both the free form and salts of (b) have the same color which may be explained if the dimethylated N atom is pentavalent. Such forms as those of H. would then not be possible. The Na salt of helianthine (Me orange) similarly treated in AcOH with H_2O_2 gives yellow crystals, m. 233° (decompn.), which are to be studied further. E. J. WITZEMANN.

The preparation and decomposition of phenylnitroformaldehyde phenylhydrazone. R. CIUSA AND G. BENELLI. Univ. Bologna. *Atti accad. Lincei* 24, II, 20-5(1915).—In a preceding paper (*C. A.* 8, 489) the fact was brought out that $\text{O}_2\text{NCPh:NNHPh}$ (a) is decompd. by heat thus: (a) $\rightarrow (\text{PhC:NNHPh})' + \text{NO}_2$, which is similar to the decompn. of ONCPh:NHNPh into $(\text{CPh:NNHPh})_2 + 2\text{NO}$ (Bamberger, Pemsel, *Ber.* 36, 161, 347). These decompns. resemble the following: $\text{CPh}_2\text{NO}_2 \rightleftharpoons \text{Ph}_2\text{C} + \text{NO}_2$; $\text{CPh}_2\text{NO} \rightleftharpoons \text{CPh}_2 + \text{NO}$ and $\text{NPh}_2\text{NO} \rightleftharpoons \text{NPh}_2 + \text{NO}$. The present paper is a report on the secondary products of the reaction. The best way of studying the decompn. of nitrohydrazones consists in heating with a reflux condenser a soln. of dry nitrohydrazone in xylene (dried over Na) and facilitating the loss of NO_2 by passing a stream of dry N_2 . In this way NO_2 was evolved in proportions varying with the rapidity of heating and the current of N_2 and the amt. of moisture present. On cooling the compd. $\text{CHPh:NNPhC}_6\text{H}_4\text{Me}_2\text{NO}_2$ seps. as white needles, m. 170° , gives PhNHNH_2 on hydrolysis with H_2SO_4 , and arises from the following reactions: (1) $\text{O}_2\text{NCPh:NNHPh} \rightarrow \text{NO}_2 + (\text{PhC:NNHPh})$; (2) $2(\text{PhC:NNHPh}) + \text{C}_6\text{H}_4\text{Me}_2 \rightarrow \text{Me}_2\text{C}_6\text{H}_4\text{CPh:NNHPh} + \text{PhCH:NNHPh}$; (3) $\text{Me}_2\text{C}_6\text{H}_4\text{CPh:NNHPh} + \text{NO}_2 \rightarrow \text{O}_2\text{NC}_6\text{H}_4\text{Me}_2\text{CPh:NNHPh}$. On cong. the mother liquor a small amt. of a red liquid, m. 195° , seps., which may be the product of the action of NO_2 on PhCH:NNHPh in reaction (2). The action of NO_2 on PhCH:NNHPh in Et_2O (Ciusa, Pestalozza, *idem* 17, 844) gives (1) PhN_2NO_2 and (2) dibenzaldiphenylhydrotetrazone, which are easily sepd. from the reaction mixt. by filtration. The hydrotetrazone is freed from the other by washing with H_2O and crystg. from C_6H_6 and EtOH . On evapg. the Et_2O a red substance was obtained which on crystg. from $\text{C}_6\text{H}_6 + \text{EtOH}$ gives (a), the main product of the reaction. In order to sep. the secondary products the whole was digested with 10% KOH in which a red compound, $\text{C}_{22}\text{H}_{20}\text{O}_2\text{N}_4$, dark red needles, m. 183° , remains undissolved. This compd. was obtained by Bamberger and Pemsel (*Ber.* 36, 84(1903)) as a secondary product in the oxidation of PhCH:NNHPh with AmNO_2 . The alk. soln. on adding acid or better CO_2 ppts. a brick-red compd., $\text{C}_{12}\text{H}_{11}\text{O}_2\text{N}_4$, m. $102-3^\circ$. Digesting with MeOH exts. a compd. of the same compn., m. 135° , while $\text{O}_2\text{NCPh:NNHPh}$ remains undissolved. Since $o\text{-O}_2\text{NC}_6\text{H}_4\text{NHN:CHPh}$ occurs in 2 forms and the p -deriv. in 3, none of which is identical with the above, C. and B. propose the formula PhCNO_2 for the one



m. 102° and PhCNO_2 for that which m. 135° . From the alc. in which the reaction



mass was dissolved a small amt. of a compd., yellowish needles, m. $202-4^\circ$, was sepd. which is possibly tetraphenyltetrazoline (cf. B. and P., *l. c.*). Thus 6 different products were isolated from this mixt. E. J. WITZEMANN.

Aromatic substance containing multivalent iodine. X. Peculiar compounds obtained in Sandmeyer's reaction applied to naphthalene derivatives. L. MASCARELLI AND G. MARTINELLI. Univ. Cagliari. *Atti accad. Lincei* 24, II, 25-30(1915).—During expts. on the tendency of dinaphthyl deriva. to form pentaatomic nuclei containing

plurivalent I (C. A. 8, 1760) it was necessary to prep. much of $\beta, \alpha\text{-C}_{10}\text{H}_7\text{NO}_2$ (a), from $\text{C}_{10}\text{H}_7(\text{NH}_2)\text{NO}_2$. Diazotizing the latter in HCl in the presence of H_2SO_4 (Meldola, *J. Chem. Soc.* 47, 520(1885)) in order to obtain the corresponding insol. sulfate gave in the final product after treatment with KI no (a) but 2 other compds.: (1) 1-chloro-2-iodonaphthalene (?) (b), $\text{C}_{10}\text{H}_7\text{ClI}$, white prisms, m. $83\text{--}4^\circ$, sol. in org. solvents; (2) 1-chloronaphthalene-2-diazonium chloride iodochloride (c), $\text{C}_{10}\text{H}_7\text{ClN}:\text{NCl}:\text{ICl}$, shining, golden scales, m. $146\text{--}8^\circ$, decomp. easily with H_2O with the evolution of gas, sol. in hot aq. solns. of $\text{NaCl} + \text{HCl}$ without decompn. The formation of such a diazonium iodochloride from the corresponding diazonium chloride takes place by the action of the I liberated on adding KI, thus: $\text{RN}_2\text{Cl} + \text{I}_2 \longrightarrow \text{RN}_2\text{ClI}_2 \longrightarrow \text{RI} + \text{N}_2 + \text{ICl}$ and the ICl reacts thus: $\text{RN}:\text{NCl} + \text{ICl} \longrightarrow \text{RN}:\text{NCl}:\text{ICl}$. In the above case, however, the NO_2 group is also substituted by Cl. In the C_{10}H_7 series the substituents have a certain mobility with respect to that of the C_6H_5 series and nascent Cl (from the decompn. of ICl) may attack the NO_2 and substitute it just as when NO_2 derivs. of C_{10}H_7 are heated with PCl_5 . This mobility is shown by the fact that Friedländer and Littner (C. A. 9, 1335) substituted NO_2 with OH by boiling 1,2- $\text{C}_{10}\text{H}_7(\text{NO}_2)\text{CN}$ with BaCO_3 . It was confirmed by M. and M. by obtaining (c) by the action of ICl on 1,2- $\text{C}_{10}\text{H}_7(\text{NO}_2)\text{N}_2\text{Cl}$. 50 g. $\alpha, \beta\text{-C}_{10}\text{H}_7(\text{NO}_2)\text{NH}_2$ suspended in 250 cc. HCl (d. 1.19) were treated with 500 cc. H_2O which pptd. most of the amine and then with 17 g. NaNO_2 in 200 cc. H_2O at 0° , giving a red-brown liquid which was poured into 41 g. KI in 200 cc. H_2O . This, decolorized with SO_2 , was allowed to stand overnight. The yellow cryst. powder of (c) was filtered and washed with Et_2O and cold H_2O . The wash Et_2O and that used to ext. the mother liquor was filtered, washed with alkali and H_2O , dried with CaCl_2 and evapd., giving the 1,2- $\text{C}_{10}\text{H}_7\text{ClI}$, m. $83\text{--}4^\circ$. 5 g. $\alpha, \beta\text{-C}_{10}\text{H}_7(\text{NO}_2)\text{NH}_2$ were treated with NaNO_2 in HCl. A drop of ICl in I (Bigot, *Ann. chim. phys.* [6] 22, 464(1891)) added to the red-brown soln. ppts. a yellow cryst. powder identical with (c). Also in *Gazz. chim. ital.* 45, II, 200-8(1915).

E. J. WITZERMANN.

The isomerism of erucic and brassidinic and isoerucic acids. III. Their reciprocal cryoscopic behavior. L. MASCARELLI AND G. SANNA. Univ. Cagliari. *Atti accad. Lincei* 24, II, 30-7(1915).—In a previous paper the cryoscopic behavior of these 3 acids in behenic acid (a) was given (C. A. 9, 1761). In this paper the cryoscopic behavior of these 3 acids dissolved reciprocally in each other is described. It was suggested (l. c.) that 1 of these acids has one form and the other 2 the other. It is now thought that erucic acid is the *cis* form and other 2 the *trans*, since the 1st does give solid solns. in behenic acid and since the latter both give solid solns. In erucic acid, brassidinic, isoerucic and behenic acids are cryoscopically normal; in brassidinic acid, erucic acid is normal and isoerucic and behenic acids are abnormal (the latter slightly so); in isoerucic acid erucic is normal and brassidinic acid markedly abnormal and behenic acid somewhat so; in behenic acid erucic acid behaves normally and brassidinic and isoerucic acids abnormally. The observation that behenic acid is not sol. in the solid state in erucic acid and that it does form solid solns. in brassidinic acid agrees with the observation that satd. open chain compds. form mixed crystals with the more stable *trans* modification of the corresponding ethylenic compd. but not with the less stable *cis* form. The f. p. const. of erucic acid lies between 50.5 and 53.6 (av. 52.3) when C_{10}H_8 , dibenzyl, crotonic, elaidinic and BzOH , $p\text{-Br}_2\text{C}_6\text{H}_4$ and Ph_2 were used as solvents; the const. according to Raoult's empirical law should be 209.5. van't Hoff's formula gives 12.13 cal. for the latent heat of fusion of 1 g. mol. erucic acid. The f. p. const. for brassidinic acid is 38.6-44.2 (av. 41.6) in the same solvents; the latent heat of fusion is 17.83 cal. per g. mol. For isoerucic acid the mean f. p. const. in $p\text{-Br}_2\text{C}_6\text{H}_4$, dibenzyl and C_{10}H_8 is 52.54; the calcd. latent heat of fusion is 13.52 cal. per g. mol.

IV. Saturation curves of binary systems. *Ibid* 91-7.—To complete the expts. pre-

viously described (*idem* 1915) and others under way it seemed useful to know the course of the satn. curves obtained by combining erucic, brassidinic, isoerucic and behenic acids in pairs. The existence of 3 acids having the compn. and constitution of erucic acid can only depend on phenomena of isomerism, polymerism or polymorphism. The results of the mol. wt. detns. in previous papers exclude polymerism. The difference between isomerism and polymorphism lies in that the 1st is usually connected with the cryst. state, while the 2nd may also persist in the liquid and gaseous state, so that the study of the solid-liquid equil. may be of value. In detg. the f. p. curve the method of analysis of van Bijlert, for ascertaining whether the compds. were sol. in the solid state and to what extent, could not be applied. Nevertheless the various types of curves could be detd. and classified since the values for mol. wts. at small concns. of the acids dissolved in each other resp. as solvents are known. The f. p. curves show the following: (1) erucic acid with brassidinic, isoerucic and behenic acids, resp., does not give mixed crystals; the curves are made up of 2 branches (on which the pure solvent seps.), meeting in an eutectic pt. (2) isoerucic with brassidinic and brassidinic with behenic give mixed crystals limitedly; the curves have 2 branches (on which the mixed crystals sep.). (3) Isoerucic with behenic acid gives mixed crystals in all proportions; the curve is represented by 1 branch that lies between the m. p. of the 2 components. Omitting erucic acid which occurs in the 1st 3 systems in which mixed crystals are not formed it is uncertain for all the other acids whether they are monomorphic or in part at least dimorphs and show isodimorphism. The types of the curves are the same whether one has 2 isomorphous components or 2 isodimorphic components provided in the 2nd case the mixed crystals may have the cryst. form of the prevalent component. As an example of this the case of formation of mixed crystals of $\text{MgSO}_4 \cdot 7\text{H}_2\text{O}$ is discussed. The study of solid solns. of org. compds. has shown that many of them may not show isomorphy in the strict sense but nevertheless can give mixed crystals reciprocally. It is thus quite probable that brassidinic, isoerucic and behenic acids although not being wholly isomorphic may give mixed crystals through phenomena of isopolymorphism. None of the curves shows the formation of compds. which eliminate the possibility that the 3rd isomer may result as an addition product of the other 2. If as has been found with many other org. compds. soly. in the solid state is an indication of similar constitution and configuration erucic acid has a different configuration than all the others. Brassidinic and isoerucic acids since they are sol. in the solid state in behenic acid must have a configuration similar to this acid, which also explains why these 2 acids give mixed crystals. This confirms M.'s previous work but does not explain the existence of 2 *trans* acids having a double bond. Further work is under way. For curves and numerical data see the original. Also in *Gazz. chim. ital.* 45, II, 208-19(1915).

E. J. WITZEMANN.

Indones. I. Synthesis of α -ethyl- β -phenylindone. R. DE FAZI. *Atti accad. Lincei* 24, II, 150-6(1915); *Gazz. chim. ital.* 45, II, 143-51(1915).—The prepn. of α,β -diphenylindone by the action of P_2O_5 on $\text{Ph}_2\text{CCH}(\text{OH})\text{CO}_2\text{H}$ (C. A. 9, 3063) suggested the possibility of obtaining derivs. of indone from cinnamic acid derivs. It was also desired to obtain cinnamic acids with different groups in the α - and β -positions. The syntheses of β -methylcinnamic (Schroeter, C. A. 1, 1988), β -phenylcinnamic (Rupe and Busolt, C. A. 2, 537) and α -methyl- β -phenylcinnamic acid (Rupe, *et al.*, C. A. 8, 1113) suggested a way of prepg. such acids. Treating $\text{EtCHBrCO}_2\text{Et}$ with PhCO_2 and Zn gives $\text{Ph}_2\text{C}(\text{OZnBr})\text{CEtHCO}_2\text{Et}$ which gives $\text{Ph}_2\text{C}(\text{OH})\text{CEtHCO}_2\text{Et}$ (a). (a) with concd. H_2SO_4 in the cold gives a transitory yellow or orange color and then an emerald-green. This green color was noted with β -diphenyllactic, β -phenylcinnamic acids and some derivs. Heyl and Meyer (*Ber.* 28, 2787 (1895)) noted that α,β -diphenylindone gave a green color with concd. H_2SO_4 ; de F. noted the same reaction

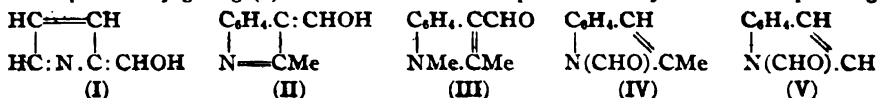
for $\text{Ph}_2\text{CCH}(\text{OH})\text{CO}_2\text{H}$ and its derivs. (*l. c.*). From (a) de F. obtained α -ethyl- β -phenylindone which gave the same reaction. Likewise α -methyl- β -diphenyllactic acid (Rupe, *et al.*, *l. c.*) and its α -methyl- β -phenylindone (to be described later) gave the same test with H_2SO_4 . This green color that these acids give with cold H_2SO_4 is a true sign of the formation of indone. Stoermer and Voht (*C. A.* 9, 1757) studied the action of ultraviolet light on the transformation of α -ethyl- and α -methylcinnamic acids into the *allo* form. They found that the stable form does not give the coloration nor the indone but the *allo* form gave the coloration with H_2SO_4 and the indone as well. This result supports the idea that the indones could be obtained by transforming the cinnamic acid into the *allo* form and dehydrating. Bakunin (*Gazz. chim. ital.* 30, I, 355(1900)) mentioned this possibility. Liebermann (*Ber.* 31, 2095(1898)) obtained truxone (the dimer of indone) by treating allocinnamic acid with concd. H_2SO_4 . In the prepn. of α -ethyl- β -phenylindone from (a) by the action of concd. H_2SO_4 in the cold the 1st step was the hydrolysis of the ester to give the free acid, a mol. H_2O was then eliminated to give α -ethyl- β -phenylcinnamic acid and finally a 2nd H_2O was removed between the CO_2H and Ph groups, giving α -ethyl- β -phenylindone (b). This method of synthesis of indones is very simple and gives a good yield: 2 g. (a) give 1 g. (b). 20 g. Ph_2CO in 60 cc. C_6H_6 (dried with Na) + 14 g. $\text{EtCHBrCO}_2\text{Et}$ + 10 g. granulated Zn heated under a condenser (CaCl_2 tube) on the H_2O bath for 2 hrs. was cooled and decompd. with dil. H_2SO_4 . The C_6H_6 soln. was sepd., washed with H_2O and on concg. sepd. tufts of white needles of (a), m. $107-8^\circ$; yield, 20 g. 2 g. (a) were added to 10 cc. concd. H_2SO_4 and after 1 day treated with small pieces of ice with careful cooling in an ice-NaCl bath. The color changes from green gradually to an intense yellow, after which H_2O is added gradually in the same way. The orange-yellow flocks sepd. are collected on a filter and dissolved in EtOH from which sep. orange-yellow shining crystals of (b), m. $92-3^\circ$. 2 g. (b) in 40 cc. EtOH + 2 g. $\text{NH}_2\text{OH.HCl}$ in 10 cc. H_2O boiled 3 hrs. sepd. on cooling α -ethyl- β -phenylindone oxime, gold-yellow needles from EtOH, m. $182-3^\circ$, gives a blood-red color with concd. H_2SO_4 in the cold. 2 g. (b) in 40 cc. EtOH + 2 g. PhNHNH_2 boiled 2 hrs. on the H_2O bath and concd. somewhat seps. on cooling α -ethyl- β -phenylindone phenylhydrazone, intensely yellow prisms from EtOH, m. $136-8^\circ$, gives a red-brown color with cold H_2SO_4 . II. Synthesis of α -methyl- β -phenylindone. *Idem* 343-8.—In continuation of the preceding expts. α -methyl- β -diphenyllactic acid (c) was prepd. according to Rupe, Stieger and Fiedler (*C. A.* 8, 1113): 20 g. Ph_2CO in 60 cc. C_6H_6 treated with 24 g. $\text{MeCHBrCO}_2\text{Et}$ and 7 g. granulated Zn as above with (a), gave 20 g. (c) as white needles, m. $101-2^\circ$. 2 g. (c) in 10 cc. H_2SO_4 treated as with (a) gave flocks of α -methyl- β -phenylindone (d), orange-yellow lamellas from EtOH, m. $86-7^\circ$, identical with that obtained by Rupe, *et al.* (*l. c.*) by the action of SOCl_2 on α -methyl- β -phenylcinnamic acid. (d) gives an emerald color with cold concd. H_2SO_4 ; a red color with cold concd. HNO_3 . One g. (d) in 30 cc. EtOH + 0.5 g. $\text{NH}_2\text{OH.HCl}$ in 5 cc. H_2O boiled 3 hrs. seps. on cooling α -methyl- β -phenylindone oxime, $\text{C}_{15}\text{H}_{15}\text{ON}$, shining yellow-green prisms, m. $199-200^\circ$, gives a blood-red color with cold concd. H_2SO_4 , ruby-red with HNO_3 , sol. in MeOH, EtOH, CHCl_3 and C_6H_6 . 1 g. (d) in 20 cc. EtOH boiled 1 hr. with 1 g. $\text{NH}_2\text{CONHNH}_2\text{HCl}$, seps. on cooling α -methyl- β -phenylindone semicarbazone, $\text{C}_{17}\text{H}_{17}\text{N}_3\text{O}$, rose-orange leaves, m. $219-20^\circ$, gives a blue color with concd. H_2SO_4 , cherry-red with concd. HNO_3 . α -Ethyl- β -phenylindone semicarbazone, $\text{C}_{18}\text{H}_{17}\text{N}_3\text{O}$, orange-yellow tufts of shining needles, m. $198-9^\circ$, was prepd. similarly and gives the same tests with H_2SO_4 and HNO_3 . 1 g. (d) in 50 cc. EtOH treated with 0.40 g. semioxamazide on the H_2O bath 1 hr. sepd. on cooling α -methyl- β -phenylindone semioxamazone, $\text{C}_{18}\text{H}_{15}\text{N}_3\text{O}_2$, as tufts of fine intensely yellow needles, m. $203-5^\circ$, gives a blue color with cold concd. H_2SO_4 , and a cherry-red color with cold concd. HNO_3 .

E. J. WITZEMANN.

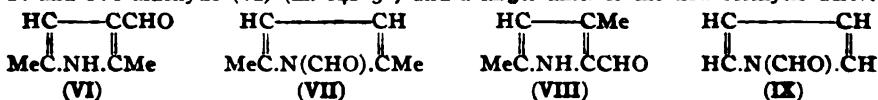
A crystallographic study of cuproammonium cyanomethyl- and benzylcyanomethylglutaconimide. FAUSTA BALZAC. Univ. Turin. *Atti accad. Lincei* 24, II, 133-7 (1915).—Guareschi (*Atti accad. Sci. Torino* 1897, 193) described some new cuproammonium compds. of some derivs. of glutaconimide which, written according to Werner's scheme, are as follows: cyanomethylglutaconimide cuproammonia (a), $(C_7H_5N_2O_2)_2[Cu(NH_3)_4] \cdot 2H_2O$; methylcyanomethylglutaconimide cuproammonia, $(C_8H_5N_2O_2)_2[Cu(NH_3)_4] \cdot 4H_2O$; ethylcyanomethylglutaconimide cuproammonia, $(C_9H_5N_2O_2)_2[Cu(NH_3)_4]$; benzylcyanomethylglutaconimide cuproammonia (b), $(C_{10}H_7N_2O_2)_2[Cu(NH_3)_4] \cdot 2H_2O$; cyanophenylglutaconimide cuproammonia, $(C_{10}H_7N_2O_2)_2[Cu(NH_3)_4]$; etc. B. has begun a crystallographic study of these compds. obtained from G. in order to study the morphotropic relations of the compds. of this group depending on the various substituents in the imide as well as the H_2O of crystn. The results with (a) and (b) which differ only in the Bz group are described here. The crystals of (a) belong to the monoclinic system and the prismatic class, $a : b : c = 1.3406 : 1 : 2.0107$, $\beta = 95^\circ 59'$. The crystals of (b) are of the triclinic system; $a : b = 0.7941 : 1$, $\alpha = 94^\circ 42' 6''$, $\beta = 121^\circ 51' 7''$, $\gamma = 69^\circ 58' 15''$. The results with these 2 compds. show that the entrance of the Bz group into the cyanomethylglutaconimide mol. causes a complete change in the cryst. form. The d. is somewhat diminished in the Bz deriv., i. e., there is an increase in the mol. vol. The Bz deriv. is slightly more colored than the other. For details cf. the original.

E. J. WITZEMANN.

Formylic and aldehydic derivatives of pyrroles and indoles. LUIGI ALESSANDRI. Florence. *Atti accad. Lincei* 24, II, 194-9 (1915).—This paper is a continuation of A.'s extended and general study of the aldehydes of the pyrrole series. Recently (C. A. 9, 1044) A. showed how from the halogenated compd. of magnesium pyrrole it is possible to obtain α - C_4H_4NCHO (a), in better yield than by Bamberger and Djerdjan's method (*Ber.* 33, 536 (1900)). Although (a) does not show the characteristic reactions of a true aldehyde (such as adding $=NOH$ to give hydroxamic acid), N, α - $C_4H_4NMeCHO$ (b) (Angeli and A., C. A. 9, 1321) seems to give these typical reactions (at least qualitatively). Moreover (a) gives a Na salt which (b) does not; so that these anomalies are explained by giving (a) Formula I. The comparative study of the corresponding



indole derivs. (II) and (III) is not so significant. While α -methylindolealdehyde (II) does not give any hydroxamic acid the N -methyl- α -methylindolealdehyde (III) gives only a trace of a salt that gives a violet color with $FeCl_3$, which A. attributes to the fact that it is an α -substituted aldehyde. Starting with the halogenated compds. of Mg indole by the action of alkyl formates, A. desired to obtain β -indolealdehyde but in this, starting either from α -methylindole or from indole itself, only a small amt. of the aldehydes were obtained. The principal products were a cryst. compd., m. 76.5° , and an oil that crystd. at low temps., isomers of the resp. aldehydes, which boiled with dil. alkali give α -methylindoles and indole, resp., as well as HCO_2H . The compds. are thus probably (IV) and (V). Plancher and Ponti (C. A. 4, 2452) obtained α, α -dimethylpyrrolealdehyde by the action of $CHCl_3$ and KOH on the pyrrole but got poor results in the prepn. of α, β -dimethylpyrrolealdehyde. By the action of alkyl formates on halogen compds. of the corresponding Mg pyrrole A. obtained a little of P. and P.'s aldehyde (VI) (m. $142-3^\circ$) and a larger amt. of the new formylic deriv.



(VII), m. 35°. With α,β -dimethylpyrrole the new aldehyde, m. 89°, is similar to α -pyrrolealdehyde in appearance; oxidized in Me_2CO with KMnO_4 it gives 2,4-dimethylpyrrole-5-carboxylic acid by which its structure was detd. The Na salts of (VI) and (VIII) heated in a sealed tube at 100° with 1 mol. MeI gave the Me derivs., resp., which through analogy with *N*-methyl- α -methylindolealdehyde are substituted at the N atom. *N*-Methyl- α,α -dimethylpyrrolealdehyde (VI), m. 96°, reacts with dihydroxyammonia and gives a cherry-red color with FeCl_3 . *N*-Methyl- α,β -dimethylpyrrolealdehyde was obtained in poor yield as an oil, could not be purified by distn., reacts in part with dihydroxyammonia, gives a brick-red color with FeCl_3 . The study of these compds. will be continued. A. prepd. a considerable quantity of α -pyrrolealdehyde (a), by his own method. A. considered that the liquid product found by Chelintzev and Terentiev (C. A. 9, 88) which they 'thought was a mixt. of pyrrole and alkyl formate might be *N*-formylpyrrole (IX). Its b. p. and other physical properties coincide closely with those of pyrrole but the N content was that of (IX); the sodium salt was obtained and analyzed. Condensed with PhNHOH it gave a compd. $\text{C}_6\text{H}_5\text{NCH:N}(\text{:O})\text{Ph}$, m. 120°, unstable in light like other *N*-Ph ethers of the oxime. In order to prep. *N*-methyl- α -pyrrolealdehyde (b) (C. A. 7, 3972), which is unstable under the conditions under which it was prepd. by F. (a) as the dry Na salt was treated with MeI in the presence of a slight excess of Me_2SO_4 in a sealed tube at 100°. The oil obtained was quite stable, distd. at low pressures and was shown to be identical with F.'s prepn. by means of the phenylhydrazone, m. 123°. (b) also gave an azine, $(\text{C}_6\text{H}_7\text{N:N})_2$, m. 120°, stable and characteristic. (b) reacts easily with dihydroxyammonia and gives the violet-blue color with FeCl_3 but the free hydroxamic acid was not isolated because of lack of material. A. found that α -methylindolealdehyde oxidized in Me_2CO with KMnO_4 gives 2-methylindole-3-carboxylic acid; Plancher (*Atti acad. Lincei* 16, I, 130(1907)) working in alk. soln. obtained only acetylanthranilic acid. It was found that EtNO_2 acting on α -methylindolemagnesium iodide in the presence of Na gave a small yield of 3-nitro-2-methylindole, but the *N*-substituted deriv. may have been formed also. The exptl. details will be published later.

E. J. WITZEMANN.

The crystalline form of α -trinitrotoluene. E. ARTINI. *Atti accad. Lincei* 24, II, 274-9(1915).—A. has undertaken a crystallographic study of the 6 isomeric trinitrotoluenes, at the suggestion of Körner, who with Contardi (cf. C. A. 9, 66, 1478, 3218) isolated the 3 remaining unknown isomers. K. supplied A. with many crystals obtained from several solvents for which the individual data are given. α -Trinitrotoluene belongs to the monoclinic system and the prismatic class, $a : b : c = 1.64047 : 1 : 0.61936$, $\beta = 89^\circ 29' 9''$. Friedländer (*Z. Kryst.* 3, 168(1879)) obtained $a : b : c = 1.6753 : 1 : 0.6354$, $\beta = 90^\circ 0'$, when transformed according to the new orientation. The d. = 1.654, mol. wt. 227.07, mol. vol. 137.29; the values for the relation of the topic axes are $\chi = 8.4181$, $\psi = 5.1315$, $\omega = 3.1782$. 1,3,5-Trinitrobenzene belongs to the rhombic system and bipyramidal class. The d. = 1.688, mol. wt. 213.054 and vol. 126.22. The topic axes $\chi = 8.5504$, $\psi = 5.4064$, $\omega = 3.2757$ bring out the analogy with α -trinitrotoluene. For crystallographic details cf. the original. E. J. WITZEMANN.

The reaction of nitroprusside with thiourea. LIVIO CAMBI. Milan. *Atti accad. Lincei* 24, II, 434-41(1915).—C. recently showed (C. A. 9, 451) that the various color reactions given by ketones with nitroprusside are due to the formation of a complex ion containing the nitrosoketone group. There is a condensation between the NO group of the nitroprusside and ketone like that between alkyl nitrites or NO derivs. in alk. soln. with compds. having a mobile H atom. Of these color reactions of nitroprusside those with sulfides and some alkali mercaptans remain unexplained in which probably $[(\text{CN})_5\text{FeNO}]^- + \text{SR}' \longrightarrow [(\text{CN})_5\text{Fe}^{\text{II}}(\text{NO})^{\text{III}}\text{SR}]^{\text{II}}$ takes place. As an example of this type C. has studied the action of nitroprusside on thiourea which Hof-

mann (*Ann.* 311, 28(1900)) found gave a red-violet salt, $[(\text{CN})_5\text{Fe}^{\text{III}}\text{N}(:\text{O})\text{SC}(\text{NH})\text{NH}_2]\text{Na}_3$. C. observed the ratio 1 Fe:7 N instead of 1 Fe:8 N as in the formula of H. He also observed that N_2 is evolved. From the fact that alkali nitrites in weakly acid media transform $\text{CS}(\text{NH}_2)_2$ into HNCS by way of NH_2CSOH with the evolution of N_2 , C. was led to suppose that the NO group reacts with the NH_2 group to give $[(\text{CN})_5\text{Fe}^{\text{II}}\text{NONHCOSH}]\text{Na}_3$ containing the nitrosothiocarbamic acid group. The aquoferrocyanide indicated was found. Moreover nitro-prusside acting upon $\text{CS}(\text{NH}_2)_2$ in MeOH in the presence of excess of NaOMe gives an orange-yellow salt, which is probably $\text{Na}_7[(\text{CN})_5\text{Fe}^{\text{II}}\text{NONHCOS-Fe}^{\text{II}}(\text{CN})_5]$ and which in H_2O is hydrolyzed to give the red salt of H. Adding soda to a $\text{H}_2\text{O-MeOH}$ soln. of the red salt gave a new orange-yellow brown salt (a), $\text{Na}_3[(\text{CN})_5\text{FeNONCOS}]$, which is the salt of the nitrosothiocarbamic acid present in the complex; this salt is hydrolyzed by H_2O , giving the original red salt. Kept *in vacuo* it decomps. in part in contact with H_2O to give N_2 . The red salt is decomposed by Ag and Hg^{II} salts, giving NO in the ratio 1 NO :1 Fe. The salt (a) similarly treated gives 0.5 NO :1 Fe. On reducing the red salt with Na-Hg $[(\text{CN})_5\text{Fe}^{\text{II}}\text{NH}_2\text{NHCOSH}]\text{Na}_3$ (b) is formed in which the NH_2NH group reduces Hg^{II} salts, HgO , Ag salts and Fehling's soln. in the cold with the evolution of N_2 . $\text{Br-H}_2\text{O}$ added evolved N_2 and gave no nitroprusside, while the red salt gives no N_2 and forms nitroprusside. H. considered the Fe in the red salt as trivalent on the basis of its action with FeCl_3 with which it gives a green color, or ppt. C. found that ferrocyanides containing nitrosoketones give colors. The reaction with alkalis is that of Fe^{II} . Hofmann's salt was at first prepared according to his directions. Modifications of H.'s method were tried: making the components react in alk. carbonate media, in the cold or at $70-80^\circ$, adding NaNO_2 , but the yield was always small. The analysis corresponds closely to 3 Na:1 Fe:1 S:7 N. Using aq. solns. but a strong excess of concd. alkali a change from the red-violet color to orange is noted and the salt (a) is pptd. by adding MeOH in excess; this deliquescent salt freshly prepd. dissolved in H_2O gives the red-violet color in dil. and a red-orange color in concd. solns. A concd. soln. of the red salt cooled to 0° and treated with small amts. of semiliquid Na-Hg gives a golden yellow color gradually and when treated with EtOH seps. (b) as an oil which showed no tendency to cryst.; after washing with EtOH it was dried *in vacuo* and gave green-yellow deliquescent granules sol. in H_2O . The analysis corresponds to (b) except the Na and these variations are explained by the equil.: $\text{Na}_3[(\text{CN})_5\text{FeN}_2\text{H}_2\text{COSH}] + \text{NaOH} \rightleftharpoons \text{Na}_4[(\text{CN})_5\text{FeN}_2\text{H}_2\text{COS}] + \text{H}_2\text{O}$, which would certainly be influenced by varying conditions of concn. (b) is quite unstable; it absorbs O_2 in aq. soln., giving at first a violet color, then greenish and decomps. with sepn. of Fe_3O_4 . Its other reactions were described above. An alc. soln. of nitroprusside was treated with $\text{CS}(\text{NH}_2)_2$ and then NaOMe . The reaction was slow and a dark ochre-colored powder sepd. and N_2 was evolved. After some days the salt $\text{Na}_7\{[(\text{CN})_5\text{Fe}]_2\text{CSNHNO}\} \cdot \text{H}_2\text{O}$ was filtered off and washed with MeOH and Et_2O . This salt is deliquescent; its aq. soln. is dark orange and on standing slowly becomes red-violet; on heating the soln. it decomps. to give Fe_3O_4 , $\text{Fe}(\text{CN})_2$ and the red salt. The acids NONHCOSH and NH_2NHCOSH which enter into these complexes are not known but the corresponding O acids are known; the former as the salt of Thiele, NONKCO_2SK , and the latter as $\text{NH}_2\text{NHCOS}_2\text{H}$.

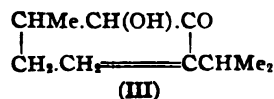
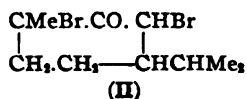
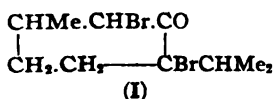
E. J. WITZEMANN.

Some derivatives of methylvanillin and a new product of condensation. Preliminary note. B. L. VANZETTI. Univ. Padoa. *Atti accad. Lincei* 24, II, 467-70 (1915).—In the study of "isolivile" (Körner, Vanzetti, *C. A.* 6, 1291) V. prepd. veratril and veratroin and V. since has undertaken to prep. veratrylic acid corresponding to benzoic acid. V. has learned that Fritsch (*Ann.* 329, 37(1903)) too was unable to obtain cryst. veratroin. Veratrylic acid (3,4,3',4'-tetramethoxybensilic acid) (a) cannot be obtained

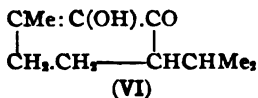
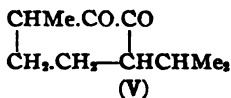
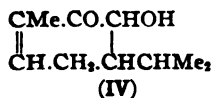
so easily from the keto compds. according to the well-known transposition and oxidation as in the case of benzil, anisil, piperonil, etc., in which the reaction is nearly quant. It seems that the presence of 4 OMe groups renders the mol. inert to this reaction and better adapted to others. Thus benzoin is transformed into benzilic acid by a current of air in the presence of alkali, but veratroin is oxidized quant. to veratril but no farther. Treatment of veratril for 20 hrs. at the b. p. in aq. KOH was unsuccessful. On adding alc. or better with EtOH-KOH a small yield of (a); $C_{19}H_{20}O_7 \cdot H_2O$, was obtained. (a) crystallizes as rosetts of silky needles, m. about 68° , loses H_2O at 105° , browns about 150° . With the hope of finding a more convenient way of prepg. (a) veratric acid was converted into the chloride, m. $70-1^\circ$, which with 1 mol. veratrole + $AlCl_3$ gave [3,4-(MeO) $_2$ C $_6$ H $_3$] $_2$ CO, m. 144.5° ; this by the addition of MeMgI gave diveratrylmethylcarbinol, m. $95-6^\circ$, and diveratrylethylene, which by oxidation gave (a). The compds. will be described in detail elsewhere. The method is not convenient. In treating veratril with KOH at the m. p. mostly veratric acid is formed. The yield of (a) varies much with the temp. and other more complicated transformations cause a dark color and a resinous mass. From this resin by the successive action of solvents an orange-yellow cryst. compound was obtained; it is insol. in H_2O and alk. solns., sol. in org. solvents, sublimes, gives red-brown needles from AcOH, which at $110-20^\circ$ give an orange compd., m. 198° , gives a blue-green color with cold concd. H_2SO_4 which becomes red and on dilg. ppts. a red powder. The compd. is that of veratril with a little less H. In appearance and behavior it is similar to the derivs. of condensed nuclei like phenanthrene or anthracene. It is indifferent to SO_2 and alkali bisulfites. This compd. is to be studied further.

E. J. WITZEMANN.

Process of reduction and oxidation in the terpene group. GUIDO CUSMANO. *Atti accad. Lincei* 24, II, 520-7 (1915).—Previously C. has shown (*C. A.* 8, 1760, 3021) that direct bromination of menthone and tetrahydrocarvone gives (I) and (II) and these

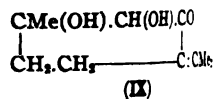
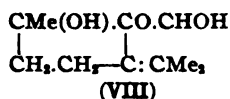
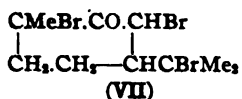


with dil. alks. give "diosphenol" or buccocamphor (VI), a component of the essence of *Diosma cretata*. This result may be explained by assuming that alkali acting on the halogen gives the unsatd. alcs. (III) and (IV) and these by mutual oxidation and re-



duction between the double bond and secondary carbinol give (V) and (VI). C. wished to know if the above interpretation may be verified especially in the transformation of (III) and (IV) into (V). For this purpose it was desired to prep., starting from a halogenated ketoterpene and by eliminating the halogen with alkali, compds. containing a secondary carbinol and a double bond in order to det. if the 2 functions are mutually modified as suggested above. C. used tribromotetrahydrocarvone (a) (Wallach, *Ann.* 286, 127), prepd. from 1,8-dibromotetrahydrocarvone. The position of the 3rd Br was unknown but was thought to be 3. Thus (a) should behave with dil. alkalies like (II). It did not do this. (a) with 2.5% alkali in the cold reacts quant. thus: $C_{10}H_{16}Br_3O + 4NaOH \rightarrow C_{10}H_{17}O_2Na + 3NaBr + H_2O$. $C_{10}H_{17}O_2Na$ is a salt of a mono- CO_2H acid having 2 OH groups and a double bond which with dil. AcOH + PbO_2 gives CO_2 and $Me_2C:CHCH_2CH_2Ac$; the same result is obtained by heating to 250° . In aq. soln. with Pt black this salt absorbs 2 atoms H and the new compd. heated dry gives $Me_2CH.(CH_2)_2Ac$. These facts indicate that the acid is $Me_2C:CHCH_2-$

$\text{CH}_3\text{CMe}(\text{OH})\text{CH}(\text{OH})\text{CO}_2\text{H}$ (*b*) in which the tertiary OH and double bond are derived from Br atoms 1 and 8 in (*a*) and OH in the CO_2H group from Br atom 3. The formula of (*a*) is (VII). The alkali acting on (VII) gives (VIII) which by hydrolysis between



C atoms 3 and 4 gives the aldehyde hydrate, $\text{Me}_2\text{C} : \text{CHCH}_2\text{CH}_2\text{CMe}(\text{OH})\text{CH}(\text{OH})\text{CH}(\text{OH})$, and this by reciprocal oxidation and reduction gives (*b*). (VIII) may also give the tautomer (IX) which by more rapid hydrolysis than (VIII) between C atoms 3 and 4 could give (*b*). This mechanism is more in accord with the mobility of the terpenes. 17 g. powdered (*a*) placed in a 2.5% soln. of 7.2 g. NaOH was completely dissolved after agitating 30 hrs. The neutral soln. was concd. on the H_2O bath until crystn. began; 10 g. $\text{C}_{10}\text{H}_{17}\text{O}_4\text{Na}$ were obtained as shining white lamellas. A similar result is obtained by treating (*a*) with KOH; the K salt is liquid. The Na salt treated with AgNO_3 ppts. the *silver salt*, $\text{C}_{10}\text{H}_{17}\text{O}_4\text{Ag}$; the *barium salt*, $(\text{C}_{10}\text{H}_{17}\text{O}_4)_2\text{Ba} \cdot 2\text{H}_2\text{O}$, was obtained similarly with $\text{Ba}(\text{OH})_2$. Attempts to esterify the acid $\text{C}_{10}\text{H}_{17}\text{O}_4$ by treating its Na salt with a mol. amt. of Me_2SO_4 gave shining white scales containing Na and having an acid reaction corresponding to the acid salt $\text{C}_{10}\text{H}_{17}\text{O}_4\text{Na} \cdot \text{C}_{10}\text{H}_{17}\text{O}_4$. In the prepn. of (*a*) besides the pure solid (*a*) a liquid part was obtained. This treated with NaOH gave a large amt. of $\text{C}_{10}\text{H}_{17}\text{O}_4\text{Na}$ and a *compound*, $\text{C}_{10}\text{H}_{19}\text{O}_4$, shining white needles from dil. EtOH, m. 76° , having the odor of phenol, gives a black-violet color with FeCl_3 , is pptd. by CO_2 from the alk. soln., and is volatile with steam. 2 g. of the Na salt dissolved in 50% AcOH were treated with 2.5 g. PbO_2 with slight warming CO_2 was evolved. On distg. with steam a colorless oil with a banana odor, which treated in H_2O or EtOH with $\text{NH}_2\text{CONHNH}_2$, AcOH gave methylheptenone semicarbazone m. 137° , was obtained identical with the same compd. derived from cineolic anhydride 0.5 g. of the Na salt heated in a small flask with a bare flame gave the same oil and semicarbazone successively. 2 g. of the Na salt in 50 cc. H_2O treated with a few cc. Pt black and agitated with H_2 absorbed 220 cc. at 25° and 764 mm. The mixt. was filtered and concd. and gave a *sodium salt*, $\text{C}_{10}\text{H}_{19}\text{O}_4\text{Na}$, flat, white needles; the *succinic salt*, $\text{C}_{10}\text{H}_{19}\text{O}_4\text{Ag}$, shining white laminas. This Na salt decompd. as above gave methylheptanone, recognized by its semicarbazone, m. 158° .

E. J. WITZMANN

The heat of formation of organic addition compounds. IV. Picrates. B. I. VANZETTI AND V. GAZZABIN. Univ. Padoa. *Atti accad. Lincei* 24, II, 527-32 (1915). —In a preceding paper (C. A. 7, 2222) the heats of combination of picric acid with chemically neutral substances like C_{10}H_8 , eugenol and isosafrol were reported. The values obtained were quite low especially in the case of C_{10}H_8 which has no free valence except the unsatd. valences in the C_6H_3 ring. The heat of formation of the picrate of C_{10}H_8 is only 0.1 cal. per gram mol. This is ascribed to the ethylene bond in these compounds. Additional expts. on the $\text{C}_6\text{H}_4\text{N}$ group have been performed. It is desired to show the difference that exists between combinations of picric acid and tertiary amines ($\text{C}_6\text{H}_4\text{N}$, quinoline, etc.) and the corresponding hydrogenated secondary compds. (piperidine, etc.). Later the expts. are to be extended to the pyrrole group and natural bases (like nicotine, coniine, etc.). The results show that the greatest values were obtained with piperidine as compared with $\text{C}_6\text{H}_4\text{N}$, which was expected from the nature of these 2 bases. $\text{C}_6\text{H}_4\text{N}$ and quinoline give nearly equal values. Tetrahydroquinoline gave very low values contrary to expectation. The heat of formation was detd. with a Thomsen calorimeter by pouring the 2 solns. simultaneously into a satd. soln. of picric acid. The mol. heat of combination of $\text{C}_6\text{H}_4\text{N}$ with picric acid is 13.84 cal.; at a concn. of about 0.22% in H_2O pyridine picrate is about $\frac{2}{3}$ dissociated; at 0.5% in EtOH it

is $\frac{1}{4}$ dissociated. The mol. heat of combination of piperidine with picric acid is 20.56 cal.; at 0.5 to 0.6% in H_2O the picrate is less than 0.5 dissociated into its components; at 0.5 to 2% in 95% EtOH it is $\frac{11}{20}$ combined as the picrate and at 4% concn. it is $\frac{11}{20}$ picrate. The mol. heat of combination of quinoline with picric acid is 13.2 cal.; with tetrahydroquinoline it is 9.9 cal.

E. J. WITZEMANN.

Reaction of esters with magnesium organic compounds. II, III. G. L. STADNIKOV. *J. Russ. Phys. Chem. Soc.* 47, 2037-44, 2115-20(1915).—In a former article (*C. A.* 9, 3052) it was shown that the interaction of esters with iodo-Mg alcoholates of the higher alcs. under certain conditions yields both plain and mixed ethers. It is now shown that the temp. has great influence in this reaction. Thus while under the usual conditions of carrying out Grignard's reaction when the ingredients are mixed slowly and under cooling the product is an alc., if the ester is added all at once to the Mg org. compd. so that the temp. of the mixt. rises quickly the iodo-Mg alcoholate formed in the 1st stage interacts with the ester to give a good yield of ether, together with a little alc. In this way $PhMgBr$ (a), treated under these conditions with $BzOMe$, gives chiefly Ph_3COMe and some Ph_3COH (b). Similarly when to (a) $BzOCH_2Ph$ is added without cooling the product is a mixt. of Ph_3COCH_2Ph (c) and (b). If the last reaction is carried out at 100° the yield of (c) increases, while that of (b) decreases. If an excess of $AcOEt$ is added all at once to $PhMgBr$ (d) without cooling the product consists of 80% of $Ph_3C:CH_2$ (e). When $AcOCH_2Ph$ is added in small portions at a time and with const. cooling to (d) the result is $(PhCH_2)_2O$ and Ph_3MeCOH (f) but no (e). If, however, the mixt. is permitted to get hot the reaction yields $PhCH_2OH$, (f) and (e). Most probably the formation of the unsatd. hydrocarbon $C_{10}H_{18}$ previously obtained by the action of $AcOEt$ on the iodo-Mg alcoholate of terpineol (*C. A.* 9, 3051) is due to the same reaction as yields (e), i. e., at first an acetate of terpineol is produced which reacts with MgI_2 to give $C_{10}H_{17}I$, and this at the elevated temp. interacts with $EtOMgI$ to give $EtOH + C_{10}H_{18} + MgI_2$.

H. M. GORDIN.

Addition of hydrogen to acetylene derivatives. VI. Hydrogenation of an acetylene alcohol. YU. S. ZAL'KIND. *J. Russ. Phys. Chem. Soc.* 47, 2045-50(1915).—In a former article (*C. A.* 9, 2510) it was shown that with colloidal Pd as catalyzer the hydrogenation of γ -glycols of the C_2H_2 series takes place with a break in the velocity of reduction corresponding to the addition of 2 H, after which the reduction to satd. compd. is much slower, while with Pt black no such breaks occur, the velocity of reduction continually diminishing from the beginning to the end according to the equation for monomol. reactions. In order to see whether other C_2H_2 derivs. behave in the same manner, $Me_3C(OH)C:CPh$ (a) was hydrogenated with Pd as catalyzer. It was found that in this case no break occurs in the velocity of reduction. The product of complete reduction was *dimethyl- β -phenylethylcarbinol*, $Me_3C(OH)CH_2CH_2Ph$, thick liquid of a very agreeable odor, $b_{11} 144^\circ$, $d_4^{20.7} 0.9978$, $d_4^{20.7} 0.9626$, $n_D^{20.7} 1.50775$, is not colored by H_2SO_4 ; *acetate*, $C_{11}H_{18}O_2$, thick, agreeably smelling liquid, $b_{17} 131^\circ$, $d_4^{20.7} 0.9987$, $d_4^{20.7} 0.9831$, $n_D^{20.7} 1.4882$.

H. M. GORDIN.

Oxidation of 2,3-hypogeic acid with alkaline permanganate and with Caro's reagent. N. ZIMOVSKII. *J. Russ. Phys. Chem. Soc.* 47, 2121-4(1915).—Alk. $KMnO_4$ oxidizes 2,3-hypogeic acid, $Me(CH_2)_{11}CH:CHCO_2H$, to a 2,3-dihydroxypalmitic acid, $Me(CH_2)_{11}[CH(OH)]_2CO_2H$ (a), m. $125-7^\circ$, freezes $123-1^\circ$, while Caro's reagent oxidizes it to a stereoisomer of (a), m. $105-6.5^\circ$, freezes $102.5-100^\circ$. The soly. of the 1st is 1.43 parts in 100 parts of alc. at 18° , and 0.15 in Et_2O at 19° , while that of the 2nd at the same temps. is 7.94 in alc. and 1.39 in Et_2O .

H. M. GORDIN.

Crystallization of diphenyl ether (ДАУЗЭР) 2.

II. BIOLOGICAL CHEMISTRY.

WILLIAM J. GIES, EDGAR G. MILLER, JR., PAUL E. HOWE.

A. GENERAL.

FRANK P. UNDERHILL.

Decomposition of lactic acid by killed yeast. V. I. PALLADIN AND D. A. SABININ. *Bull. acad. sci. Petrograd* 1916, 187-94.—For the alc. fermentation of lactic acid (a), P. and S. offer the assumption that it takes place under the influence of AcH with the intermediate formation of pyrroacemic acid (b), which yields CO₂ and continuously regenerates AcH: $\text{MeCH(OH)CO}_2\text{H} + \text{AcH} = \text{AcCO}_2\text{H} + \text{EtOH}$; $\text{AcCO}_2\text{H} = \text{CO}_2 + \text{AcH}$. In order to test this assumption and to have (b) in nascent state, (a) was fermented with zymin, both in presence and absence of (b), and the CO₂, AcH and EtOH produced detd. The results showed that (b) promotes the decompn. of (a) by killed yeast, though to a lesser extent than methylene blue (Harden and Norris, *C. A.* 10, 204). The fermentation of (a) by zymin gives no greater amt. of AcH than is given by (a) alone with zymin. Hence no AcH comes in this reaction from (a). The amt. of alc. in these expts. was considerably smaller as compared with the CO₂ than is the case in normal alc. fermentation. Various possible explanations are suggested for this predominance of CO₂, but none is given preference. It will require further work to clear up this point, as well as definitely to prove the formation of (a) in ordinary alc. fermentation.

H. M. GORDIN.

The retention of activity by urease and by oxidase after exposure to the temperature of liquid air. JOSEPH S. HEPBURN AND CHARLES B. BAZZONI. *J. Franklin Inst.* 180, 603-5 (1915).—An aq. soln. of urease retained 96.29% of its initial activity after having been kept in a glass container in liquid air for 100 hrs.; the same soln. retained but 44.39% of its initial activity after having been kept at 20° for 100 hrs. After an aq. soln. of cresol tyrosinase (oxidase) had been kept in liquid air for 3.5 hrs. it retained the power to produce a cherry-red color with Witte peptone plus *p*-cresol.

JOSEPH S. HEPBURN

Bubble formation in tonometers. A. URSPRUNG. *Ber. deut. botan. Ges.* 33, 140-53 (1915).—U. discusses the formation of bubbles in tonometers and compares the processes taking place in the cell. By "tonometer" is meant all apparatus which is used to determine the cohesion of fluid. Bubble formation, in the opinion of the author, takes place in the manner described by Gerenz in cases of supersaturated solutions.

B. HOROWITZ

On the effects of various substances (electrolytes, nonelectrolytes, alkaloids, etc.) upon the urease of soy-bean. NAOSUKE ONODERA. Univ. Coll., London. *Biochem. J.* 9, 544-74 (1915).—The inhibitory action of acids on urease is a function of hydrogen-ion concn. and of surface tension. The inhibitory effect of NaOH is due to the hydrogen-ion concn., but that of ammonia has some further factor. The effects of neutral salts are due, to a certain degree, to the alkalinity of metal bases. The effects of alcohols and aldehydes were also studied.

B. H.

Processes of calcification and of ossification. I. Calcium carbonate formation in presence of colloids. L. SABBATANI AND I. SALVIOLI. *Atti r. ist. Veneto* 71, II, 1057-73 (1912).—While the biologic factors producing calcification in bones have been well studied, the chem. and physico-chem. factors are only slightly known. All animal liquids and tissues contain salts of Ca, phosphates and carbonates, but only at certain anatomical points and under detd. physiological and pathological conditions will there be pptn. of carbonates or phosphates of Ca, when the concn. of the constituents of the Ca salts reaches a critical value. Potential causes for fixation and accumulation of

Ca salts in calcification may be (A), chem. combination of Ca salts with organic substances; (B) variations in the nature of the solvent, which is here essentially H_2O ; (C) variations in the product of solubility through increase of concn. of the acid ion (phosphoric, carbonic); (D) increase of concn. of the Ca salt (carbonate or phosphate) in consequence of osmotic work of the tissue, comparable in its effect to an internal secretion; (E) increase in concn. of the Ca salt through positive adsorption, effected by the organic constituents of the tissue. The animal organism in its entirety and with respect to Ca salts in the body and to calcification, represents a 2-phase system, implying a state of stable equil. and a reversibility of the process. From the nature of the union of mineral substances with the organic substance, the deposition of Ca salts in processes of calcification and ossification does not compare with their pptn. in H_2O , but to their pptn. in presence of colloids. Ppts. formed in presence of colloids are not only of diff. cryst. forms than the usual calcite rhombohedron, but are really new products in which the colloids exist intimately united with the mineral substance. The authors first exptd. with egg albumen, which was dild. with 3 vol. H_2O , well shaken and filtered. This soln. was variously dild. and mixed (at 12°) with solns. of Na_2CO_3 and $CaCl_2$ in equimol. proportions. After shaking, a little of the ppt. was collected with a pipet and observed under the microscope. Comparisons were made with ppts. from solns. free from albumen. From albumen solns. the deposits were knot-like, spheroidal, and slightly oval, while albumen-free solns. gave rhombohedral forms, and only exceptionally were rounded forms observed. The same knot-like, spheroidal forms were observed when smaller quantities of albumen were used, with less concn. of the reagents; but with the diminishing quantity of albumen, rhombohedral crystals began to form, which were not of good shape and had blunted angles. The rhombohedral crystals became more well-formed, and increased relatively in numbers with decreasing concn. of albumen, until finally the spheroidal crystals completely disappeared. Similar observations were made using lime H_2O and CO_2 soln. instead of Na_2CO_3 and $CaCl_2$. The albumen must be present at the beginning of the reaction. If it is added only 30 sec. later, the crystals assume the characteristic form of those pptd. in pure H_2O . Similar expts. were made and similar results obtained with ox-blood serum, also with liquid gelatin, though more slowly. By slight change of method the same results were obtained with solid gelatin. Gum arabic and peptone also gave rounded forms. The velocity of the reaction between $CaCl_2$ and Na_2CO_3 is very much less in presence of colloids than in H_2O , but this slowness is not the cause of the rounded, knot-like crystals, because the reaction carried out in concd. glycerol, although exceedingly slow, yields crystals identical with those pptd. in H_2O . Neither viscosity nor high density of the medium are causative factors. Histological observations with high magnification show that the colloid is intimately united with the carbonate in the crystals, and under polarized light they behave exactly like osseous substance. When burned, after washing and drying, they blacken and liberate vapors which have the odor of burnt horn and which change red turnsole paper to blue. An analysis of the sample pptd. in presence of egg albumen (after centrifugal washing and drying *in vacuo* over $CaCl_2$) gave 84.5% $CaCO_3$ and 15.5% organic substance. The rounded crystals suspended in H_2O and treated with $AcOH$ gave CO_2 ; the liquid became transparent but not perfectly limpid, and under the microscope showed rounded forms of the same shape as the original crystals, and similar to the photomicrographic forms obtained on treating bone with acids. No insol. forms are obtained from the rounded crystals from gum arabic and peptone after treating with $AcOH$, because these colloids occur only in the hydrosol state, while the others, occurring in both hydrosol and hydrogel states, change from the 1st to the 2nd on pptn. with $CaCO_3$, and at the time of this change there probably takes place also an adsorption,

causing the intimate union of the protein and the calcareous substance, the adsorption being the more intense, the greater the surface of the adsorbing body and the finer the subdivision.

S. LEVY.

The variations in reaction of the blood of different species as indicated by hemolysis of the red blood cells when treated with acids or alkalis. JAMES G. CUMMING. *J. Infect. Dis.* 18, 151-79(1916).—The chem. index of hemolysis is described as the % of a chem. which will hemolyze a 1% suspension of red cells in a given length of time. The time index is the length of time required by a given concn. of a chem. to produce complete hemolysis of the same amt. of red cells. For the 15 min. hemolytic system there is a marked difference in the chem. requirements (NH_3 , NaOH , HCl) for some species, while the difference is not so marked for others. For this system one of the 3 chem. hemolysins may be of the same % for 2 species. Invariably there appears, however, a difference in the % requirement for either one or both of the other 2 chem. hemolysins. The NH_3 hemolytic time indices divide the animals tested into 4 fairly distinct groupings. The position of the NaOH hemolytic time indices of the different species corresponds closely to that of the NH_3 indices. There is no special arrangement of the HCl time indices for the different species with relation to the alk. indices. By the use of the chem. and hemolytic time indices blood-cell suspensions of different species can be identified with a considerable degree of accuracy. By increasing the % of blood from 1% to 10% a greater variation in the time indices of different species may be found. Alk. hemolysis may be considered to be due to the hydroxyl group, and acid hemolysis due to the H ion. The hemolysis of the red blood cells may be used as an indicator to det. the degree of acidity or alk. of certain solns. As an indicator the cells are affected by the isotonicity of the blood suspension. Hemolysis may be an aid in detg. mol. wts. Alk. hemolysins may be influenced by acids, and acid hemolysins by alkalis. Both acid and alk. hemolysins can be influenced by the neutral-salt content of the suspension. In most of the specimens tested there was shown a distinct variation between the normal and pathological blood of the same species. The time indices in the majority of the latter specimens were increased or decreased in comparison with the normal. It is possible that the variation between the normal and pathological specimens may be accounted for by increased alkalinity or decreased acidity, or by the variation in the neutral-salt content.

JULIAN H. LEWIS.

Brief contributions to biochemistry. JACOB ROSENBLUM. Pittsburgh. *Biochem. Bull.* 5, 22-5(1916). I. Report of a chemical examination of the brain of a luetic fetus. II-V. Chemical analyses of human hydramnios fluid, normal human pericardial fluid, normal human bile and human cerebrospinal fluid. VI. The absence of creatine and creatinine from human cerebrospinal fluid.—200 cc. of cerebrospinal fluid collected from different cases and examd. by the Jaffé method showed no trace of either creatine or creatinine. VII. A modification of Gerhardt's test for diacetic acid in urine.—Pour about 5 cc. of urine on top of 5 cc. of 10% FeCl_3 soln. and if diacetic acid or other substances that form wine colors with FeCl_3 are present, a fine port-wine color appears in the zone of contact. The ppt. of FePO_4 does not interfere with the test if performed in this manner.

A. P. LOTHEOP.

The stability of the growth-promoting substance in butter fat. THOMAS B. OSBORNE AND LAFAYETTE B. MENDEL. Conn. Agr. Expt. Station and Yale Univ. *J. Biol. Chem.* 24, 37-9(1916).—Butter "oil" (cf. C. A. 9, 2263), in which the growth-promoting substance of butter is more concd. than in the original fat, gradually deteriorates and within a year almost completely loses its characteristic potency in promoting growth. On the other hand, the growth-promoting substance in butter fat is very stable under ordinary conditions of storage and samples were found to be efficient more than a year and two months after their prepn.

A. P. LOTHEOP.

Comparative studies in calcification. J. H. MUMMERY. *Proc. Roy. Soc. Med.* 8, *Odontological Sec.* 6-32(1915).—The article includes a description of osmotic growths in colloidal soln. A. H. RAHE.

Urease, an enzyme present in soy beans. K. R. LABBERTE. *Pharm. Weekblad* 52, 1428-40(1915).—L. obtained the active form of the urease by shaking the powder of the soy bean with 10 times its weight of water for 1 hr., centrifuging, and filtering. The action of this ext. on urea solns. was studied by mixing known quantities of the 2 solns., allowing the reaction to proceed for a definite length of time, and titrating the $(\text{NH}_4)_2\text{CO}_3$ formed with standard acid, using dimethylaminoazobenzene as indicator. The results are summarized as follows: (a) The decompn. of urea is not a monomolecular reaction; (b) the av. values of the reaction consts. follow the temp. law of Arrhenius; (c) the reaction velocity is proportional to the enzyme concn.; (d) the catalytic effect of an enzyme soln. is definite and proportional to the amt. of free enzyme; (e) the reaction product retards the reaction; (f) the method can be used for the accurate detn. of urea; (g) acetamide is not hydrolyzed; (h) $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, $\text{Na}_2\text{SO}_3 \cdot 7\text{H}_2\text{O}$, and H_2S decrease the reaction velocity, H_2S only slightly. P. A. v. d. MEULEN.

The capacity for adsorption of living yeast (ROHLAND) 2.

B. METHODS AND APPARATUS.

STANLEY R. BENEDICT.

Demonstration of bubble formation in water of variable air content. A. URSPRUNG. *Ber. botan. Ges.* 33, 108-12(1915).—A simple method for demonstrating the significance of the air content in bubble formation. B. H.

Colored turpentine obtained with the help of fat dyes; the use of "yellow glycerol" (Gelbglycerin) as a reagent for wood and cork. M. PLAUT. *Ber. deut. botan. Ges.* 33, 133-9(1915).—A consideration of the prepn. and use of turpentine in biological technic. B. H.

Volumetric estimations of total sulfur and sulfates in small quantities of urine. JACK C. DRUMMOND. King's College, London. *Biochem. J.* 9, 492-507(1915).—D. makes use of the benzidine method. The greatest care must be paid to the details of the technic of filtration, as follows: A 5 cm. funnel fitted into the neck of a 250 cc. filtering flask, carries a small perforated porcelain filtering disk of 1 cm. diameter. A suspension of filter paper pulp is poured into the funnel and sucked dry upon the porcelain disk by means of a filter pump. The layer of filter paper should not be thicker than 1-2 mm. The benzidine sulfate ppt. can now be directly poured on to the filter, and filtered by partial vacuum. Care must be taken to prevent the ppt. at any time from sucking dry upon the filter, as otherwise it will be obtained in a flaky condition and will not be attacked by the alkali during the titration. (Should the flakes appear, dissolve the ppt. in an excess of standard alkali by warming, and titrate the excess of alkali with standard acid.) The pressure is, therefore, greatly released at the moment before the precipitate sucks dry upon the filter. The vessel in which the precipitation has been carried out is then washed out into the funnel with 2 washings of about 2-3 cc. of a satd. soln. of benzidine sulfate in distd. water, and the washings drawn through the filter by gentle suction, again taking care to prevent the ppt. from being sucked dry. The ppt., together with the filter paper and porcelain disk, is transferred by means of a clean glass rod into the vessel in which the pptn. was carried out, and the rod and funnel washed into it with a fine jet of distd. water. The suspension of benzidine sulfate and filter paper is heated to boiling and titrated while hot with 0.2 N KOH. A dil. soln. of phenolphthalein, or a drop or two of a satd. alc. soln. of methyl red, may be used as indicator. A blank should be run upon the reagents. *Inorganic sulfates in urine:* 5 cc. of urine are measured into a 50 cc. beaker, acidified with 0.5 cc. HCl

(1 concd. HCl :3 H_2O), and 20 cc. of the benzidine reagent are then added. Allow the ppt. to settle for 5 min. and filter upon a small filter-paper pulp as described above. Transfer the ppt. to the original beaker, and titrate at the boiling pt. with 0.2 N KOH . Even 2 cc. of urine may be used for an estn. *Total sulfates*: 5 cc. urine are measured into a 25 cc. wide-mouthed Erlenmeyer flask, and 0.5 cc. HCl (1 concd. HCl :3 H_2O) is added. A small glass funnel inserted in the neck of the Erlenmeyer acts as a reflux trap to prevent spurting and undue concn. of liquid. Boil the liquid gently on a sand bath for 30-40 minutes. Keep the volume of liquid fairly const. Now cool, wash the funnel and neck of flask with a fine jet of distd. water, and add 20 cc. of the benzidine reagent. Allow the ppt. to settle for 5 min. and proceed as with inorg. sulfates. *Total sulfur*: 2 cc. of urine are measured into a 6 cm. porcelain evapg. dish, 0.5 cc. of Benedict's reagent is added, and the fluid evapd. gently to dryness on a water-bath. Ignite the residue by the use of a Barthel alc. burner. Cool, and add 1 cc. of 1 in 4 HCl . Cover the dish with a clock-glass, and warm upon the water-bath until the residue is entirely in soln. Should evapn. to dryness occur before soln. is complete, add 1 cc. of acid and continue warming. Wash the cover into the dish, and gently evap. the contents to dryness. Add 1 cc. of distd. water, and transfer the contents to a 25 cc. beaker. Add 10 cc. of the benzidine reagent. From here proceed as with inorganic sulfates. D. obtains good results with his method (many examples given).

B. HOROWITZ.

New method for the preparation of plant globulins. GEORGE REEVES. Imperial Coll. of Science, London. *Biochem. J.* 9, 508-10(1915).—R. makes use of Schryver's observation (*C. A.* 8, 182) that the globulins are much more sol. in solutions of those salts which lower the surface tension of water than they are in NaCl soln. The bulk of material employed is thereby reduced. *Prepn. of edestin from hemp-seed*: The seed is ground and extd. with light petroleum. It is filtered, washed with petroleum, and air-dried. The husks are then removed by sifting through course muslin. 500 g. of material thus prepd. are mixed with 500 cc. 0.5 N Na benzoate soln. (corresponding to about 7%). After standing for 30 min. enough torn blotting paper is pressed into the mass to make it appear almost dry. The whole is wrapped round with filter paper, placed in a Buchner press, and submitted to high pressure. The residual mass is again extd. with 500 cc. of the benzoate soln. and the above operation repeated. The combined exts. are poured into 10 l. of water, and allowed to stand overnight. The clear liquid is decanted off, and the creamy paste at the bottom is centrifuged. The edestin, which seps. as a powder, is washed twice with water, once with 95% alc., once with abs. alc., and twice with dry ether. It is then quickly transferred to a vacuum desiccator. The product thus obtained is almost entirely sol. in 10% NaCl soln., and from this it can be obtained in cryst. form in the usual way. 450 g. of the sifted meal yield 130 g. crude edestin (vacuum-dried). In a similar manner excelsin from Brazil nuts and legumin and vicillin from horse-beans were prepd.

B. HOROWITZ.

The preparation of collodion membranes of differential permeability. WILLIAM BROWN. Imperial Coll. of Sci. and Technology, London. *Biochem. J.* 9, 591-617(1915); cf. *C. A.* 10, 207.—Collodion membranes are completely air-dried, whereby they become highly impermeable; they are then placed in solns. of alc. and water for a suitable time. When subsequently washed in water these membranes show a permeability which decreases regularly with the strength of the alc. employed. *Method of preparing air-dried membranes*: An 8% soln. of Schering's celloidin in a mixt. of equal parts (by vol.) of abs. alc. and ether is used. The membranes are formed on the outside of a test tube (1 cm. diameter). The latter is dipped in the collodion soln. to a depth of 8-10 cm., drained for a few seconds, and placed in a vertical position inside an inverted conical flask ($\frac{1}{2}$ l. capacity), being held by an ordinary cork which fits the neck of the

flask. By manipulation of the tube after insertion into the flask the length of the membrane can be increased. The tube is allowed to drain for five minutes after which it is withdrawn and *immediately* immersed in water. After about one minute the membrane is stripped off by eversion. For this purpose use is made of the "runnels" of collodion, which have by now become solidified. These on being cut across serve as handles in pulling the membrane off. The membrane is trimmed, washed in water and dried at laboratory temp. *Alcohol treatment:* The membrane is soaked in the alc. mixt. for 24 hrs. at 20°. It is then transferred to distd. water and washed for one day. The diffusive capacity of any substance through collodion may be specified in terms of the alc. strength required to produce the membrane which just prevents its passage. This is termed the "alcohol index" of the substance.

B. HOROWITZ.

Fractionation of the phosphotungstic acid precipitate with acetone as a useful method for the preparation of the vitamine fraction from yeast. CASIMIR FUNK. *Biochem. Bull.* 5, 1-16(1916).—"The phosphotungstate ppt. from alc. ext. of yeast can be divided by means of Me_2CO into two fractions: A small insol. fraction, which contains the bulk of the vitamine; and a large sol. one, which is totally inactive." In order to avoid the use of alkali, which has a tendency to destroy vitamine, the phosphotungstates were decomposed with $\text{Pb}(\text{OAc})_2$ instead of baryta; very clear solns. are obtained which facilitate further purification. A crude sepn. of the phosphotungstate ppt. into 4 sol. fractions can be effected by using 25, 100, 50 and 75% Me_2CO solns. in this order. A fifth insol. fraction remains, representing about 13% of the total ppt.

A. P. LOTHROP.

The bromine and iodine compounds of hexamethylenetetramine. K. SUGIURA AND K. G. FALK. Harriman Research Lab., N. Y. *Biochem. Bull.* 5, 17-21(1916).—A study of the compds. which $(\text{CH}_2)_6\text{N}_4$ forms with Br and I has led to the development of a simple quant. method for its estn. based upon the formation of the tetraiodide. To 50 cc. of soln. free from proteins or similar substances pptd. by I, add from a buret with stirring an alc. I soln. contg. 3.6 g. of I in 100 cc. of 95% alc. If $(\text{CH}_2)_6\text{N}_4$ is present a brownish yellow ppt. is formed which changes to reddish and finally to dark brown. About 20% excess of I is advisable (5-8 cc. required as a rule). Allow to stand for 10 min. with occasional stirring and filter with suction through an asbestos mat in a Gooch crucible. Refilter through the same mat once. Wash the ppt. 5-10 times with cold H_2O . Transfer the ppt. and crucible to a beaker, add 50 cc. of H_2O and 3 cc. of glacial AcOH and titrate with 0.04 M $\text{Na}_2\text{S}_2\text{O}_3$ soln., adding starch soln. near the end point. 1 cc. 0.04 M $\text{Na}_2\text{S}_2\text{O}_3$ soln. is equiv. to 1.4 mg. of $(\text{CH}_2)_6\text{N}_4$. If the liquid contains protein, such as albumin in urine, add an equal vol. of MeOH , allow to stand 1-2 hrs., filter by decantation through folded filter paper and evap. to $\frac{1}{2}$ the vol. in an air current or under diminished pressure. Add I soln. and proceed as described. The error in aq. soln. is at most 15%, usually much less. In urines, a compensation of errors apparently occurs and the results are accurate within 5%, but are satisfactory for the detn. of the amts. of $(\text{CH}_2)_6\text{N}_4$ eliminated by the body under various conditions.

A. P. LOTHROP.

Respiratory chamber for small animals. A. C. KOLLS AND A. S. LOEVENHART. Univ. Wisconsin. *Am. J. Physiol.* 39, 67-76(1915).—Description of a respiration chamber ($90 \times 90 \times 45$ cm.) with a closed ventilating system with automatic control in which animals may be kept a week or more in a given atm. of O and N. A smaller chamber ($50 \times 50 \times 38$ cm.) is designed for expts. at reduced or increased pressures.

J. F. LYMAN.

Method of bringing a small quantity of blood into equilibrium with a given gas. "Microaerotonometer." T. KATO. Cambridge. *J. Physiol.* 50, 37-41(1915).—App. is described suitable for exposing small amts. (0.1 cc.) of blood to gases for the

purpose of establishing equil. between the two. A gas holder suitable for storing mixts. of gases of known compn. to be used with the above app. is also described.

J. F. LYMAN.

The bacteria of gangrenous wounds. H. R. DEAN, Univ. Manchester, and T. B. MOVAT, Sheffield. *Brit. Med. J.* 1916, I, 77-83.—A new medium for the cultivation of anaerobic bacteria is described. The yolk of one egg is shaken with glass beads, 300 cc. of distd. water added, the shaking repeated, and the whole kept at the boiling point for $\frac{1}{2}$ hr. The mixt. is shaken during the whole period of heating. The medium is particularly adapted to the cultivation of *B. edematis maligni*. A. H. RAHE.

New reaction of urine. A. BACH. *Compt. rend.* 162, 353-4(1916); cf. C. A. 5, 2258, 3859; 6, 495, 872.—This test depends on the reducing action upon nitrates of an enzyme when in the presence of a coenzyme existing in urine. Separately these enzymes exert no reducing action. An approx. detn. is carried out by adding to 3 cc. of fresh urine, 2 cc. of fresh milk and 0.2 g. NaNO_3 (free from nitrite) and allowing to stand 20 min. at 60° . A control is run with the same proportion of urine and milk but without the NaNO_3 . At the end of 20 min., to each is added 5 cc. of Ilosvay reagent (a mixt. of sulfanilic acid and α -naphthylamine in AcOH) when the contents of the tube containing the nitrate become more or less red while the control remains unchanged. Upon adding to the control drop by drop a measured amt. of standard NaNO_2 until the color of the test is matched, the amt. of nitrite may be detd. For more accurate detns. 15 cc. of urine, 10 cc. of milk and 1 g. of NaNO_2 are mixed. At the termination of the reaction 0.5 g. finely pulverized $\text{PbOH}(\text{C}_2\text{H}_3\text{O}_2)$ is added, the mixt. agitated, filtered through a dry filter and the nitrite detd. in 20 cc. of the filtrate as in the sanitary analysis of water. Expts. show that 1 cc. of urine in the presence of milk can reduce from 0.01 to 0.05 g. of N_2O_4 . Urine previously boiled gives the same result as normal urine. With boiled milk and nitrate or fresh milk without nitrate the reaction is not produced. Blood serum aseptically obtained does not reduce nitrates in the presence of milk, but serum subjected to the action of bacteria, or even of a pure culture (diphtheric toxin) gives an intense reaction. L. W. RIGGS.

Capillary test for acidity in the stomach. S. ORRILL. *Hygiea* 77, No. 21(1915); *J. Am. Med. Assoc.* 66, 392.—O. repeated the work of Holmgren (cf. C. A. 5, 1616) and found that the results which differed from those of H. were due to the drying out of the blotting paper which had been used. It had lost much of its adsorbing power and the figures obtained were too high. The findings after 5 min. were taken as the standard. L. W. RIGGS.

Occult bleeding in differential diagnosis. C. SALVINI. *Riforma medica* 31, No. 49(1915); *J. Am. Med. Assoc.* 66, 463.—In an investigation of various technics for the detection of invisible blood in stomach contents or stools the benzidine method and Ganassini's eosin reaction (cf. C. A. 9, 3265) gave the clearest responses, being sufficiently sensitive down to 1 in 15000 for all practical purposes. Only findings in the first 30 min. are reliable. L. W. RIGGS.

Measurement of oxidation in sea-urchin egg. L. V. HEILBRUN. *Science* 42, 615-6(1915).—The errors due to change of I concn., in the methods of Winkler, Ridel and Stewart, and Warburg and Siebeck are pointed out and the following procedure suggested: The eggs are inclosed in celloidin tubes of about 10 cc. capacity and narrow bore to fit into 300 cc. bottles previously filled with sea-water. At the conclusion of the expt. the tube containing the eggs is taken out and the bottle completely filled with sea-water of known O content and tested for O by the Winkler method. Iodine absorbing substances normally given off by *Arbacia* eggs are colloidal and do not pass through the walls of the celloidin tube. The amt. of I in the sea-water therefore re-

mains constant and does not interfere with the detn. of O. H.'s method cannot be used without modification for the measurement of oxidations during cleavage, because the eggs are too tightly packed. The results show that partial or complete cytolysis produced by dil. sea-water causes a decrease of oxidations.

L. W. RIGGS.

Estimation of inorganic phosphorus in plant and animal substances (FORBES) 7.

C. BACTERIOLOGY.

ERNEST D. CLARK.

The bactericidal power of serum after the administration of salvarsan or neosalvarsan. S. R. DOUGLAS AND L. COLEBROOK. London. *Lancet* 1916, I, 181-3.—Salvarsan and neosalvarsan in aq. solns. possess a very distinct bactericidal power against staphylococci in dilns. of 1-6000. When the solvent consists largely of blood or serum this power is slightly diminished. The bactericidal power of these two preps. appears to be practically the same. The administration of neosalvarsan in ordinary doses renders the serum markedly bactericidal. This condition lasts but a short time and seems to reach its max. about 1 hr. after the administration of the drug, diminishing rapidly in the 3rd and 4th hrs. Heating the serum to 60° for 10-20 min. has no deleterious effect on the bactericidal power, showing that it is not in any way due to development of immune bodies in the serum. Salvarsan gave practically no demonstrable bactericidal power to the patient's serum when ordinary therapeutic doses were administered.

GEO. T. CALDWELL.

The gum-disease of sugar cane, caused by the *Bacterium vascularum* Cobb. J. GROENEWEGE. Pasoeroean. *Med. Proef. Java-Suikerind.* 5, 29-124 (1914); *Chem. Zentr.* 1915, I, 1128.—After a thorough description of the gum-disease produced by the *Bacterium vascularum* Cobb., G. discusses the morphology and culture of the bacterium. Cultures on peptone-bouillon and gelatin are colorless; on agar they are ochre-yellow. They cause coagulation of milk with reaction at first neutral, later alk.; there is slow peptonization of the coagulum. Nitrates are not reduced and sugars are not fermented. The indole formation is slight. With NH₄ tartrate as C- and N-source there is no growth. The virulence toward cane sugar is not diminished after a year. Indican is decomposed; urea is not. There is weak H₂S formation. The bacterium is extremely aerobic. Diastase and invertase are not formed.

P. M. GIESY.

Studies in antiseptics. II. "Chloramine," its preparation, properties and use. H. D. DAKIN, J. B. COHEN AND J. KENYON. *Brit. Med. J.* 1916, I, 160-2.—Sodium *p*-toluenesulfonchloroamide (chloramine) was chosen as an antiseptic because of its N-Cl linkage. This type of linkage is assumed to take place when hypochlorites act upon protein. A table showing germicidal action in serum and water is given.

A. H. RAHE.

Vitality of the cholera vibrio in the water of New York Bay. A. J. GELARIE. Quarantine Laboratory, New York. *Med. Record* 89, 236-9 (1916).—The survival of cholera organisms in water depends upon the particular strain employed, the type of water, the number of bacteria seeded and other factors. The vibrios lived in native bay water 7-47 days and in sterilized bay water for 285 days. In sterile tap water they survived 1-18 days; in native tap water 1-3 days. In competition with water bacteria the life of the vibrios is short. Prolonged exposure to native bay water (44 days) caused an alteration in the form of the organisms and rendered them inagglutinable. After repeated transfer of such altered organisms from peptone water to agar and *vice versa* they reassumed their original forms and could again be agglutinated.

A. H. R.

Two unusual strains of diphtheroid bacilli. RALPH R. MELLON. Ann Arbor. *Med. Record* 89, 240-1 (1916).—One of the organisms described showed extreme pleomorphism, alternating from bacillary to streptococcal form. It fermented, without

gas production, dextrose, lactose, dextrin, glycerol, sucrose, salicin, maltose and inulin. The other strain was a strict anaerobe, showing only ordinary pleomorphism. Both strains were pathogenic for rabbits.

A. H. RAHR.

Action of ozone on microorganisms and artificial substrates, as shown by ozone treatment in the cold storage of meat. R. HEISE. *Arb. hies. Gesundh.* 50, 204-31 (1915).—The results of this study are shown in 13 tables, 5 figures, and over 35 references to literature. The following summary is given: The bactericidal action of impure or purified ozone appears only at the surface of the nutritive medium and in case the ozonizing follows soon after the inoculation. If the development of the culture is retarded by low temp., ozone exerts its bactericidal action the same as shortly after inoculation. If the culture had developed colonies no efficient action of the ozone occurred. Repeated ozonizing produced no change other than morphological differences according as impure or pure ozone was used. If the surface of the nutritive gelatin is ozonized before inoculation with a culture of *B. coli*, the growth is notably retarded, the action being stronger for impure than for pure ozone. The precise manner in which the ozone affects the nutritive matter and the role of the oxides of N is not detd. The results of this lab. study do not contradict the experience from the use of ozone in the cold storage of meat.

L. W. RIGGS.

Action of antiseptics on pus. P. DELBERT. *Compt. rend.* 162, 36-8 (1916).—The pus was stirred to a homogeneous condition and taken into pipets with little more than double the vol. of the antiseptic soln. to be studied. The pipets were then sealed and kept in a closet under the same conditions as a control pipet containing untreated pus. After 24 hrs. a sowing and a culture were made from each pipet. Although these conditions were very favorable to the action of antiseptics, sterilization was the exception. In many cases the bouillon inoculation from pus cultures in contact with the antiseptic gave a larger crop than inoculation from the control tubes, especially if hypochlorite was used as the antiseptic agent. This agrees with the observation that the number of bacteria may increase in wounds dressed with antiseptics. Phenol, in concns. of 2 to 100, proved the best antiseptic though one of the weakest germicides. Other antiseptics tried were Et_2O , "sublimate," Labarraque's soln., and Dakin's soln. D. suggests the following explanation: The hypochlorite combines with certain elements of the pus in a manner to form products favorable to bacterial growth. These products, which are called "intermediates," are formed before the antiseptic acts upon the bacteria and cause a suppression of the antiseptic; and by the splitting of the protein mol. the latter is more easily utilized by the bacteria.

L. W. RIGGS.

Rapid method of counting living bacteria in milk and other richly seeded materials. W. D. FROST. Univ. Wis., Madison. *J. Am. Med. Assoc.* 66, 989-90 (1916).—One-twentieth cc. of milk is mixed with standard nutrient agar and spread over a definite area of a sterile glass slide. When the agar is hard this small plate culture is placed in an incubator for 6 hrs. under conditions which prevent evapn. It is then dried, given a preliminary treatment to prevent the agar from firmly binding the stain, stained, decolorized and cleared. When this plate culture is examd. under the microscope the colonies appear highly colored on a colorless or slightly colored background, and can readily be counted. Very complete directions, which are too long to be abstracted, are given in the original paper. These directions make special reference to the counting of colonies and calcg. the number of bacteria per cc.

L. W. RIGGS.

Magnesium hypochlorite as a disinfectant. C. MAYER. *Paris médical* 6, No. 8 (1916); *J. Am. Med. Assoc.* 66, 988.—The advantages claimed for $\text{Mg}(\text{ClO})_2$ are that it is less caustic than NaClO and is not expensive. It is prepd. by mixing 2 liters of water containing 190 g. of MgSO_4 with 2 liters of water into which 100 g. of CaOCl_2 have

been stirred. The ppt. of CaSO_4 is allowed to settle and the clear liquid used. This fluid is tolerated perfectly by the tissues so that it can be applied freely.

L. W. RIGGS.

Factors involved in germicidal effect of freezing and low temperatures. C. M. HILLIARD, C. TOROSSIAN AND R. P. STONE. Simmons Coll. *Science* 42, 770-1(1915).—Different species of bacteria were differently affected by freezing; thus 99% of 24 hr. old cultures of *B. coli* were killed by freezing in tap water or in distd. water in 3 hrs., while with a culture of *B. subtilis*, presumably free from spores, the reduction, though not uniform, was seldom over 80%. Three strains of *B. coli* showed no appreciable difference in relation to the germicidal action of freezing. Intermittent freezing and thawing had but slightly greater influence upon *B. coli* than sustained freezing for the same length of time. A temp. of -15° was much more fatal to *B. coli* than -2° , while in control tubes kept at $+0.5^\circ$ for 3 hrs. seldom over 40% of the bacteria were killed. Cream containing 30% fat exerts a striking protection to bacteria whether the freezing be continuous or intermittent.

L. W. RIGGS.

D. BOTANY.

CARL L. ALSBERG.

Physiology of the intake of material by the living plant cell. III. Influence of neutral salts and some nonelectrolytes on the toxic action of alcohols on plant cells. HELENE NOTHMANN-ZUCKERKANDL. *Intern. Z. physik.-chem. Biol.* 2, 19-41(1914); *J. Chem. Soc.* 108, I, 199-200.—The exosmosis occurring when leaves of plants (*Echeveria*, *Saxifraga sarmentosa*, and *Tradescantia discolor*) are immersed in aq. solns. of the lower alcs. increases if neutral salts are also added. Those salts which, in aq. soln., produce the greatest exosmosis have the greatest supplementary action on the osmosis caused by the alc. solns. It is probable that the observed augmentation on the addition of a salt is not due to an altered soly. of the alc., but to a summation of the separate actions of the 2 substances, alc. and salt. In the presence of butyl and higher alcs., salts react usually in such a way as to reduce the exosmotic effect; but sometimes the action is so slight in comparison with the toxicity of the added salt that it is unobservable. The antagonism between butyl alc. and salts is explained by the assumption that they enter the cell by the same path, and when both are present, each obstructs the passage of the other. Plasmolysis expts., showing that the concn. limit of van't Hoff's soln. which just produces plasmolysis is lowered by butyl alc., confirm this view. The author draws the conclusion that the hydrocolloids of the plasma must constitute the only path by which materials enter the plant cell. Tannic and aspartic acids and peptone increase the action of the various alcs., while glycine, tyrosine, sucrose, and maltose are inactive. The osmotic power of nonelectrolytes, as well as of salts, is therefore of secondary importance to the lyotropic influence in producing effects on plant cells.

E. J. C.

Injurious root secretions. D. PRIANISHNIKOV. *Rev. gén. botan.* 25, 563-82 (1914); *J. Chem. Soc.* 106, I, 1208-9.—The results of expts. in which etiolated wheat plants were grown successively in the same distd. water showed no reduction in the yield; under these conditions no substance toxic to wheat seems to be secreted by the roots of wheat. In sand and soil-culture expts. it was found, however, that the yields of subsequent crops were considerably reduced, according to the plants grown, not only when the same plant was grown 2 or 3 times in succession, but with different plants. The reduction in yield was much greater when the roots of the first plant were left in than when they were removed. Oats grown in an ext. of black soil gave a very small yield, while normal growth was obtained when the ext. was filtered through charcoal. When the ext. was distd., and both the distillate and the residue employed as culture

solns., the former produced a normal growth and the latter a much smaller yield; the difference was still more marked when the distn. was conducted under reduced pressure. The conclusion is drawn that roots contain a substance which is toxic both to the same and to other plants. It is suggested that one cause of the reduced yield of a second growth may be the increased alkalinity, which would be greater when the first crop is removed during early periods of growth, and varies according to the plant grown. On the other hand, alkalinity is not removed by charcoal, which in some cases raised the yield to its original amt. The expts. referred to form part of a research by Peritourine (*Ann. Inst. Agron. Moscow* 1913, No. 4).
E. J. C.

Enzymes of apples and their relation to the ripening process. R. W. THATCHER. Univ. Minn. *J. Agr. Res.* 5, 103-16(1915).—Ripening is defined as the change taking place between the cessation of growth and the disintegration of the tissue until it becomes mushy. Attempts to surround individual apples with films to prevent gaseous exchange were not successful. The method used was to seal the apples in atmospheres of different gases under as nearly sterile conditions as possible. Gases used were air, H, N, O, CO₂, and SO₂. Only CO₂ and SO₂ seemed to retard ripening. In prepg. pulp for sepn. of the enzymes, slices of apple were treated with acetone-ether, dried and powdered or the pulp ground with quartz sand. These methods yielded active exts. The oxidases were the only enzymes which produced changes in the carbohydrates during ripening. The presence of small amts. of esterase and protease indicates the possibility of hydrolytic decompn. of the small amts. of essential oil and protein present.

R. O. E. D.

The poisonous forms of *Phaseolus lunatus* (the lima bean). W. R. DUNLOP. *West Indian Bull.* 15, 29-35(1915).—The poisonous principle is HCN. The dark purple or black bean (the Java bean) is dangerously poisonous; the creamy-white lima bean is perfectly wholesome.

W. H. FRY.

A chemical peculiarity of the dimorphic anthers of *Lagerstroemia indica*, with a suggestion as to its ecological significance. J. A. HARRIS. *Ann. Botany* 28, 499-507(1914).—In *L. indica* the stamens are dimorphic. Those of the outer whorl are larger than those of the central yellow group. H. maintains that the differentiation is due to chemical phenomena.

B. H.

Filtration and lifting power (Hebungskraft). A. URSPRUNG. *Ber. botan. Ges.* 33, 112-7(1915).—Observations concerning the lifting power of leaves, etc.

B. H.

Several new instances of the action of nitrogenous compounds initiating germination on seeds sensitive to light. G. GASSNER. *Ber. botan. Ges.* 33, 217-32(1915).

B. H.

The urease of the soy bean and its "co-enzyme." NAOSUKE ONODERA. Univ. Coll., London. *Biochem. J.* 9, 575-90(1915).—A 1.5% urease soln. lost its activity by 5 days' dialysis, 5 cc. of this dialyzed urease developing only 0.08 cc. 0.1 N NH₃, while 5 cc. of the control urease, even 3 times diluted, hydrolyzed almost all the urea present in nearly the same time. The addition of 0.5 and 1 cc. of 0.5% soln. of fresh urease revived the lost action markedly, the amt. of NH₃ produced by the mixture being much greater than the sum of the amts. produced by the dialyzed and the fresh urease used separately. The "co-enzyme" is not an inorganic salt, and is destroyed by ether. It probably consists of 2 groups of components, one of which is dialyzable and the other non-dialyzable. The inhibitory effects of heat, acid and alkalis are exerted upon the co-enzyme, but not upon the urease proper. In germination, urease accumulates in the germs of the soy beans in large proportion, but free co-enzyme is absent. Ox serum, though it has an accelerating influence on urease action, contains no co-enzyme.

B. HOROWITZ.

Relation between osmotic pressure and regulation of stomata. W. S. ILJIN. *Bot. Centrbl., Beihefte* 32, 15-35(1914).—Stomatal regulation, which is related to transpiration conditions, shows a close relation to change in starch content, and this again shows a close relation to variations in osmotic pressure. B. H.

Increased carbon dioxide concentration in relation to transpiration and development in plants. N. KISSELEW. *Bot. Centrbl., Beihefte* 32, 86-96(1914).—An increase of carbon dioxide supplied to plants considerably accelerates development. B. H.

Nitrites in plants. K. ASO AND T. SEKINE. *Bot. Centrbl., Beihefte* 32, 146-7(1914).—Nitrites are present in the shoot-like buds of *Sagittaria sagittifolia*. These nitrites may be produced by the oxidation of amino acids, or the reduction of nitrates. B. HOROWITZ.

Growth and colloid hydration in cacti. E. R. LONG. *Bot. Gaz.* 59, 491-7(1915).—Hydrochloric and malic acids inhibited growth and hydration in *Opuntia blakeana*. NaOH was not so constant in its action as the acids. B. HOROWITZ.

Lycopin and its relation to chlorophyll. W. LUBIMENKO. *Rev. gén. botan.* 25, 475-93(1914).—The formation of lycopin and the decomposition of chlorophyll in plants go on simultaneously. L. regards the oxidation of chlorophyll as giving rise to lycopin and lycopinoids. B. HOROWITZ.

Biochemical investigation of saponins. MARIE KORSKOFF. *Rev. gén. botan.* 26, 225-44(1914).—This deals with the occurrence, distribution, and role of saponin in *Saponaria officinalis* and *Agrostemma githago*. In the course of germination the amt. of saponin does not diminish. K. regards this as showing that the saponin is not utilized as a food reserve. B. HOROWITZ.

Absorption and excretion of electrolytes by *Lupinus albus* in dilute simple solutions of nutrient salts. R. H. TRUE AND H. H. BARTLETT. *Science* 41, 180-1(1915).—The absorption of ions from solns. was measured by changes in electrical cond. K phosphate and KCl behaved like distd. water; K_2SO_4 , KNO_3 , and NaCl showed slight absorption; $Ca(NO_3)_2$ and $CaSO_4$ showed decided absorption. B. HOROWITZ.

Influence of acids, alkalies and alkali salts on the growth of rice plants. K. MIYAKE. *Trans. Sapporo Nat. Hist. Soc.* 5, 91-5(1913); *Bot. Centrbl.* 126, 588(1914).—The hydrogen ion is more injurious than the sodium ion, and the latter more so than that of potassium. The OH ion is more injurious than either the SO_4 or Cl ion. B. H.

The complex carbohydrates and forms of sulfur in marine algae of the Pacific Coast. D. R. HOAGLAND AND L. L. LIEB. *Cal. Agr. Expt. Station, Berkeley. J. Biol. Chem.* 23, 287-97(1915); cf. *C. A.* 9, 1525.—Marine algae do not contain simple carbohydrates or easily hydrolyzed polysaccharides. Starch is not present and only minor amts. of cellulose. The most frequently occurring carbohydrates are pentosans, galactans, levulans and methylpentosans. H. and L. describe in detail the physical and chem. properties of several complex polysaccharides obtained from *Macrocystis pyrifera* and *Iridaea laminarioides*. From the acid-precipitable complex known as "algin" a pentosazone was prepared with a m. p. of $154-5^\circ$, similar in many of its properties to *l*-xylose phenylosazone. In the alc.-insol. carbohydrate fraction of *Macrocystis pyrifera* a methylpentose, having the properties of fucose, was isolated; a similar fraction from *Iridaea laminarioides* yielded only galactose. Estimations were made of the various forms of S in *Ulva fasciata* which contains 4.44% of total S, of which 3.21% is sol. and 2.85% exists as sol. sulfates. Marine algae in general have a high S content. A. P. LOTHROP.

Significance of oblique incidence of light for helio-perception of parallelotropotrophic organs. K. NOACK. Freiburg i/B. *Inaug. Diss. Freiburg i/B.* 1914, 79 pp.; *Zentr. Biochem. Biophys.* 18, 303-4(1915).—Phototropic excitation is dependent (1) upon

the amt. of incident light and (2) upon the angle of incidence. These results do not sustain Blaauw's hypothesis of a simple photochem. action of light. H. S. PAINE.

Plant chemistry. P. Q. KEEGAN. *Chem. News* 112, 203-5, 295-7(1915); 113, 85-7(1916); cf. *C. A.* 7, 628, 2775, 3515; 8, 3667; 9, 1494, 2922.—The physical characteristics, including soil preferences, of the following plants are given, together with their org. chem. constituents as detd. by the usual methods of plant analysis and analysis of ash: Canary grass (*Phalaris arundinacea*), purple loosestrife (*Lythrum salicaria*), heather (*Calluna vulgaris*), ragwort (*Senecio jacobaea*), hairmoss (*Polytrichum commune*), early purple orchis (*Orchis mascula*), marsh marigold (*Calitha palustris*), hedge mustard (*Allaria officinalis*), tufted vetch (*Vicia cracca*), bogbean (*Menyanthes trifoliata*). A few of the more general conclusions are that the production of mucilage is in no way related to the production of CaC_2O_4 . The absorption of humic matter from the soil appears to serve as a basis for the formation of mucilages and hemicelluloses, but not of starch and certain sugars. Plants bearing flowers containing carotin require, even when the top soil is peaty, a substratum of sand or gravel where the relation of N to C is rather high. Many of the habits of plants are deduced from their chem. compn., anatomical structure, and physiologic activity. L. W. RIGGS.

The presence of hematoid compounds of iron in plants. I. G. GOLLA. Roy. Bot. Gardens, Turin. *Atti accad. Lincei* 24, I, 1239-43(1915).—Earlier work on the nature of compds. of Fe in plants is reviewed. G. (*Ann. botanica, Rome* 5, 441(1907)) had previously detd. the existence of organic Fe compds. in many aquatic plants and has now extended these expts. and has extd. from many kinds of plants org. compds. of Fe which are all similar to each other and which by their distribution in tissues and in the most widely various organisms permit of an hypothesis on the physiologic function and on the nature of the organic compds. of Fe. At first G. used plant tissue free from chlorophyll but later used the method for the green plants also. Pine or poplar sawdust was macerated with 0.3% NaOH. The ext. was sepd. and acidified with AcOH; it gave a brown amorphous ppt. the ash of which was rich in Fe. By extg. with Na_2CO_3 instead of NaOH less impurities come out with the ppt. This concn. of the alk. soln. for extn. varies with the material to be extd. In this ppt. is the part containing Fe which is sol. in dil. alks. and which is pptd. from these solns. on acidifying. Heating the ppt. with aq. alkalies does not easily sep. the Fe. The ppt. is insol. in neutral org. solvents; it is sol. with partial alteration in AcOH and is more changed in aq. AcOH; its incomplete soly. in $\text{C}_6\text{H}_5\text{N}$ shows that it is not homogeneous; heated 3-5 hrs. with KOH-EtOH it is decompd. and evolves NH_3 , probably derived from protein inclusions. After heating in a Ag crucible with KOH at 200-40° for 5-7 hrs. in an air bath under a layer of petroleum the mass was extd. with cold abs. EtOH and was almost completely dissolved. That part not dissolved contained only a little Fe. A little dry glycerol was added to the EtOH soln. and then 1.5 vol. Et_2O ; this gave a dark brown layer consisting mostly of glycerol poor in K. This was sepd. and acidified with glacial AcOH; treatment with 2 vols. Et_2O and centrifuging sepd. most of the Et_2O and AcOH; a 2nd treatment with Et_2O removed all AcOH. The brown amorphous compd. thus obtained is nearly insol. in neutral solvents; it is sol. in $\text{C}_6\text{H}_5\text{N}$. This compd. gives a *picrate* as a brown amorphous mass which melts easily and burns with deflagration and a luminous flame, and from which excess picric acid can be removed by washing with petroleum satd. with EtOH. The picrate may be decomposed by hydrolyzing with H_2O or better by the action of $\text{C}_6\text{H}_5\text{N}$, which dissolves the picrate but not picric acid. On adding Et_2O the Fe compd. is pptd. and can be purified by repeating this process. Heated with Zn it evolves alk. vapors, probably NH_3 , and gives the pine chip reaction for pyrrole. Aq. alkalies rapidly sep. the Fe; acids (AcOH) do this a little more quickly; in 4-5 days a purple violet ppt. seps. which on treatment with dil. HCl gives the $\text{K}_4\text{Fe}(\text{CN})_6$ test for Fe.

The portion insol. in EtOH after the KOH fusion was mostly dissolved with glacial AcOH and treated with picric acid gave a *picrate* similar to that above. That part insol. in glacial AcOH also gave a similar *picrate*. Whether these are different compds. present in the plant or represent stages of the action of KOH was not detd. Although there are some objections, G. considers these compds. to be similar fundamentally to the hematin of the blood. Further expts. are under way. One quintal of poplar sawdust gave 170 g. of the crude Fe compd.; 1 quintal of dry vegetation gave 430 g.

E. J. WITZEMANN.

E. NUTRITION.

PHILIP B. HAWK.

NORMAL.

The soy bean and condensed milk in infant feeding. JOHN RUHRÄH. *Am. J. Med. Sci.* 150, 502-12(1915).—From his experience in using the soy bean, condensed milk and some cereal (for additional carbohydrate) in proper proportions, R. feels that this method of feeding can be used without any danger TULA LAKE HARKEY.

A résumé of infant feeding. CHARLES H. SRYBERT. Philadelphia. *Hahnemannian Monthly* 51, 210-7(1916).—A review. JOSEPH S. HEPBURN.

Studies on the digestion of cooked meat by dogs. E. ZUNZ. *Biochem. J.* 9, 17-35(1915).—Analyses of the stomach contents of dogs after the ingestion of meat are given. Z. suggests the use of the character of the protein decomposition products as an index to protein metabolism. B. H.

Influence of fat and carbohydrate on the excretion of endogenous purines in the urine of dog and man. NOBUYOSHI UMEDA. Glasgow. *Biochem. J.* 9, 421-38(1915).—A study of the possibility of the synthesis of uric acid in the mammalian body. In man, on a diet rich in carbohydrate, some evidence of the synthetic formation of uric acid was obtained. In the dog the same result was obtained by the addition of allantoin to the diet. The protein-sparing action of carbohydrate as compared with fat was again clearly demonstrated. The output of endogenous uric acid in human urine was increased after the ingestion of glycerol or NaHCO₃. Several expts. showed that a decrease in the output of purine bases resulted in an increase in the excretion of uric acid. In fat-rich diets (carbohydrate-poor) the output of uric acid was markedly diminished. B. HOROWITZ.

Influence of carbohydrate and fat on protein metabolism with special reference to the output of sulfur. KWANJI TSUJI. Glasgow. *Biochem. J.* 9, 439-48(1915).—It is known that ingestion of carbohydrate brings about a reduction in the output of N in the urine, and that fat tends to increase this output when carbohydrate is present in small amt. T.'s object was to study the S output under similar conditions. The method employed was that of superimposition, *i. e.*, on a particular day there was added to a standard diet the special foodstuff to be tested, the N and S content of which was known. In some cases the diet was rich in fat and correspondingly poor in carbohydrate. The subject of the expt. was a healthy bitch weighing approx. 13 kg. She was catheterized each morning and the urine added to that collected in the receiver of the cage. The methods of analysis were: Total N, Kjeldahl; total S, Benedict; inorganic and alkyl sulfates, Folin. The feces were not examd. The standard diet was continued until the output of total N and total S became fairly regular. Then an amt. of the protein to be tested, which contained approx. 6 g. of N, was added to the standard diet at the usual feeding time. The standard diet was then continued until the output of total N and total S was again regular. The extra amts. of N and S excreted were detd. by the subtraction of the av. amt. of N and S excreted on the 3 days immediately preceding the superimposition from the av. after the addition. In 3 expts. the retention of super-

imposed N was greater on a carbohydrate than on a fat diet. In 2 expts. out of three the same was true for S. The amt. of extra N and S excreted varies with the protein used. The greater part of the extra S excreted is in the form of inorganic sulfates. The partition of S on the carbohydrate and fat diets is very similar; it is for the most part excreted in the form of inorganic sulfates and neutral S in almost equal amt. There is no evidence that the protein retained after superimposition is poor in S.

B. HOROWITZ.

The use of phlorhizinized dogs to determine the utilizable carbohydrate in foods. The food value of commercial glucose. W. D. SANBURN AND R. T. WOODYATT. Rush Medical College. *J. Biol. Chem.* 24, 23-9(1916).—In 5 expts. completely phlorhizinized dogs, which were also rendered glycogen-free by injection of epinephrine, received 1-2 g. per kg. of body wt. of commercial glucose or corn sirup by mouth and a control dose of a corresponding wt. of C. P. *D*-glucose. The control doses of *D*-glucose did not reappear quant. in the urine and apparently some sugar was retained or burned in the body. The best yields were obtained by maintaining free diuresis through administration of salines supplemented by suitable amts. of alkali. The commercial glucose yielded 93.48 % as much extra sugar as the same wt. of C. P. *D*-glucose so that at least that % of the solid matter in the sample of com. glucose studied was "capable of passing through whatever physiological processes of digestion, absorption and assimilation are necessary for its ultimate existence in the body as *D*-glucose." There was no evidence of any deleterious effects attributable to the ingestion of commercial glucose. "The expts. are considered of interest as showing the possibility of using the diabetic organism for resolving a heterogeneous mixt. of carbohydrates and allied compds. into the form of a single easily measured sugar, and as casting light on the compn. and utilizability of that mixt. of glucose, dextrins, and other substances known as commercial glucose."

A. P. LOTHROP.

The value of amino acid compounds with formaldehyde for the nitrogen economy of animals. Azzo Azzi. Univ. Naples. *Atti accad. Lincei* 24, I, 1125-9(1915); see C. A. 9, 1943.

E. J. WITZEMANN.

ABNORMAL.

Prolonged fasting in diabetes. FREDERICK M. ALLEN. *Am. J. Med. Sci.* 150, 480-5(1915).—The main features wherein the proposed treatment differs from previously established methods are: (1) A fast of one or two days longer than is necessary to clear up glucosuria; (2) a subsequent diet such as to keep glucosuria and acidosis permanently absent, with as many interspersed fast days as are necessary; (3) keeping the most severe diabetics intentionally and permanently at a sufficiently low level of wt. and metabolism to prevent return of symptoms and downward progress, and (4) opposition to the doctrine that fat feeding does not appreciably influence diabetic glucosuria and that calories lost in the urine should be replaced by additional calories in the diet, preferably in the form of fat. The author feels that whatever the ultimate outcome, present knowledge seems to justify the conclusions: (1) That this treatment removes glucosuria and acidosis more quickly and surely than do former methods of treatment, and (2) that patients do better when glucosuria and acidosis are removed than when these conditions are allowed to continue.

TULA LAKE HARKEY.

Output of creatine in glucosuria. KWANJI TSUJI. Glasgow. *Biochem. J.* 9, 449-55(1915).—The purpose of the author was to obtain further evidence in support of the view that the reported appearance of creatine in the urine of animals in which the carbohydrate metabolism has been interfered with is due to the metabolic disturbance, and is not merely an error in observation due to the presence of acetoacetic acid. Cathcart and Orr (*J. Physiol.* 48, Proc. xxi (1914)) have shown that phlorhizin can give rise to a creatinuria without an accompanying acidosis. Since phlorhizin

glucosuria is associated with a renal disturbance, T. selected cases of glucosuria (1) following the injection of adrenaline, and (2) post-anesthetic. Injection of adrenaline (a soln. 1 : 1000—Parke, Davis & Co.) increases the output of total N. This rise is not due to any increase in one particular constituent but to a general increase of all the constituents estd. (ammonia, Folin method; creatinine and creatine, Folin methods, after the urine being treated as recommended by Graham and Poulton; urea, urease method; sugar, Benedict method; acetone and acetoacetic acid, Messinger-Huppert method). On the day of injection there was glucosuria, and associated with it the appearance of creatine. That this is a real creatine excretion and not merely apparent, due to the presence of acetoacetic acid, is shown when the total acetone excreted is considered. The results with carbohydrate-rich and carbohydrate-poor diets were identical. When ether anesthesia was employed, the urine for the day on which the animal was anesthetized was divided into 2 parts for examn. because of the transitory nature of the changes produced: (a) the urine which was excreted and obtained from the bladder by catheter before the anesthetic was given, and (b) the urine collected for the rest of the 24-hr. period after the anesthetic. Using a carbohydrate-rich diet, no rise in the output of total N on the day of narcosis was obtained, but there was a very slight rise in the output on the following day. There was a slight rise in the excretion of urea, a definite fall in the output of NH_3 , a slight fall in creatinine, the appearance of a trace of creatine, a slight glucosuria, and a slight increase in the output of total acetone. The presence of creatine was shown also by the diacetyl test. Using a carbohydrate-poor diet, there was a definite rise in the excretion of NH_3 on the day of anesthesia. The output of creatine was unaltered on the day of expt., but there was a marked fall on the day following. No sugar was detected in the urine. The output of creatine was a mere trace. There was a small but appreciable rise in the excretion of total acetone.

B. HOROWITZ.

The effect of phlorhizin on the formation of glycogen in the liver. ALBERT A. EPSTEIN AND GEORGE BAHR. Mt. Sinai Hosp., N. Y. *J. Biol. Chem.* 24, 17-21 (1916).—In phlorhizinized cats from which the kidneys have been removed, the presence of phlorhizin in the body actually stimulates the accumulation of glycogen in the liver. "With the kidneys intact, the glucosuric action of phlorhizin is so much more powerful than this liver action that the glycogen accumulations in the liver are rapidly diminished. Upon removal of the kidneys, however, the glucosuric action is eliminated and the effect upon the liver becomes manifest in a rapid building up of glycogen, even in a state of extreme starvation." As the % of blood sugar never rose above the normal figure, it is not probable that the accumulation of excess of sugar after nephrectomy was due to a disturbance in carbohydrate metabolism produced by the phlorhizin.

A. P. LOTHROP.

Experimental contribution to the etiology of pellagra. KARL RUHL. *Dermatol. Woch.* 60, 113-26, 151-8, 176-80 (1915); *Tropical Diseases Bull.* 7, 65 (1916).—This is principally a study of the effect of red light. R. found that no photodynamic reaction takes place in guinea pigs and that these animals are not suitable for these expts. Red light, even with mixed diet, delayed the development of young animals, but had no effect on adults. Red light, with exclusive maize diet, resulted in the death of 80%. R. believes the red light is not harmful, but rather the exclusion of the chemically active violet and ultraviolet rays. His final conclusion is that Funk's vitamine theory is not proved and that Raubitschek is mistaken in considering pellagra to be a photodynamic problem.

C. J. WEST.

Diabetes and pellagra. EUGENIO BRAVETTA. *Riv. pellagrol. ital.* 15, 43-7 (1916). *Tropical Di* 59 (1916).—Good food represents the best remedy

to assuage, to cure and perhaps to cause the complete disappearance of pellagra.

C. J. WEST.

Histological lesions after exclusive maize diet, starvation and experimental scurvy. PIETRO RONDONI AND MARIO MONTAGNANI. *Sperimentale* 69, 659-96(1915); *Tropical Diseases Bull.* 7, 63(1916).—In guinea pigs fed only on maize, the organs chiefly affected are the spleen, thyroid gland and suprarenals and after them, the central nervous system. Less effect was found in the liver, digestive canal, kidneys, bone marrow, myocardium and lungs. The authors maintain that sclerosis of the thyroid is enough to distinguish "maidism" from the results of starvation. They believe that their pathological studies help to admit pellagra into the group of diseases due to the deficiency of nutrition.

C. J. WEST.

Maize diet from the point of view of the etiology of pellagra. PIETRO RONDONI. *Sperimentale* 69, 723-97(1915); *Tropical Diseases Bull.* 7, 63(1916).—Maize is an unsatisfactory and insufficient food for man and for various animals. From expts. on guinea pigs it is thought likely that the anti-maize vitamine is different from the anti-scurvy vitamine. The view is still held that the food value of maize depends upon the kind and the district in which it is grown. Adrenaline administered to sick and emaciated guinea pigs, by mouth, under the skin or intraperitoneally caused them to live several days longer than the control animals, which were apparently suffering with "hypo-adrenalism." In spite of the obvious difficulties, R. believes that the effects of a prolonged maize diet, which should be almost exclusive, should be studied on monkeys or on man. He recommends as prophylaxis the substitution of other cereals, potatoes, fresh vegetables, meat and milk for some of the maize of the diet. Addition of protein, peptone, amino acids, glucose, tabloids of thyroid glands, allantoin, etc., to the maize diet had no conclusive effects.

C. J. WEST.

Acidosis and some of the factors which influence it. R. M. LANG. Glasgow. *Biochem. J.* 9, 456-78(1915).—In healthy individuals, on a constant diet, the total acetone excreted is practically constant in amt. The quantity found is influenced by the diet, being greater with a high protein intake than with a low one. The acetone output in the early days of starvation is governed by the nature of the preceding diet. Both carbohydrate and protein when administered to the fasting organism cause a rapid diminution in the amt. of "acetone bodies" found in the urine. Fat causes an immediate drop in the total acetone output during the first 4 hrs. and this is succeeded by a definite rise. Glycerol reduces acidosis; alc. has no effect.

B. HOROWITZ

Influence of salts on amylolysis in bread (EFFRONT) 12.

F. PHYSIOLOGY.

ANDREW HUNTER.

Human milk. G. D. ELSDON. *Analyst* 41, 74(1916).—Two samples from the same sources on successive days contained: fat, 4.0 and 3.5; lactose, by diff., 7.5 and 7.4; protein, 1.5 and 1.4; ash, 0.2 and 0.2%. The mixed fat taken on several successive days showed the following consts.: n_{40} 1.4568; Zeiss butyrefractometer, at 40°, 46.3; R.-M. value, 5 g., 2.0; Polenske value, 2.2; Kirschner value, 1.9. Complete analyses of 67 samples gave the following av. max. and min. figures, resp.: Total solids, 11.7, 14.6, 9.6; solids-not-fat, 8.59, 9.1, 8.0; fat, 3.11, 5.9, 1.1; proteins, 1.19, 1.8, 0.7; ash, 0.21, 0.3, 0.2; lactose, by diff., 7.18, 7.6, 6.6%. Av., max., and min. figures of 79 partial analyses are also given: Total solids, 11.78, 14.3, 9.4; solids-not-fat, 8.50, 9.4, 7.9; fat, 3.28, 5.7, 0.7%.

P. B. DUNBAR.

Chemism of formation of bile pigments from the iron-containing constituents of blood pigments. WILLIAM KURSTER. *Arch. Pharm.* 253, 457-97(1915).—An historical treatment of the subject.

W. O. E.

The innervation of dentin. J. HOWARD MUMMERY. *Dental Cosmos* 58, 258-69 (1916).—A histo-chemical demonstration of the presence of nerve fibers in the dentinal tubules.

JOSEPH S. HEPBURN.

Effect of ingestion of urea, sodium lactate and sodium hydrogen carbonate on the reaction of the blood and the composition of the alveolar air in man. GORO MOMOSE. *Physiol. Lab., Cambridge. Biochem. J.* 9, 485-91 (1915).—M.'s object was to test the question whether certain substances taken by the mouth make the blood in the body more alk. Katl (*C. A.* 10, 348) has shown that addition of certain alk. substances to the blood (NaOH , Na_2CO_3 , NaHCO_3 , Na_2HPO_4), accelerates the oxidation and retards the reduction of the blood. Alkali, then, would increase the percentage satn. of O in blood exposed to a given O pressure, just as acid reduces the percentage satn. (Barcroft, Camis, Mathison, Roberts and Ryffel, *Trans. Roy. Soc. London (B)* 206, 49 (1914)). M. used this measurement as a test for the changed reaction. The method of exposing blood to a standard gas mixt. is that described by Kato (*C. A.* 10, 1361), in which 0.1-0.2 cc. is put into the bulb of a small pipet, and gas is passed over it from a gas holder, the pipet being rotated in a water-bath at 37-38° for about 10 min. This gives complete equil. between the blood and the gas. 0.1 cc. of blood is then analyzed for its percentage satn. by the use of the differential gas analysis app. (Barcroft, *The Respiratory Function of the Blood*, p. 300 (1914)). Urea, Na lactate and NaHCO_3 , taken by the mouth, cause the blood to become more alk., i. e., cause the percentage satn. in the blood to rise when exposed to the standard mixt. On the other hand, these substances, in the doses taken, produce little change in the alveolar CO_2 .

B. HOROWITZ.

Thrombin and calcium chloride in relation to coagulation. J. O. W. BARRATT. *Lister Inst., London. Biochem. J.* 9, 511-43 (1915).—B. studied the quant. relation between the time of coagulation of fibrinogen and the amt. of thrombokinase taking part in the process of coagulation, in presence of CaCl_2 .

B. HOROWITZ.

Mechanism adapting the oxygen capacity of the blood to the requirements of the tissues. H. C. DALLWIG, A. C. KOLLS AND A. S. LOEVENHART. *Univ. Wisconsin. Am. J. Physiol.* 39, 77-108 (1915).—Expts. on small animals kept in respiration chambers under reduced atm. pressure or in an atm. of low O concn. but normal pressure prove that a decrease in the partial pressure of the O of the respired air caused an increase in the erythrocytes and hemoglobin per unit vol. of blood and that the increase occurs even at atm. pressure under conditions which eliminate all of the physical effects of decreased barometric pressure and high mountain climates. The erythrocytes are increased as a result of the stimulation of the bone marrow in response to decreased O tension and the increase is abs. not relative. O pressure must be reduced at least to 14% of an atm. to produce these effects. Stimulation results even when O pressure falls to 6% of an atm.

J. F. LYMAN.

Stimulation of the hypophysis in dogs. R. W. KEETON AND F. C. BECHT. *Northwestern Univ. Am. J. Physiol.* 39, 109-22 (1915).—Expts. conducted under conditions which precluded hyperglucemia as a result of the anesthesia employed showed that elec. stimulation of the hypophysis in dogs caused a rise in reducing substances of the blood. Stimulation anteriorly or posteriorly to the hypophysis caused no such rise provided precautions were taken to prevent an escape of current to the gland. The fact that dogs whose splanchnic nerves had been cut from 30 to 137 days previous to hypophyseal stimulation showed no rise in blood sugar is opposed to the hormone theory of hypophyseal action whereby cellular glycogenolysis is directly increased. With active diuresis glucosuria appeared when the reducing substances of the blood were equiv. to 0.190 to 0.21% dextrose. Once established, sugar in the urine increased out of proportion to the reducing power of the blood.

J. F. LYMAN.

Effect of aqueous extracts of organs upon the contractions of unstriated muscle fibers. G. G. FAWCETT, J. M. RAHE, G. S. HACKETT AND JOHN ROGERS. Cornell Univ. Med. Coll. *Am. J. Physiol.* 39, 154-61(1915).—The filtrate from H₂O exts. of pituitary, pineal, thyroid, parathyroid, thymus and adrenal glands after removal of nucleoproteins, globulins and coagulable proteins contains most or all of the internal secretions of these organs as shown by expts. on unstriated muscle of cat uterus or intestine. The action on the muscle in different parts of the intestine varies. Epinephrine paralyzes unstriated muscle stimulated by exts. of the above glands; therefore the region affected by these organ exts. must be some portion of the termination of the sympathetic nerves.

J. F. LYMAN.

Action of pituitary extracts upon the isolated intestinal loop. V. N. SHAMOFF. Harvard. *Am. J. Physiol.* 39, 268-78(1916).—The posterior lobe of the pituitary gland contains some substance which has an action on the isolated intestinal loop resembling the action of epinephrine. This active substance may not be identical with the compds. in the posterior lobe which cause hemodynamic and diuretic responses.

J. F. LYMAN.

Secretory discharge of the pituitary body produced by stimulation of the superior cervical sympathetic ganglion. V. N. SHAMOFF. Harvard. *Am. J. Physiol.* 39, 279-90(1916).—Stimulation of the superior cervical sympathetic ganglion after section of both vago-sympathetic trunks in the middle of the neck and of the spinal cord at the fourth thoracic segment caused diuresis and glucosuria in the cat, a result which can best be interpreted as due to the discharge of hypophyseal secretion by the stimulation of the hypophysis and the subsequent action of the hormones contained therein.

J. F. LYMAN.

Effects upon gastric secretion of organ extracts. JOHN ROGERS, J. M. RAHE, G. G. FAWCETT AND G. S. HACKETT. Cornell Univ. Med. School. *Am. J. Physiol.* 39, 345-53(1916).—The non-coagulable portion of a H₂O ext. of the thyroid contains a substance which, when injected subcutaneously, is an active stimulant of both gastric secretion and gastric motility. Gastric secretion is stimulated only by the non-coagulable portions of the H₂O exts. of parathyroids, thymus, spleen and liver. Both the coagulable and non-coagulable portions of pancreatic exts. increase the flow of gastric juice. The pituitary and adrenal glands yield a non-coagulable H₂O-sol. portion which inhibits gastric secretion. All the stimulant fractions appear to act upon some peripheral gastric mechanism in which the nervous system is an essential part.

J. F. LYMAN.

Effects of testicular transplants upon vasomotor irritability. H. WHEELON AND J. L. SHIPLEY. St. Louis School Med. *Am. J. Physiol.* 39, 394-400(1916).—Castration tends to lower the irritability of the sympathetic nervous system as shown by the comparative response to nicotine. After castration the vasomotor response to nicotine averaged 50% lower than reactions to the same drug before removal of the glands. After transplants of testicular tissue had been made in the neck muscles, the response averaged only 23% below normal. It is concluded that a direct relationship does exist between the internal secretion of the testis and the sympathetic nervous system.

J. F. LYMAN.

The physiology of cholesterol metabolism. KARL LOWENTHAL. Berlin. *Beitr. Path. Anat.* 61, 564-9(1916).—In hypercholesterolemic conditions which follow the entrance of cholesterol into the blood stream from the body fat depots, the amt. of cholesterol is decreased in the testicles; nevertheless the testicle does not belong to the reticulo-endothelial system, which is the center of intermediary cholesterol metabolism. After complete castration, the amt. of cholesterol in the blood increases. Whether

this hypercholesterolemia is lasting and on the loss of what particular part of the testicle it depends, remains questionable. Unilateral castration is apparently without effect.

JULIAN H. LEWIS.

G. PATHOLOGY.

H. GIDEON WELLS.

Immune reactions against tumor growth in animals with spontaneous tumors. M. S. FLEISHER AND L. LOEB. St. Louis. *J. Med. Res.* 34, 1-19(1916).—Mice with spontaneous tumors are not so good a soil for the growth of transplantable tumors as normal controls. This may be due to age or to the effects of tumor growth on nutrition. Certain mechanisms which inhibit in normal mice the growth of a transplantable tumor have the same effect in mice with spontaneous tumors. One of these mechanisms may consist in the production of certain immune substances. Following the extirpation of a transplanted tumor the presence of immune substances or immune mechanisms, produced by the growth of the transplanted tumor, can be demonstrated by further attempts at transplantation. Spontaneous tumors on the other hand do not produce, in any considerable quantity, immune substances comparable to those produced by the ordinary transplanted tumors; neither do spontaneous tumors neutralize immune substances produced by the growth of transplantable tumors. GEO. T. CALDWELL.

Superficial fatty streaks of arteries: an experimental study. J. W. MCMEANS AND O. KLORZ. Pittsburgh. *J. Med. Res.* 34, 41-63(1916).—A hypercholesterolemia was produced in rabbits by feeding varying amts. of cholesterol in olive oil and cholesterol Na oleate mixts. At autopsy, 115 to 160 days after the beginning of the treatment, there were observed in the aortas of the animals fatty streaks closely resembling the fatty streaks so frequently seen in the human aorta in individuals dying of acute infections, severe blood diseases and uremia. The deposit in these areas contained much demonstrable cholesterol. GEO. T. CALDWELL.

The colloidal gold precipitating substance in the cerebrospinal fluid in paresis. P. G. WESTON. Warren, Pa. *J. Med. Res.* 34, 107-12(1916).—The gold-pptg. substance is destroyed by boiling for 5 min. It is dialyzable through thimbles impermeable to protein. Its exact nature has not been detd. but it is not peptone. Colloidal gold was not found to be a delicate or reliable test for minimal quantities of peptone. The salts, Cu-reducing substance and Wassermann-reacting substance from cases of paresis do not ppt. gold from colloidal suspension when the fluid containing them is used in the same or larger quantities than are used in Lange's test. The Wassermann-reacting substance is not dialyzable. GEO. T. CALDWELL.

A comparison of the natural hemolytic activity of fresh human sera against guinea-pig and sheep erythrocytes. H. W. WADE. New Orleans. *J. Med. Res.* 34, 113-9(1916).—Natural anti-guinea-pig hemolytic activity occurs in human serum in considerable regularity and uniformity of concn. This hemolytic combination is much superior to the natural anti-sheep hemolysin as serological reagent since the latter appears less constantly and with greater variability of concn. Only 4.2% of human sera is non-hemolytic to guinea-pig corpuscles while 16% is inactive with sheep corpuscles. GEO. T. CALDWELL.

The urea content of the cerebrospinal fluid. R. G. CANTI. London. *Lancet* 1916, I, 344-8.—The normal physiological urea content of the cerebrospinal fluid, as measured by the hypobromite method, is below 0.05%. Of patients dying of uremia, the majority are found to have a greatly increased quantity of urea in the cerebrospinal fluid, usually about 10 times and occasionally more than 20 times the normal amt. Each case in which a greatly increased quantity of urea has been found in the cerebrospinal fluid in a brief period. GEO. T. CALDWELL.

Studies of nephritis. HENRY A. CHRISTIAN, CHANNING PROTHINGHAM, JR., JAMES P. O'HARE AND ALLEN C. WOODS. *Am. J. Med. Sci.* 150, 655-80(1915).—(A) In testing renal meals in relation to renal function, two methods were used—those of v. Monakow and of Hedinger and Schlayer—and similar results obtained. Fixation in excretion of N seems to develop at a later period generally than is true of water and salt. (B) Quantitative studies of non-protein nitrogenous substances of the body. Urea N averaged 63.4% of the total non-protein N of the blood, and its increase was usually proportionate to the increase of the total non-protein N. Ammonia N increased slightly but not proportionately; the same held for uric-acid and amino-acid N. Creatinine showed roughly a proportionate increase. There is no advantage in quant. detg. the N of the spinal fluid over detg. it in the blood. There is no relation between the amount of non-protein N in the blood and changes in the retina. (C) Diuresis in relation to diuretics. Observations justify skepticism as to the efficacy of diuretic drugs in cases of nephritis without cardiac decompensation. (D) No constant relations were found between anatomical lesions and renal function in so far as excretion of phenolsulfonethalein, albumin in the urine, casts, presence or absence of edema, blood-pressure detns., etc., are concerned.

TULA LAKE HARKEY.

Observation upon the elimination of acetone and diacetic acid in two hundred and fourteen surgical cases. M. R. BRADNER AND S. P. REIMANN. *Am. J. Med. Sci.* 150, 727-33(1915).—Acetone, occasionally accompanied by diacetic acid, was eliminated in the urine of 182 out of 214 surgical patients. The temperament of the individual and the length of time of pre-operative treatment appeared to have a slight positive effect upon the acetone eliminated. Both are eliminated in larger quantities and oftener in women than in men. Surgery alone increased the acid, but the severity of the operation and the amt. of obvious shock present had but little bearing upon the amt. of eliminated acid and the time of elimination.

TULA LAKE HARKEY.

An acidimetric study of the saliva and its relation to diet and caries. JOHN H. MARSHALL. Univ. California. *Dental Items of Interest* 38, 116-27(1916).—No relationship exists between the acidity and alkalinity of normal resting saliva and the susceptibility to caries. In approx. 200 cases examd. not one was found in which a markedly carious condition was associated with a notably acid saliva. The diet is without influence on the compn. of the saliva. In immune conditions the relationship of the neutralizing power of the normal resting saliva to that of the activated saliva varies within relatively wide limits. In the carious condition, this relationship varies within relatively narrow limits; consequently growth of bacteria, including lactic acid organisms, is favored, and lactic acid is formed in sufficient strength to act on the Ca salts of the teeth.

JOSEPH S. HEPBURN.

Studies in experimental diabetes after pancreatectomy. ALBERT A. EPSTEIN AND GEORGE BAEHR. Mt. Sinai Hosp., N. Y. *J. Biol. Chem.* 24, 1-16(1916).—After pancreatectomy there is a tendency for the animals to drink H₂O in large amts. and there is a consequent increase in blood vol. sometimes reaching 150%. Such changes in blood vol. must be taken into consideration in order to obtain an accurate estimation of the variations in the sugar, non-coagulable N and other blood constituents. After pancreatectomy in the cat the hyperglucemia rises progressively in the terminal stages due to renal insufficiency, as the marked hyperglucemia was accompanied by albuminuria and a diminished glucosuria and acetoneuria. A similar excessive rise in blood sugar is observed in human diabetes and is an indication of impending coma. A rapidly progressing hyperglucemia is produced in depancreatized cats by removal of the kidneys, the accumulation being due to the gradual mobilization of the reserve carbohydrate from the liver and muscle.

A. P. LOTROP.

Liver circulation in relation to glucemia. HUGH MCGUIGAN AND E. L. ROSS. Northwestern Univ. Med. School. *Am. J. Physiol.* 39, 480-9(1916).—Portal ligation caused a rise in blood sugar of 62% of the original; hepatic ligation caused no greater increase than ether alone. Ligation of both blood vessels did not increase blood sugar. Hyperarterialization of the liver increased the sugar of the blood 35% of the original while hypervenuosity did not cause such increase. "The utmost conceivable uncomplicated change in the circulation of the liver can play but a minor role in the production of glucosuria or diabetes."

J. F. LYMAN.

Indicanuria and ocular affections. VARNI. *Ann. oftalmol.* 1914, 514; *Zentr. Biochem. Biophys.* 18, 390(1915).—Indicanuria does not possess the significance of an autointoxication and neither is it a pathognomonic indication of a general affection. Indicanuria is rather to be regarded as a fortuitous condition which has no connection with ocular affection.

H. S. PAINE.

Remarks on the work of Römer and Gebb: "Investigation of the biological behavior of blood serum toward lens albumin in cataract, V, VII." E. v. HIPPEL. Göttingen. *Arch. Augenheilk.* 78, 364(1915); *Zentr. Biochem. Biophys.* 18, 398(1915).—Polemical with reference to comments (*Arch. Augenheilk.* 78, No. 1/2) by R. and G. on a previous paper by v. H. entitled "Abderhalden method in cataract" (*C. A.* 8, 3464).

H. S. PAINE.

Structure and formation of biliary calculi. HUGO RIBBERT. Vienna. *Arch. Path.* 220, 20(1915); *Zentr. Biochem. Biophys.* 18, 178-9(1915).—The faceted, pigmented biliary calculi contain little or no Ca; they originate from soft, irregular masses which are composed of bile ppts. and possess at first no particular structure, being generally rounded in shape. In these masses there occurs a cryst. sepn. of cholesterol as tablets, spear-shaped figures and larger, radiating masses which appear as white granules; the bile pigment seps. from the original mixt. at the same time and appears as a yellowish brown to dark brown mass which is mixed with crystals in a varying manner and is impregnated with H₂O. Around the soft nucleus which is being transformed by the attachment of sepd. crystals there are deposited harder masses whereby sepn. of cholesterol and bile pigment occurs in a more regular manner and radial deposition of crystals ensues. Formation of strata occurs at the same time, while pure cholesterol layers alternate with pigment layers. In many gall stones there is a center or nucleus composed of minute fragments of crumbled stones or several united masses of irregular shape. The shape of the stones is quite independent of their chem. compn.; the significant fact is that sepn. (which further depends on the varying degree of fullness of the gall bladder) occurs at intervals. A pure cholesterol stone originates in a non-inflamed gall bladder through a simple process of crystn. (from bile rich in cholesterol) around any central nucleus (which is no longer detectable in the final stone). In case several irregular masses are formed these become mutually flattened out in pyramidal form and become enlarged by peripheral deposition of cholesterol, especially at the angles and edges (where more bile pigment is also deposited.)

H. S. PAINE.

Substances which excite growth of connective tissue. ROST AND R. WERNER. Heidelberg. *Deut. Z. Chir.* 133, 344-54, 355-67(1915); *Zentr. Biochem. Biophys.* 18, 376(1915).—Transplantation expts. with rabbits showed that only a slight connective tissue-like reaction was occasioned by recently transplanted tissue. The reactive proliferation of connective tissue was more pronounced when the tissue had previously been brought to incipient decompn. by means of autolysis. Röntgen rays especially influence tissue cells by causing the production therein of substances with pronounced excitant action on connective tissue. Peru balsam, scarlet red, naphthalan, ichthyol, etc., have no especial influence on connective tissue proliferation. R. and W. detected in mineral oils a series of substances which have considerable effect in stimulating

connective tissue. This action probably depends on the content of unsatd. hydrocarbons in these mineral oils.

H. S. PAINE.

Appearance of antitoxins in the anterior chamber of the eye. POLEV. *Klin. Monatsbl. Augenheilk.* 52, 819(1914); *Zentr. Biochem. Biophys.* 18, 401(1915).—Expts. on horses which had been immunized with diphtheria toxin showed that antitoxin appeared in the anterior chamber of actively immunized animals in an amt. of 1:250-900 as compared with its content in the serum; the amt. in the aq. humor was not the same in the various animals and was not proportional to the antitoxin titer of the serum.

H. S. PAINE.

Disturbance of liver function during pregnancy. B. BAUCH. Cologne. *Monatschr. Geburtshelk.* 42, 258(1915); *Zentr. Biochem. Biophys.* 18, 391(1915).—Out of 22 healthy pregnant women 14 excreted little or no sugar in the urine after administration of 40 g. galactose, while 8 excreted amts. of sugar which were comparable to the amts. eliminated by healthy non-pregnant women under similar circumstances. The sugar content of the blood showed normal values and experienced at most a quite insignificant increase due to the action of galactose. Hyperglucemia was not observed in healthy pregnant women; it was, however, detected in a case with symptoms of slight pregnancy toxicosis (this increased distinctly after galactose administration). These results indicate that impairment of liver function does not occur in healthy pregnant women.

H. S. PAINE.

Investigations of the organs and experimental studies of non-dropsical chlorine retention. J. LEVA. Berlin. *Z. klin. Med.* 82, 1-7(1915); *Zentr. Biochem. Biophys.* 18, 385(1915).—L. presents tables which show that the human organs may in pathol. cases (renal, cardiac and vascular affections) store twice the normal amt. of Cl (even thrice the normal amt. in the skin) without any essential increase in H₂O content; non-dropsical Cl retention may therefore take place in the human organism within these limits. Expts. with rabbits which had been rendered nephritic with U gave analogous results.

H. S. PAINE.

Excretion of various urinary constituents in liver affections. W. VON MORACZEWSKI AND E. HERZFELD. Zürich. *Z. klin. Med.* 82, 61-77(1915); *Zentr. Biochem. Biophys.* 18, 391(1915).—Total N, uric acid + purine bases, NH₃, volatile acids, Me₂CO, amino acids, indican and indole were quant. detd. in the urine (also N and indole in the feces) of patients suffering from liver affections (catarrhal jaundice, liver cirrhosis, etc.), healthy individuals in a condition of fast, diabetics, and patients suffering from renal affections and diseased conditions of the blood. No difference was detected between catarrhal jaundice and liver atrophy. Fasting, as well as fever, was found to modify liver functions. Excretion of all the substances which were quant. detd. was increased in affections of the liver, while only certain ones of these values were found to increase during a fast, diseased conditions of the blood, etc.

H. S. PAINE.

An enzyme theory of cancer. LEVERETT D. BRISTOL. Univ. of North Dakota. *Med. Record* 89, 180-90(1916).—Cancer is the result of localized hyperoxidation in epithelial cells and is induced by concd., accelerated and uninhibited action of intracellular oxidizing enzymes "as a result of [the presence of] various injurious agents."

A. H. RAHE.

H. PHARMACOLOGY.

ALFRED N. RICHARDS.

Chronic lead-poisoning in guinea pigs; with especial reference to nephritis, cirrhosis and polyserositis. W. OPHÜLS. *Am. J. Med. Sci.* 150, 518-41(1915).—Chronic lead-poisoning in guinea pigs produces severe degenerative changes in the epithelium of the kidneys and of the liver, leading to necrosis. These destructive lesions are partly

compensated for by constant regeneration. In the kidneys these lesions may eventually cause collapse of certain groups of tubules associated with moderate proliferation of the connective tissue and some chronic inflammatory changes. The glomeruli in these foci usually show a fibrous thickening of the capsule. In exceptional instances the defects produced in this way are large enough to cause a somewhat granular gross appearance of the organs. In the liver, large areas of collapse occur more frequently, so much so that marked irregularity of the surface resembling that observed in human cirrhosis is quite common. The connective tissue proliferation associated with this process is extremely limited, and therefore should be designated, not as a cirrhosis, but as a chronic focal atrophy. It produces general increased permeability of the blood vessels leading to the production of effusions, usually of a hemorrhagic character, into the serous cavities. These are most commonly observed in the pericardium, but the pleurae and the peritoneum are often also involved in the process. False membranes are apt to form on the surface of the serous membranes and their organization leads to the development of the picture of chronic polyserositis with fibrous thickening and sometimes adhesions.

TULA LAKE HARKBY.

The germicidal efficiency of dental cements. PAUL PORTSCHKE. Phila. *Dental Cosmos* 58, 325-31(1916).—"A critical review" of Smirnow's paper on the same subject (*C. A.* 10, 210).

JOSEPH S. HEPBURN.

The inflammatory tissues of the gingival margin and periodontal membrane: treatment by ionic medication. ERNEST STURRIDGE. London. *Dental Cosmos* 58, 403-6(1916).—The chemical principles underlying ionic medication are discussed. An expt. is reported, demonstrating the penetration of ions into tissue for a considerable distance with very low current strength. This medication is an excellent mode of antiseptis for deep tissues, *e. g.*, in pyorrhea alveolaris.

JOSEPH S. HEPBURN.

Are there any laws which govern the behavior of dental amalgams? N. K. GARTHART. *Dental Register* 70, 62-6(1916).—All amalgams made solely from base metals are sol. in the oral secretions, *e. g.*, Cu-Cd amalgam. The insolubility increases directly as the Ag content. Hardness or edge strength increases directly with the Ag content until the "period of saturation" or amalgam of max. hardness is reached; still higher Ag content causes too rapid setting. Retention of color depends on hardness; oxidation and action of sulfides are resisted by a hard and highly polished amalgam surface. The period required for setting, which begins as soon as the excess of Hg is removed from the plastic mixture of alloy and Hg, depends on the ratio of the metals in the alloy and on the quantity of Hg added; the amalgam should contain a max. of Ag and minima of Sn and Hg. Shrinkage increases as the time of setting grows greater.

JOSEPH S. HEPBURN.

Chemical treatment for pyorrhea alveolaris-necrotic tissue. J. S. BRIDGES. Chicago. *Dental Review* 30, 248-52(1916).—A description of the physiological action of certain compounds ($MgSO_4$, ZnO , $BiONO_3$, $PhOH$, aconite, eugenol, lanolin) when they are applied locally in the treatment of pyorrhea.

JOSEPH S. HEPBURN.

A review of some drugs old and new. S. F. M. HIRSCH. Cleveland, O. *Dental Summary* 36, 138-44(1916).—A discussion of the pharmacological action of $EtCl$, cocaine-HCl, novocaine, adrenaline, eugenol, $PhOH$, cresol, $HCHO$, $CuSO_4$, $ZnCl_2$, $CaCl_2$, $AgNO_3$ and emetine.

JOSEPH S. HEPBURN.

The place of the silicates in dentistry. CHARLES C. VOELKER. Brooklyn, N. Y. *Dental Summary* 36, 177-97(1916).—A statement of the compn. and the chemical and physical properties of the silicate cements.

JOSEPH S. HEPBURN.

Stovaine, a spinal anesthetic. JAMES G. SPACKMAN. Wilmington, Del. *Hahnemannian Monthly* 51, 130-2(1916).—Stovaine blocks the nerve roots. It is more stable

than cocaine, a more powerful anesthetic and but $\frac{1}{2}$ as toxic. Cardiac failure, due to stovaine, is counteracted by infusion of adrenaline in normal saline, or by intravenous injection of caffeine citrate, strychnine sulfate and adrenaline. JOSEPH S. HEPBURN.

A natrium muriaticum case. RUDOLPH F. RABE. New York City. *J. Am. Inst. Homoeopathy* 8, 1013-5(1916).—A report on the physiological action of NaCl given in homeopathic doses. JOSEPH S. HEPBURN.

Cimicifuga. ELLA M. TUTTLE. New Berlin, N. Y. *J. Am. Inst. Homoeopathy* 8, 1040-2(1916).—A discussion of the physiological action of tincture of cimicifuga (*Actaea racemosa*). JOSEPH S. HEPBURN.

Fixation of salvarsan and neosalvarsan by the blood after intravenous injection. WILLIAM J. YOUNG. Austral. Inst. of Tropical Med., Townsville. *Biochem. J.* 9, 479-84(1915).—Nierenstein (*Annals Trop. Med. Par.* 2, 249, 323(1908)) has shown that when serum is shaken with atoxyl (sodium *p*-aminophenylarsenate) and the proteins pptd. with tannic acid, the ppt. contains As which cannot be removed by washing. He further observed that when derivs. of atoxyl were used instead of atoxyl itself, As was present in the ppt. only in those cases in which the deriv. contained a free amino or imino group. The same occurs when atoxyl and its derivs. are injected into animals (Breinl and Nierenstein, *Deut. med. Wochschr.* 34, 1181(1908); *Z. Immunitäts-fors.* 1, 620(1909); *Annals Trop. Med. Par.* 3, 395(1909); *C. A.* 4, 468). Y. performed expts. to ascertain whether similar combinations could be obtained with salvarsan and neosalvarsan. Since these compds. are less stable than atoxyl, only expts. with living animals were made. Goats were injected intravenously with salvarsan or neosalvarsan and blood was drawn after various intervals of time. The blood was allowed to clot and the serum poured off and filtered. The serum was then dialyzed in parchment bags against running water (or saline) until all dialyzable As was eliminated. The serum was now filtered, decomposed with HNO_3 and H_2SO_4 , and evapd. The residue was tested for As by the modification of Gutzeit's method as recommended by Sanger and Black (*C. A.* 2, 975, 2352). In every case As was found. The ppt. caused by the addition of tannic acid to the serum gave a positive As test. Inorg. As is not bound to the serum in a similar manner. The combined As is found in blood long after free salvarsan and neosalvarsan have been removed. This combined As is confined to the plasma and the red blood cells. None is retained by the fibrin.

B. HOROWITZ.

Sodium hypochlorite in the treatment of septic wounds. FREDERICK J. A. DALTON. *Brit. Med. J.* 1916, I, 126-8—Dakin's antiseptic soln. (cf. *C. A.* 9, 2943) was applied to 15 cases of septic wounds. The decreased number of redressings required, and the safety with which the hypochlorite may be applied by untrained persons, make it of particular value in war surgery. A. H. RAHE.

Radium. C. E. FIELD. New York. *Med. Record* 89, 135-9(1916).—Twenty cases are cited in which Ra was used for the reduction of blood pressure. A. H. R.

Experimental study of the effect of emetinized blood on the typhoid bacillus. MARCUS BEEKMAN. *Med. Record* 89, 284(1916).—Tests performed on a human subject showed that subcutaneous injection of emetine-HCl does not impart bactericidal properties to the blood. A. H. RAHE.

Autolysin. S. P. BEEBE. *N. Y. Med. J.* 103, 360-4(1916).—A description of the compn. and method of prepn. of "autolysin," an herbal mixt. A. H. RAHE.

Experimental study of the influence of quinine in hemoglobinuric fever. RAYMOND BIJON. *Bull. Soc. Path. Exot.* 8, 597-604(1915); *Tropical Diseases Bull.* 7, 31(1916).—There is a diminution of the resistance of the red blood corpuscles and a lysin exists in the blood. The lysin comes into action owing to a failure of the

body to produce the necessary anti-lysin. Quinine has an action on the lysin either by satg. it or perhaps indirectly destroying malarial parasites. Quinine cannot have any effect on the progress of hemoglobinuric fever but only on its etiology, by accidentally pptg. the onset in an individual who is already in a state of malarial intoxication and will almost certainly have an attack later even without the administration of any quinine.

C. J. WEST.

Some refractories used in dentistry. GUY S. MILLBERRY. *Dental Register* 70, 75-85(1916); see C. A. 10, 616.

JOSEPH S. HEPBURN.

From the visible to the gamma-ray spectrum. SIDNEY RUSS. Middlesex Hospital. *Brit. Med. J.* 1916, I, 124-6.—One of the objects of this article is to put forward a plea for a more exact specification of the different types of radiation which are used experimentally and therapeutically.

A. H. RAHE.

Emetic action of oil of strophanthus (HATCHER) 17.

I. ZOÖLOGY.

R. A. GORTNER.

The production of light by animals. ULRIC DAHLGREN. Princeton Univ. *J. Franklin Inst.* 180, 513-37, 711-27(1915); 181, 109-25, 243-61, 377-400, 525-56(1916).—These papers give a comprehensive description of the production of light by bacteria, protozoa, fungi, sponges and coelenterates, echinoderms and lower mollusks, and cephalopods, respectively. The physiology and histology of the light organs are described, and attention is paid to the biochemistry of luciferin and its oxidation with the production of light.

JOSEPH S. HEPBURN.

Oxygen and carbon dioxide content of the blood during hibernation in the woodchuck (*Marmota monax*). A. T. RASMUSSEN. Cornell. *Am. J. Physiol.* 39, 20-30 (1915).—During hibernation of the woodchuck there is a slight increase in arterial CO_2 and a marked increase in venous CO_2 (33% in venous blood about the middle of torpidity). Venous blood has a decidedly lower and arterial blood a slightly lower O content during hibernation.

J. F. LYMAN.

Resistance of fresh-water fish to changes of osmotic and chemical conditions. W. E. GARREY. Washington Univ. *Am. J. Physiol.* 39, 313-29(1916).—Fresh-water fish (*Notropis blennioides*) live in distd. H_2O for weeks provided the skin is uninjured. In sea water death is sudden but sea water dild. to the concn. of the blood is a perfectly balanced soln. Solns. of cane sugar are directly toxic, least so when isotonic with the blood. The toxicity of cane sugar solns. is reduced by alkalies and by salts. Individual solns. of the chlorides of Na, K, Ca, and Mg are toxic in the order $\text{K} > \text{Mg} > \text{Ca} > \text{Na}$. Toxicity of solns. of CaCl_2 , MgCl_2 and KCl is decreased by NaCl ; of NaCl , KCl and MgCl_2 by CaCl_2 ; of CaCl_2 and KCl by MgCl_2 . MgCl_2 did not show an antagonistic action against NaCl , nor KCl against CaCl_2 , MgCl_2 and NaCl . In combinations of 2 or more of the other salts the antagonistic decrease of toxicity by K and by Mg is apparent. An alk. tap water is not noticeably injurious to these fish.

J. F. LYMAN.

Reaction and resistance of fishes in their natural environment to acidity, alkalinity and neutrality. M. M. WELLS. *Biol. Bull.* 29, 221-57(1915).—Fresh-water fishes select a slight acidity in a gradient, when the other choices are neutrality and alkalinity. They choose slight alkalinity in preference to neutrality. The CO_2 optimum for the species of fishes varies from very close to neutrality for the blue gill to 6 cc. per l. water for the goldfish. This is for the Nov. to Jan. conditions. At other seasons the optimum probably varies. The optimum acid concn. for the blue gill is about 0.00005 N H_2SO_4 . The distribution of the reaction in N. Y. shows a correlation with the chem. reaction

of the water. There are fewer animals at neutrality than in slightly alk. or slightly acid water. The neutrality of distd. water is a factor to be considered with reference to its toxicity. Cf. C. A. 10, 939. L. W. RIGGS.

Effects of certain organic and inorganic substances upon light production by luminous bacteria. E. N. HARVEY. *Biol. Bull.* 29, 308-11(1915).—The effects on luminous bacteria of diln. of sea-water with water, *M* sugar soln., HCl, valeric acid. NaOH, CH_3NH_2 , salts of sea-water in different combinations, and of methyl, ethyl, propyl, butyl, amyl, and capryl alcs. were studied and the results are shown in 4 tables. Changing the compn. of sea-water in any way generally diminishes the amt. of light given off by the luminous bacteria. Cf. C. A. 10, 74. L. W. RIGGS.

Nitrogenous constituents of *Paralithodes camtschatica* and *Polypus punctatus*. E. TAKAHASHI. *J. Coll. Agric., Tohoku Imp. Univ.* 6, 289-302(1915).—The work of various authors on the compn. of crab meat and of mollusks is reviewed. By T.'s method with *P. camtschatica*, 2200 g. fresh crab meat were hashed and repeatedly extd. with H_2O at 60° until the combined exts. measured 6.5 liters. Total N in 100 g. of the fresh meat is 2.71 g.; H_2O -sol. N 1.26, which was made up of albumin N 0.308, ammonia N 0.021, N pptd. by phosphotungstic acid 0.342, remaining N 0.589. The phosphotungstic fraction calcd. to 100 parts of fresh meat gave N pptd. by AgNO_3 0.013, pptd. by AgNO_3 and Ba(OH)_2 0.109, remaining N 0.218. In 100 parts of H_2O -sol. N there was found albumin N 24.44, ammonia N 1.67, N pptd. by phosphotungstic acid 27.14, remaining N 46.75. In 100 parts of N pptd. by phosphotungstic acid there was found N pptd. by AgNO_3 3.81, N pptd. by AgNO_3 and Ba(OH)_2 31.91, remaining N 64.28. Detailed directions are given for the isolation and detn. of the bases with the following results: One kg. of crab meat contained histidine (hydrochloride) 0.041, arginine nitrate 0.91, betaine 2.0, tyrosine 0.125, leucine 0.46, and purine bases were present. Two kg. of the clear flesh of *Polypus punctatus* (ink snail) were extd. with H_2O at 50 - 60° , the combined exts. measuring 4.5 liters. Calculated to fresh meat 100 parts gave sol. matter 7.942, sol. N 0.787, sol. albumin 0.142, basic N 0.315. The bases were isolated as cryst. products with the following results: One kg. fresh meat contained taurine 3.73, carnosine (picrate) 2.39, betaine 3.28, histidine (methyl ester hydrochloride) 0.54 g. (cf. following abstr.). L. W. RIGGS.

Occurrence of betaine in some sea animals. E. TAKAHASHI. *J. Coll. Agric., Tohoku Imp. Univ.* 6, 303-9(1915).—Detailed directions are given for the extn. and purification of betaine from the meat of the lobster and from 2 species of mussels, with the following results, the figures for the crab and ink snail (cf. preceding abstr.) being added for comparison: One kg. of fresh meat of *Pandalus* sp. 2.0, *Macra sachalinensis* 5.0, *Pecten yessoensis* 0.6, *Paralithodes camtschatica* 2.0, and *Polypus punctatus* 3.28 g. (Cf. Suzuki, *et al.*, C. A. 4, 223, 1051.) L. W. RIGGS.

Electromotive phenomena and membrane permeability. J. LOEB. *New York Science* 42, 643-6(1915); cf. C. A. 10, 344.—A review and criticism are given of the ground taken by Bayliss in the latter's address (cf. *Science* 42, 509(1915)), and from the work of L. and Beutner shows that the fact that an active part of a tissue becomes negative to a part at rest is explained by assuming "that in the active part of the tissue substances are formed which temporarily alter the potential at the inner surface in such a sense as to make the outside on that spot appear more negative. There is no necessity for assuming any increase in the permeability of the skin." L. W. RIGGS.

Cell penetration by acids. W. J. CROZIER. *Bermuda Biol. Sta. Science* 42, 735-6(1915); cf. C. A. 8, 2197.—The water-sol. blue pigment in the cells of a nudibranch, *Chromodoris zebra*, is a sufficiently delicate indicator for use in this study. The pigment is insol. in anhydrous acetone, Et_2O , CHCl_3 , xylene, and oils. It turns pink

with acids and green with alkalis. Comparatively uniform pieces of the lateral mantle edge were treated by the method of Harvey (cf. *C. A.* 8, 3080), the acids being 0.01 *N* concn. The time of penetration in min. at 27° was for different acids as follows: isovaleric 1.9, salicylic 3.5, formic 4.5, HCl 7.6, HNO₃ 8.4, H₂SO₄ 8.5, lactic 8.6, oxalic 8.8, tartaric 13.5, citric 16.0, butyric 19.0 and acetic 75.0. These results are in general agreement with those of Harvey on the testis of *Stichopus ananus*. By testing the penetration of these acids over a range of concns. (0.1 to 0.001 *N*) and arranging results to show penetration-dilution curves a very different picture is obtained. The acids fall into 2 groups the first consisting of oxalic and the 3 mineral acids, and the second group of the others. Further details are promised.

L. W. RIGGS.

12. FOODS.

W. D. BIGELOW, F. F. FITZGERALD.

The analysis of maple products. VII. The electrical conductivity test for the purity of maple sirup. J. F. SNELL. *J. Ind. Eng. Chem.* 8, 331-3(1916); cf. *C. A.* 7, 4021; 8, 380, 1839; 10, 940, 1059.—Errata in Paper I (cf. *C. A.* 7, 4021) are corrected. The test has been modified to suit the new Van Zoeren electrode which S. now uses. 20 cc. of the sirup are measured into a 100 cc. beaker from a 25 cc. graduate, allowing thorough draining. Two successive portions of distd. water each equal in volume to the sirup taken are added from the same graduate. The mixt. is put into a dip electrode, thoroughly stirred, brought to exactly 25°, and the measurement made. The const. of the cell is divided by the observed number of ohms, and the results multiplied by 100,000. Cond. values as low as 96 and as high as 230 have been met with in genuine sirups. The limits of percentage variation of the cond. value in genuine sirups are much narrower than those of any of the older analytical values but not as narrow as those of the volumetric lead no. Values above 200 have not been met with except in kettle-boiled and pan-boiled sirups.

E. A. TSCHUDY.

The occurrence of sucrose in relatively large amounts in a new seedling grape. W. B. ALWOOD AND J. R. EOFF, JR. *J. Ind. Eng. Chem.* 8, 334-5(1916).—A seedling grape, apparently of the *labrusca* group was examd. frequently for 60 days, and during this period the sucrose content varied between 5.23 and 10.36%. This is higher than previously reported for any grape. The analyses of 17 samples collected at intervals from Aug. 23 to Oct. 22 are tabulated.

H. S. BAILEY.

The occurrence of sucrose in grapes of American origin. H. C. GORE. *J. Ind. Eng. Chem.* 8, 333-4(1916).—An examn. of 66 varieties of grapes grown in Vineland, N. J., during 4 successive seasons shows that 43 contained no sucrose. In 10 sucrose was found occasionally, and in 13 varieties it was frequently present. The tabulated data show as much as 5% of sucrose in one variety (Lady), in 1913, and none in the same grape in 1914.

H. S. BAILEY.

A comparison of the methods for the determination of casein in milk. C. B. HERSHEY. *J. Ind. Eng. Chem.* 8, 335-6(1916).—The Van Slyke volumetric, the Hart centrifugal, and the Official Nitrogen methods for the detn. of casein in milk were compared on 143 samples of Calif. milk. The av. found by the Official method was 2.47, by Hart's 2.52 and by Van Slyke's 3.07; max. 3.31, 3.4, 3.70 and min. 1.71, 1.81 and 1.05%, resp. 70% of the detns. by the Hart method gave results higher, 6.0% equal to, and the remainder less than the Official method. With the Van Slyke method 77% of the results were above, 1.0% the same, and the rest below the A. O. A. C. method, but the amt. of variation was greater with the V. S. than with the Hart method. For all ordinary work the Hart method, when an elec. centrifuge is used, is as accurate

as the Official method, and far superior to the V. S. method. It is very much quicker, and requires neither exact standard solns. nor final calcs. H. S. BALEY.

The importance of determining the specific gravity of milk serum as a means of detecting water adulteration. HERRAMHOF. *Molkerei Ztg. (Hildesheim)* 28, No. 7, 115-8 (1914).—After an investigation extending from June, 1912 to February, 1913, H. reached the following conclusions: (1) The sp. gr. of the serum of milk from the same cows remains practically const.; it varies less than the sp. gr. of the milks examined. (2) The sp. gr. of the serum is lowered in proportion to the amt. of water added. (3) The serum obtained by spontaneous coagulation is preferable to that obtained by any other method. (4) The sp. gr. of the serum remains const. after 3 days and, in the case of a perfectly clear filtrate, even after 4 days. (5) Cloudy milk serum can be made clear by filtering through bone-black without affecting the sp. gr. G. A. MENGES.

Comparative experiments on pasteurized and biorized milk. R. BURRI AND A. C. THAYSEN. Bern-Liebfeld. *Z. Gärungsphysiol.* 5, 167-86(1915).—"Biorized" milk, prep'd. by spraying raw milk into a heated chamber and cooling, was compared with pasteurized milk. It was found that milk biorized at 75° was practically equiv. to milk pasteurized 1/2 hr. at 65°, as regards peroxidase reaction, catalase reaction, time of coagulation by rennet, Schardinger reaction, and bacterial count. A. W. DOX.

"Herramhof's fat-tester," an apparatus for determining fat in cheese, dry milk, cream, etc., in practice. HERRAMHOF. *Molkerei Ztg. (Hildesheim)* 28 No. 36, 677-9 (1914); *Exp. Sta. Record* 33, 314.—The app. employed consists of 2 parts, a flask which receives the cheese to be tested and the butyrometer proper. The outer wall of the mouth of the flask and the inner wall of the butyrometer are so ground as to form a sealed joint. The butyrometer is graduated to 0.5%. In the test 2.5 g. cheese is weighed into the flask and 6 cc. H₂SO₄ (d. 1.5) is added. The flask and contents are heated on an asbestos plate until the cheese is completely dissolved, and 16.5 cc. H₂SO₄ (d. 1.5) and 1 cc. AmOH are added. The butyrometer attachment is then placed on the flask and the app. kept for about 30 sec. on the hot plate. After going through the other details of the procedure, the butyrometer attachment with its contents is stoppered with a rubber, whirled in a centrifuge for 3 min. and placed in a water-bath at 67°. The height of the fat column is then read. The total solids of the cheese may be estd. by drying the cheese in the flask previous to adding the H₂SO₄. The methods of detg. fat in dry milk, cream, and milk are also described. G. A. M.

The present status of milk-drying technic. EMIL FREUND. *Wiener Landw. Ztg.* 65, 663-4, 669-71(1915).—F. describes the different methods used in the prep'n. of milk powder and points out their advantages and disadvantages. Several illustrations are given. C. F. MILLER.

"Poli" Oil, a new adulterant of ghee, Indian clarified butter-fat. J. H. BARNES AND ARJAN SINGH. *Analyst* 41, 72-3(1916).—Poli is a name applied to a weed of Northwest India, *Carthamus oxyacantha*, one of the safflowers, belonging to the natural order Compositae. Its seed is edible, and yields a yellow oil, sometimes used as an illuminant, and also as an adulterant of ghee or Indian clarified butter. For the latter purpose its color and taste render it very suitable. The consts. of the fresh oil are: d_{15.5} 0.9272, I value 167.4, sapon. value 174.2, acetyl value 60.5, acid value 5.9, R.-M. value 0.61, [α] nil, n_{20}^D 1.4818, n_{40}^D 1.4755. P. B. DUNBAR.

Influence of salts on amylolysis in bread. J. EFFRONT. *Mon. sci.* [5] 6, 5-12(1916).—The role of the saliva is to dissolve the starchy substances in the course of the first hour of gastric digestion. The HCl of the gastric juice stops salivary digestion of pure starch, but the starchy matter of bread offers greater resistance to the acid, due to the P₂O₅. Whole-wheat bread, having more phosphate than white bread, is more easily

digested. The salts of di- and tribasic acids in bread neutralize the HCl. The monophosphate formed exerts a direct action on the amylolytic enzyme, rendering it more resistant to the free acids.

C. S. M.

The fruit of the horse-chestnut, and its use as human and animal food. H. SERGER. raunschweig. *Chem. Ztg.* 40, 221-2(1916).—Expts. on feeding the nuts to calves, pigs and sheep have shown the best results with calves, as the bitter taste was less objectionable to these. The bitter may be removed by boiling the crushed nuts a short time with several changes of H₂O, after which they may be prepd. for feeding other domestic animals. For human food, extn. with H₂O did not completely remove the bitter taste. A 1% soln. of K₂CO₃ removed the bitter taste but left a disagreeable sweetish taste which can be removed by extg. with 50% alc., giving a flour suitable for baking. Treating the nuts with alc. before extg. with H₂O did not remove all the bitter taste. Cf. Auld, C. A. 7, 1769; Laves, *Chem. Ztg.* 26, 954(1902).

J. H. M.

Native pasture grasses of the United States. DAVID GRIFFITHS, GEO. L. BIDDLE and CHAS. E. GOODRICH. Bur. Plant Ind., U. S. Dept. Agr., *Bull.* 201, 52 pp. (1915).—Data are given regarding over 140 species, analyses being given in most cases.

E. J. C.

Fruit by-products. W. V. CRUESS. *Calif. Sta. Rept.* 1915, 31.—C. refers to the production of clear, palatable jellies from citrus fruits. The jelly stock is cleared by settling and filtration or by clarification with Spanish clay. Small amts. of SO₂ checked darkening and development of a musty taste. Household methods of manufacture have since appeared in Univ. Calif. Sta., *Circ.* 146.

W. V. C.

Enzymes of apples and their relation to the ripening process (THATCHER) 11D. The poisonous forms of the lima bean (DUNLOP) 11D. Hydrolysis of some of the common vegetable oils (RUDD) 27. Action of ozone on microorganisms and artificial substrates, as shown by ozone treatment in the cold storage of meat (HEISE) 11C. Dried potato pulp (PAROW) 16.

Drying apple or other fruit juices. J. C. FLEMING. U. S., 1,174,404, Mar. 7. Freshly expressed juice is mixed with powdered malt and the mixt. is evapd. at a low temp. and then more completely dried under a protecting cover of animal charcoal to obtain a "fruit flour," which may be added to wheat flour and other materials used in baking.

Tomato extract. G. FERRICHS. U. S., 1,174,248, Mar. 7. A tomato ext. is prepared by fermenting pulped tomatoes with yeast and sepg. and inspissating the fermented juice. The destruction of the sugar present gives a product which is similar to meat ext.

Coffee extract. K. B. VON VIETINGHOFF. U. S., 1,175,490, Mar. 14. A readily sol. dry coffee ext. is prepd. by exhausting roasted powdered coffee berries with a fat-solvent and then with H₂O, evapg. the solvent from each ext. and mixing the 2 exts. after separately roasting the aq. ext.

Solid coffee extract. K. B. VON VIETINGHOFF. U. S., 1,175,091, Mar. 14. A completely sol. coffee ext. is made by lixiviating roasted coffee beans with H₂O, evapg. the ext. to dryness and roasting the dry residue at a temp. of about 225° for 10 min. or longer while permitting free escape of the vapors given off. The aromatic constituents may first be removed from the beans by C₆H₆ or CCl₄ and subsequently added to the aq. ext.

"Vegetable milk" from soy beans. W. J. M. S., 1,175,467, Mar. 14. Soy bean meal is stirred with hot H₂O to a thick slurry and the slurry is freed from

soy oil by centrifuging, and sesame oil or other edible oil, fatty acid, sugar, salts, citric acid and lactic culture in imitation of cow milk or cream are added and the product is pasteurized.

Pasteurizing milk. G. SINCLAIR. U. S., 1,175,876, Mar. 14. Pasteurizing milk without destroying lactic acid bacilli is effected by gradually heating the milk to about 65° to acclimatize the lactic acid bacilli to this temp., sterile air is then passed through the milk to remove noxious gases, the temp. is flashed to about 82° and after cooling to 15° the milk is maintained at this temp. for a sufficient time to permit development of the lactic acid bacilli.

Sterilizing milk. O. LOBECK. U. S., 1,174,592, Mar. 7. Milk is atomized in a closed chamber surrounded by a heating jacket and allowed to flow over a heated inclined bottom of the chamber.

Sterilization of food products in sealed metallic containers. A. WEISSENTHALER. Fr., 477,920, Mar. 8, 1915. Oxygen is removed from the interior, and the cover is then forced into place while atm. pressure prevails.

Preserving fish. G. A. SMITH. Brit., 23,194, Nov. 27, 1914. In preserving fish by immersion in cooled, concd. and electrolyzed sea water, the fish is placed in boxes having louvered or slotted sides and adapted to fit into cases through which the brine is circulated. The brine is passed through a filter comprizing porous partitions, and C-charged cylinders which serve as electrodes. The cases are connected by pipes and cocks arranged so that one or more of the cases may be cut out of the circuit.

Infant food. M. FRANZIE. Fr., 477,949, Feb. 17, 1915. Steamed cereals are subjected to the action of ferments dissolving starch, or of fruits containing these ferments, whereupon the resulting mass is dried, broken up, and pulverized.

14. WATER, SEWAGE AND SANITATION.

EDWARD BARTOW.

Effect of flood water on ground water. A. LANG. *Intern. Z. Wasserversorg.* 1: 176-7(1915).—Water of springs and wells is shown to be affected by flood flow in near by rivers.

FRED W. TANNER.

The influence of algae of submerged sand filters on the chemical composition of water. L. GIZOLME. *Compt. rend.* 161, 313-6(1915).—Under the influence of sunlight chlorophyll decomposes CO₂, increasing the dissolved-oxygen content of the effluent as much as 3 parts per million. The alkalinity expressed in terms of CaO is decreased approx. 10 p. p. m. as a result of the pptn. of carbonates. At night, in the absence of light, respiration alone is active and the dissolved oxygen in the effluent is decreased below that of the raw water. The max. lowering of the alkalinity is produced several days after filter scraping. Bubbles of gas (55 to 60% O) are released from the water over the filters, more often in the evening during periods of max. alkalinity lowering. At such times the water is found to contain large numbers of diatoms and their presence is followed by the appearance of filamentous algae. These phenomena are more apparent in summer than in winter. Naturally the rate of filtration influences the raising of the O content and the alkalinity lowering.

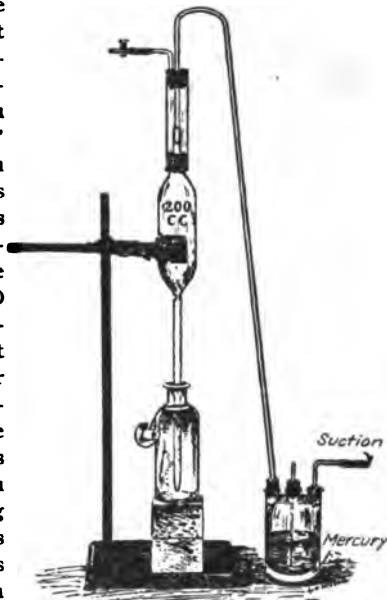
W. F. LANGELIER

Purifying water for mine power plants. M. F. NEWMAN. *Mining Eng. World* 43: 851(1915).—N. gives an example of a large saving of expense by the installation of a water-softening system in connection with a mine power plant. The use of both nostrums and mechanical devices is not to be recommended.

E. GREENFIELD

Note on a new apparatus for use with the Winkler method for dissolved oxygen in water. H. L. SHOUB. Pub. Health Service, U. S. *Hyg. Lab. Bull.* 96, 83-5, 1914.

To obviate the necessity of calibrating and marking each new bottle, with subsequent calculations, a definite volume (200 cc.) of the soln. is withdrawn (with the least possible agitation and exposure to the air) and titrated. To save time and labor the app. shown in the fig. was devised. The 200 cc. pipet extends through a rubber stopper into a suction chamber made of 1-in. glass tubing. From the top of this chamber there project 2 tubes, one terminating in a glass cock open to the air, the other in the pressure regulator bottle shown below. The latter tube extends into the suction chamber and to a point within the end of the pipet which is exactly opposite its graduation mark. The pressure regulator bottle is connected directly to the suction system or may be connected to a Richards' aspirator. It holds a layer of Hg, above which is a layer of H₂O; a capillary tube enters this bottle through the center hole and projects slightly beneath the Hg surface. The submergence of this tube is so arranged that when the suction is applied at a const. and slow rate, H₂O will rise in the pipet and part way into the suction tube. When it has reached a point about opposite the upper end of the suction chamber air enters the regulator bottle through the submerged capillary and prevents further rise of the H₂O column. An approx. adjustment of this level is made by submerging the capillary in the Hg and it is finally adjusted by adding H₂O above the Hg until the desired result is obtained. Having regulated the app., it is operated as follows: the bottle of H₂O which has been prepd. for titration is placed in position



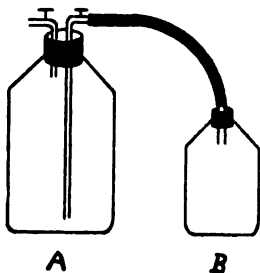
beneath the pipet and suction applied at such a rate that the pipet will just about fill in the time required for a titration. The stopcock leading to the air is closed. Titration of the previous sample is then proceeded with without further attention to the app. The liquid fills the pipet to its mark and then enters the upper tube up to a point about on a level with the upper rubber stopper, where it comes into equil. with the submerged capillary in the regulator bottle, air being admitted through the latter and the H₂O level remaining const. in the suction tube. The whole system is now in equil., and will remain so indefinitely. The bottle is next removed and a flask placed in a similar position. The stopcock is then opened to the air. The contents of the pipet are discharged rapidly into the flask, while the contents of the suction tube above its lower point are drawn over into the regulator bottle. The next sample is then put in place, the stopcock closed and the titration of the present sample proceeded with.

F. W. SMITHER.

Methods of sending specimens of water. JACK J. HINMAN, JR. *J. Am. W. W. Assoc.* 3, 224-8(1916).—The precautions which should be used in collecting samples of water for bacterial analysis are enumerated. The method here described is that in use by the Iowa State Board of Health. A gallon glass-stoppered bottle which has been sterilized according to the directions of the Am. Pub. Health Assoc. is used for collecting both the chem. and bacterial sample. For the ordinary analysis it is shipped to the lab. un-iced in a padded shipping case. Analyses for special purposes, such as filter control, are made on smaller amts. of water which are sent to the lab. packed in

ice. Field samples were taken in smaller amts. of 500 cc. which is sufficient for chem. and bacterial analyses according to the methods of Penniman and Enslow. For transporting this sample a special shipping case was devised which required 6 lbs. of ice. The box and bottle complete cost \$1.75 to \$2. Satisfactory results have been obtained with such app. F. W. T.

Sterilization of water by chlorine. J. J. H. NELSON. *Brit. Med. J.* 1915, I, 789-93.—The bottle A, shown in the diagram, is filled with water and the stopcock in the short tube closed. Two drachms of concd. HCl are placed in the small bottle B, 15 grains of KClO_3 added, and the stopper applied. The pressure in A is adjusted as required by opening the stopcock in the short tube. After the reaction is complete the contents of B are added to those of A, when the latter will contain a soln. of Cl_2 and ClO_2 of such strength that 1 oz. added to 5 gallons of water will give a diln. of Cl of 1:440,000. The app. is especially adapted to the use of troops in the field. Expts. are cited showing the effect of chlorination on natural and artificially infected waters. A. H. RAHR.



Efficiency of the liquid chlorine sterilization plant at Wakefield, Mass. E. C. SHERMAN. *N. E. W. W. Assoc.* 30, 135-42(1916); *Eng. Contrg.* 44, 410(1915); *Munic. Eng.* 49, 210(1915); *Munic. J.* 39, 811(1915).—From 9.5 to 1.24 parts per mil. of liquid Cl are used to sterilize water served to 13,000 population. The water contains large amts. of org. matter. The bacteria range from 30 to 1420 cc. in the raw water and only from 1 to 56 in the treated water. The plant cost \$600, with an operating cost of \$1.25 per mil. gal. LANGDON PEARSE

Substitute for potassium permanganate to liberate formaldehyde gas from a water solution. S. G. DIXON. Pa. Health Commission. *J. Am. Med. Assoc.* 64, 459(1915).—The following formula is recommended: $\text{Na}_2\text{Cr}_2\text{O}_7$, 10 oz. avoirdupois; satd. soln. HCHO gas, 1 pint; com. H_2SO_4 , 1.5 fl. oz.; glycerol, 1.5 oz. The glycerol is added to prevent freezing. If the soln. becomes cloudy it can be cleared by gently warming for a long period. L. W. RIGGS.

The water supply of Krakau from a hygienic standpoint. O. BUJWID. *Intern. Z. Wasserversorg.* 3, 35-7(1916).—A brief historical sketch of the development of the water supply is given. Water is taken from a series of 23 wells, the chem. and bacteriological characteristics of which are not significant. F. W. TANNER.

A water power reconnaissance in South-Central Alaska. C. E. ELLSWORTH AND R. W. DAVENPORT. With a section on Southeastern Alaska by J. C. HOYT. U. S. Geol. Survey, *Water Supply Paper* 372(1915). W. D. C.

The people's interest in water power resources. GEORGE O. SMITH. U. S. Geol. Survey, *Water Supply Paper* 400-A(1916). W. D. C.

A method of correcting river discharge for a changing stage. BENJAMIN E. JONES. U. S. Geol. Survey, *Water Supply Paper* 375-E(1915). W. D. C.

Conditions requiring the use of automatic gages in obtaining records of stream flow. C. H. PIERCE. U. S. Geol. Survey, *Water Supply Paper* 375-F(1915). W. D. C.

The Seattle water supply. JOHN WEINZIRL. *J. Ind. Eng. Chem.* 8, 369-71(1915).—Water is obtained from Cedar River by a pipe line 28.57 miles long. Special sanitary measures are employed to keep the water pure, and an emergency hypochlorite plant is maintained. Other protective measures might be adopted. R. BARTOW.

Ground water in Lasalle and McMullen counties, Texas. ALEXANDER DEUSSEN AND R. B. DOLB. U. S. Geol. Survey, *Water Supply Paper 375-G*(1916).—The supply of water is not very abundant and much of it contains too much mineral matter to be of use for domestic purposes or for irrigation. From 131 analyses (not very complete in most cases) the quality of the water in the different geologic formations is shown. For each water analyzed the scale-forming constituents, foaming constituents, and alkali coeff. are calcd. The waters are also classified as to their quality for boiler use, domestic use, irrigation, and as to probability of corrosion. W. D. C.

Water powers of the Cascade Range. III. Yakima River basin. G. L. PARKER AND F. B. STORREY. U. S. Geol. Survey, *Water Supply Paper 369*(1916). W. D. C.

Fat from sludge and the disposal of residue. JENCKEL. *Chem. Ztg.* 39, 492-3 (1915).—The process at Kassel is described; it consists in acidifying the wet sludge and treating at a temp. of 90 to 100°, filter-pressing, drying and extg. with benzene. Extd. sludge has proved to be of no fertilizer value and is only a waste product for the city. Extd. fat yields a good quality of stearin but it has not been shown that the income from it is sufficient to pay for its extn. and the disposal of the worthless sludge. One of the chief difficulties with the sludge is the removal of water. Cf. Bechhold (C. A. 9, 2410). W. D. HATFIELD.

Sewage disposal for isolated residences. C. G. GILLESPIE. Calif. State Board of Health, *Bull.* 11, 391-8(1916).—G. reviews the possible methods of waste disposal for isolated residences in rural districts. The methods discussed are leaching cesspool, septic tank, broad irrigation and subsurface irrigation. The advantages and disadvantages of these methods are treated together with brief statement of the cost. The entire system of wastes disposal for country homes should be constructed for about \$100 under conditions where labor would not have to be hired. \$40 or \$50 would cover the cost of materials. General plans and cross-sections accompany the paper.

FRED W. TANNER.

Recommends \$2,500,000 garbage plant for New York. JOHN T. FETHERSTON. *Eng. Record* 73, 349-50(1915).—The plant will be on Rikers Island and will have a capacity of 2800 tons. The plant will be of the Cobwell system of garbage treatment which is in operation at New Bedford, Mass. Financial agreement provides for the plant to revert to the city at end of 5 years on payment of 1.5 mil. dollars. New Bedford plant operation is detailed. FRANK BACHMANN.

Reaction and resistance of fishes in their natural environment to acidity, alkalinity and neutrality (WELLS) 11 I.

Water-softening apparatus. C. L. KENNICOTT. U. S., 1,176,368, Mar. 21. A float valve and connections control automatically the amt. of H₂O-softening chemicals in proportions adjusted to the amt. of H₂O to be purified which passes through the app.

Sterilizing liquids by means of ultraviolet rays. SOC. MÉRAN FRÈRES. Fr., 477,866, July 2, 1914. The liquid is conducted through a spiral trough under, and exposed to, the source of ultraviolet rays.

Preventing the formation of boiler scale. G. G. SCHLAEFFER. Fr., 477,879, Mar. 4, 1915. A pulverized carbonaceous substance is mixed with the feed H₂O. The substance is incorporated in a suitable saline soln.

Purifying sewage. G. W. and J. F. NAYLOR. Brit., 23,146, Nov. 27, 1914. Tanks for purifying sewage by aerating in the presence of sludge are divided by partitions having openings or pipe connections so that sewage and sludge pass successively through the compartments by gravity. Aerating devices consisting of porous tiles,

through which air is forced, may be placed at the back of the partitions so that injection of air assists the circulation.

15. SOILS AND FERTILIZERS.

R. O. E. DAVIS.

Preliminary studies on heated soils. JAMES JOHNSON. Univ. Wisconsin. *Science* 43, 434-5(1916).—Seed germination tests, in general, gave similar results, though different seeds varied much in their susceptibility to the injurious action. Plant growth is affected in much the same manner. Different soils give markedly different results upon heating to the same temps. The action appears to be dependent particularly upon the content of org. matter in the heated soil. The temp. to which the soil is heated is seemingly the most important factor in detg. the extent of the injurious or beneficial action; heating to approx. 250° had the greatest retarding effect on germination. Heating to 300° , or above, in all the soils used, again reduced the injurious action to seed germination and early plant growth, as well as the beneficial action to late plant growth. Heating soils to 250° produced greater amts. of material extractable with water than heating to higher or lower temps. The NH_3 content of the soil increased proportionally to the temp. up to about 250° , after which it rapidly fell to a minimum. This increase was accompanied by a decrease in nitrates, which were practically non-existent in the highly heated soils. The percentage of seed germination has been found to be closely correlated with the amt. of NH_3 present in the heated soils studied. The amt. of NH_3 required to injure germination, however, appears to vary with the type of soil. It appears that the absorptive power of the soil is a very important limiting factor in detg. the extent of the injurious action. That the toxic substance is of a volatile nature is evident by the fact that it is readily removed from the soil by aeration. If collected in water upon removal, its toxicity can be readily demonstrated. By collecting in a HCl soln. the resultant salt is NH_4Cl . Large amts. of CO_2 are produced when soils are heated. The evidence points towards the formation and injurious action of $(\text{NH}_4)_2\text{CO}_3$ particularly. It also appears that other compounds of NH_3 , more stable in character, are formed. The beneficial action of heated soils on plant growth, especially of those heated between 150° and 250° , is believed to be due largely to the direct assimilation of NH_3 or NH_3 compounds. The increased growth follows in practically all cases after a period of injurious action to plant growth. W. H. FRY.

The comparative effect of phosphates and sulfates on soil bacteria. E. B. FRY AND E. B. HART. Wisconsin Agr. Expt. Sta., *Research Bull.* 35, 35-6(1915).—The addition of mineral fertilizers to soils causes an increase in ammonification, CO_2 evolution and total number of bacteria. The addition of KH_2PO_4 to peptone soln. causes a great increase in the production of NH_3 . Merck's pptd. calcium phosphate (mixture of di- and tri-) causes a stimulation in the production of NH_3 in 5-day liquid cultures. Insol. $\text{Ca}_3(\text{PO}_4)_2$ in the form of bone ash did not aid NH_3 production by bacteria in peptone soln. CaSO_4 and K_2SO_4 increased ammonification slightly, the latter being more active, probably due to the K. The action of KH_2PO_4 as compared with that of K_2SO_4 shows that the K ion does not materially influence ammonification. KH_2PO_4 causes an enormous increase in the multiplication of bacteria. This is followed by a rise in NH_3 production which, however, is not in proportion to the number of bacteria, for the amt. of NH_3 produced by bacteria in these cultures is only $1/2$ that in cultures containing peptone soln. alone. In pure cultures of ammonifying bacteria in peptone soln. $\text{Ca}_3(\text{PO}_4)_2$ is ineffective in stimulating either ammonification or multiplication of bacteria. In Miami silt loam K_2HPO_4 stimulated ammonification and cell multiplication, as did also $\text{Ca}_3(\text{PO}_4)_2$. All phosphates increase the number of soil bacteria, this being most

marked in the case of K_2HPO_4 . $CaSO_4$ gives a slight increase in CO_2 evolution. Phosphates increased evolution of CO_2 when added to soil; with K_2HPO_4 this increase seemed proportional to the amt. of phosphate added. $MgSO_4$, K_2SO_4 and $(NH_4)_2SO_4$ increase CO_2 evolution from soil, the latter enormously. The results of this work as a whole suggest that possibly the increased crop-production of a soil resulting from the application of sol. phosphates is in part due to the promotion of bacterial activity. By the increased ammonification and consequent conversion of NH_3 into nitrates more N becomes available for rapid plant growth. The increase in CO_2 favors the soln. of the insol. minerals of the soil and thus helps to render available those mineral constituents needed for plant food. The sulfates, although as low in amt. in most soils as the phosphates, will not, in all probability, have the same general crop-producing power as the phosphates. This difference will undoubtedly rest on the differences in effect the 2 acid radicals have on the soil flora.

R. C. ROARK.

Two equipments for investigation of soil leachings. A pit equipment. C. A. MOORE, 3-5. A hillside equipment. W. H. MACINTIRE, 6-8. Tennessee Agr. Expt. Sta., *Bull.* 111(1915); 4 plates.—These equipments are pictured and their construction, cost and use fully described.

R. C. ROARK.

A new method for the determination of soil carbonates and new methods for the determination of soil acidity. E. TRUOG. *J. Ind. Eng. Chem.* 8, 341-5(1916); cf *C. A.* 10, 80.—A new form of app. for the detn. of soil carbonates is given. A test for the detection and detn. of soil acidity was developed. A distinction is made between active soil acidity and latent acidity. Active soil acidity is detd. by adding an excess of $Ba(OH)_2$ to the moist soil and passing in CO_2 to change the excess to carbonates. After evapn. a carbonate detn. gives the excess; from this the amt. required to neutralize the acidity is calcd. This is called active acidity since it combines instantly with bases brought in contact. The total acidity is detd. by boiling the soil with H_2O and $Ba(OH)_2$ and evapg. to dryness. The excess of $Ba(OH)_2$ is detd. as before. This total acidity minus the active gives the latent soil acidity. It is claimed that soil acidity is due to true acids and not selective ion adsorption by colloids.

J. J. SKINNER.

Comparison of methods for determining cohesion in soils. CARL MARQUIS. *Intern. Mitt. Bodenk.* 5, 381-516(1916).—M. compares the methods of measuring cohesion in soils with different moisture and lime contents. Expts. were made on the draft of plows under varying soil conditions. The moisture content caused greatest variation in cohesion values, and each soil shows its lowest cohesion at a different moisture content dependent on the character of the soil.

R. O. E. D.

Relation between water and soils. H. FISCHER. *Intern. Mitt. Bodenk.* 5, 518-76(1916).—Analyses of many soils and of soil waters were made where these types of soil were used with different kinds of treatment. The studies show that it is necessary in judging the value of a soil to analyze the soil and soil water and to carry out plot and pot tests and fertilizer expts.

R. O. E. D.

Moisture relations of some Texas soils. G. S. FRAPS. Texas Agr. Expt. Sta., *Bull.* 183, 5-36(1915).—This bulletin reports a study of the moisture content of 6 Texas soils under different conditions and treatment for 2 years. The av. amt. of water after continued rains is 58% of the water capacity measured in the lab., and the max. amt. is 69%. Cultivation and manure both increase the quantity of water held at the ends of the wet periods. The soils retained at the ends of the dry periods 44% of the water capacity measured in the lab. Cultivation increased the water content of the soils at the ends of the dry periods, as did also excrement.

R. C. ROARK.

The composition of the soils of the Texas Panhandle. G. S. FRAPS. Texas Agr. Expt. Sta., *Bull.* 173, 5-25(1915).—This bulletin deals with the chemical compn. of samples of soils from 26 counties in the Texas Panhandle.

R. C. ROARK.

Oxidation of organic compounds in the soil. G. S. FRAPS. Texas Agr. Expt. Sta., *Bull.* 181, 5-27(1915).—In a study of the oxidation of org. material by means of the loss on ignition it was found that the org. matter disappears rapidly during the first 3 weeks and after that the changes cannot well be followed. Corn chops, rice hulls, wheat shorts and wheat bran were oxidized 72 to 81% in 81 weeks, meat tankage and blood 47 to 68% and excrement and bat guano 15 to 22%. Cottonseed meal is oxidized about 10% in 1 day and nearly 30% in 4 days. The soils containing the least N appear to carry their C in a more easily oxidized condition. Soils when almost dry oxidized org. matter rapidly. Oxidation in a satd. soil may be very slow or moderate. CaCO_3 had little or no effect upon oxidation in the soil tested. R. C. ROARK.

Improving acid soils. A. W. BLAIR. New Jersey Agr. Expt. Sta., *Circ.* 54, 3-11(1916).—A discussion of why acid soils are undesirable, causes of acidity, methods of correcting, and results with magnesian and non-magnesian limestones. R. C. R.

Fertility and weeds. J. W. INCE. North Dakota Agr. Expt. Sta., *Bull.* 112, 235-47(1915).—Analyses of 30 common weeds are presented, showing content of dry matter, crude ash, N and P_2O_5 . Of 27 weed samples reported on the moisture-free basis, 24 contained more N and P_2O_5 than the av. for wheat, oats, barley or flax. The av. % of dry matter in wheat compared to that of wheat + weeds grown on equal areas was only 35.5%. The same relation for flax was 30.4%; for oats, 53.5%; and for barley, 79.5%. It is thus shown that weeds not only make a severe drain upon soil fertility, but successfully compete with crops in getting food from the soil. R. C. ROARK.

Report on commercial fertilizers. I. E. H. JENKINS AND JOHN P. STREET. *Annual Report of Conn. Agr. Exp. Station*, pp. 79(1915).—The present fertilizer situation is discussed and general suggestions are given. The various samples collected for analysis are given with analyses of same. B. E. B.

A proposed new method for citrate-insoluble phosphoric acid. CHAS H. HUNT. *J. Ind. Eng. Chem.* 8, 251-3(1916).—The fertilizer is digested as in the official method for total P_2O_5 and made up to a definite vol. An aliquot is taken and an excess of NH_3 is added, whereupon a white ppt. of $\text{Ca}_3(\text{PO}_4)_2$ is formed. It is then filtered and washed thoroughly with water. The ppt. is dissolved on the filter paper with HNO_3 and the P_2O_5 detd. in the filtrate according to the volumetric optional method. The ratio between the citrate-insol. P_2O_5 and that pptd. with NH_3 is about 1:1.50. This ratio varies in some cases, and the method does not seem applicable to superphosphates. The results seem to suggest a possibility of using a different factor for different types of fertilizers. The difference between the results obtained by the Official and proposed methods are no greater than the differences in the results obtained by different analysts working on the same sample when the Official method is used. W. H. FRY.

Determination of the phosphoric acid soluble in citric acid by the iron citrate method. N. ZACHARIADES AND J. CZAK. *Z. landw. Versw.* 18, 472-5(1915); through *Chem. Zentr.* 1915, II, 724.—The method of Popp was tested on Thomas meals. Addition of H_2O_2 for the oxidation of H_2S compds. is generally superfluous. The ppt. does not need to be filtered at once but may stand overnight. The method so modified is very much to be recommended. It gives more reliable results than the Darmstaedter HCl method. L. J. GILLESPIE.

Determination of the phosphoric acid soluble in citric acid by the iron citrate method. M. POPP. *Z. landw. Versw.* 18, 592-4(1915); cf. preceding abstract.—P. refers to the work of Z. and C. Care should be taken that the amt. of Fe present in the reagent is sufficient to prevent the pptn. of SiO_2 . 31.3 mg. Fe is sufficient for 0.5 g. Thomas meal. Though normal meals do not require H_2O_2 , some meals contain enough H_2S to give incorrect results if H_2O_2 is not used. L. J. GILLESPIE.

Determination of the phosphoric acid soluble in citric acid in Thomas meals by the iron citrate method. CELICHOWSKI AND FERD. PILZ. *Z. landw. Versw.* 18, 581-91 (1915); cf. *C. A.* 9, 2121.—C. and P. emphasize the need of pure substances and undecomposed solns. of H_2O_2 and citrate. The solns. of iron citrate, H_2O_2 , and magnesia mixt. are to be added to the citric acid ext. in the order named, without a long interruption in the process. A quick sepn. of the magnesia ppt. should be secured by stirring.

L. J. GILLESPIE.

The solubility of mineral phosphates in citric acid. G. S. ROBERTSON. *J. Soc. Chem. Ind.* 35, 217-20 (1916).—A series of expts. with some six different mineral phosphates, led R. to the following conclusions: The P_2O_5 is entirely sol. in 2% citric acid provided a sufficient number of exts. is made; the soly. increases somewhat with the degree of fineness of the material and diminishes upon calcining. The citric acid test is worthless as an indication of the value of phosphatic fertilizers to the plant and "there can be little doubt that as a source of P_2O_5 for the plant, rock or mineral, phosphates are just as valuable as basic slag."

C. F. MILLER.

Determination of potash in fertilizers. FERDINAND PILZ. *Z. landw. Versw.* 18, 77-108 (1915).—If a room can be kept free from NH_3 , a complete sepn. of the bases is unnecessary before a pptn. of K as $KClO_4$. The hot HCl soln. may be freed from H_2SO_4 by $BaCl_2$ (even 10% excess of this reagent hardly affects the result) and the K directly separated as the non-hygroscopic $KClO_4$. The ppt. is washed with 95 vol. % alc. containing 0.2% $HClO_4$. P. gives detailed directions for pure K and for other fertilizers and also tables for calcg. the results.

L. J. GILLESPIE.

The influence of fluorspar on the solubility of basic slag in citric acid. G. S. ROBERTSON. *J. Soc. Chem. Ind.* 35, 216-7 (1916).—In view of the fact that many basic slags now contain fluorspar (added to make them more fusible), R. carried out an investigation to det. its influence upon the soly. of the P_2O_5 by the so-called citric acid method (5 g. of material shaken for 30 min. with 500 cc. of 2% citric acid). The results showed that "the citric acid test gives no true idea of the soly. of the P_2O_5 in 'fluorspar slags' and affords no guide to its value to the plant." Although only a small % of the P_2O_5 was found to be available according to this method, from 90 to nearly 100% of the total dissolved when several extns. were made with 2% citric acid.

C. F. MILLER.

Experiments on the lime sensitiveness of lupines and its control. BODO CREYDT. *J. Landw.* 63, 125-91 (1915); through *Chem. Zentr.* 1915, II, 621.—Vegetation expts. led to the following conclusions: Lime sensitiveness of lupines is due to a specific aversion of the plants to CaO and not to a general alkali sensitiveness. The reason is to be sought in a strong power of the plant to dissolve and take up CaO . By addition of K_2CO_3 or KCl one can limit the one-sided Ca assimilation and to a certain degree moderate the injury done by Ca. Not only are the lupines directly affected by CaO but also indirectly through an unfavorable action on the nodule microorganisms.

L. J. GILLESPIE.

Nitrogen utilization in field and cylinder experiments. I. JACOB G. LIPMAN, HARRY C. MCLEAN, AUGUSTINE W. BLAIR AND LOUIS F. MERRILL. New Jersey Agr. Expt. Sta., *Bull.* 268, 5-25 (1915).—When sand was mixed with shale soil (Penn. loam) in varying proportions, the yield of dry matter and the % of N recovered from $NaNO_3$ were greater with 10 to 70% sand than they were with the shale soil alone, or with 80, 90 or 100% sand. The yield of dry matter and % of N recovered occurred with 50% sand. With 100% sand the yield of dry matter and the % N recovered were higher than with the shale soil alone. With the first crop the yield of dry matter and N were from the $NaNO_3$ cylinders

with the residual crop of buckwheat the highest av. yield of dry matter and N were from the dried blood cylinders. The fact that the av. yield of dry matter and N for the combined crops were about the same with NaNO_3 and dried blood does not necessarily lead to the conclusion that these 2 materials are equally good for all types of soil. It has been shown that for the shale soil, and dilns. up to and including 70% sand, the av. availability of dried blood is 70.6 when NaNO_3 is placed at 100, while, with 80 to 100% sand, the av. availability of dried blood is 250 when NaNO_3 is placed at 100. The av. % of N in the dry matter is higher for both crops with NaNO_3 than with dried blood or with the check cylinders. With most soils we need not expect much residual effect from NaNO_3 whereas we may from dried blood in nearly all cases. The actual net recovery of N from the humus of the shale soils to which varying amts. of sand had been added is greater in every case than the theoretical amt. as calcd. from the recovery from pure shale soil. Mixing sand with heavy soils permits better aeration and drainage and results in a more complete utilization of the N in the org. matter. It appears that the bacteria conveyed in small quantities of cow manure are instrumental in bringing about a more rapid decompn. of the green fertilizer crop and thus make available more N for the succeeding crop. If the green fertilizer crop consists of legumes, the additional N thus secured tends to obscure the effects of the manure.

R. C. ROARK.

Nitrogen utilization in field and cylinder experiments. II. JACOB G. LIPMAN, HARRY C. MCLEAN, AUGUSTINE W. BLAIR AND LOUIS K. WILKINS. New Jersey Agr. Expt. Sta., *Bull.* 281, 5-19(1914).—Expts. are recorded on the availability of NaNO_3 and dried blood when applied to shale soil and mixts. of sand and shale soil. NaNO_3 and dried blood when used on mixts. of sand and shale soil varying in proportion from 10 to 90% sand, give higher yields of dry matter and N in the 1st crop than when used with loam soil alone or sand alone. With the 1st crop nitrate invariably gave higher yields than dried blood, their availability being in the ratio 100 to 72.07. With the residual crop of buckwheat the yields from the check cylinders were in a number of cases larger than from the nitrate cylinders. With the combined crops the dried blood shows an availability of 85.66 when NaNO_3 is taken at 100.

R. C. ROARK.

Methods and results in vegetation experiments. JACOB G. LIPMAN AND AUGUSTINE W. BLAIR. New Jersey Agr. Expt. Sta., *Bull.* 269, 5-20(1914).—A wire cage for the protection of pot expts. is described with illustrations. As the result of pot expts. with both sand and gravelly loam, basic slag compares very favorably with other phosphates. A rock potash fertilizer containing 4.3% water-sol. K_2O gave lower yields than check pots, doubtless due to the formation of sol. toxic compounds. Expts. with radioactive material showed no appreciable effects one way or the other.

R. C. R.

Pot experiments on the availability of nitrogen in mineral and organic compounds. JACOB LIPMAN, HARRY C. MCLEAN, AUGUSTINE W. BLAIR AND LOUIS K. WILKINS. New Jersey Agr. Expt. Sta., *Bull.* 280, 5-23(1914).—The residual effects from the use of NaNO_3 are small, if the 1st crop develops normally, but are considerably increased where an excessive amt. of the nitrate depressed the yield of dry matter in the 1st crop. The residual effects from the use of organic nitrogenous materials are greater than the residual effects from NaNO_3 , but they are small when considered from the standpoint of the amt. of N that apparently remains in the soil after the removal of the first crop. Nitrogen applied in the form of NaNO_3 and org. matter, half the N from one and half from the other, gives a higher yield of dry matter and a higher recovery of N than N which is all in the form of organic matter. Applications of limestone ranging from 1 to 10% gave yields of dry matter which are more than double the yield without limestone and slightly in excess of the yield with NaNO_3 . With applications of limestone the % of N in the dry matter was not so high as with NaNO_3 but somewhat higher than without limestone.

R. C. ROARK.

Limestone and marl deposits of South Carolina. F. H. H. CALHOUN. South Carolina Agr. Expt. Sta., *Bull.* 183, 5-27(1915).—This bulletin records investigations made to locate the most available limestone and marl deposits of the state with special reference to those suitable for agricultural purposes.

R. C. ROARK.

The effect of organic compounds in pot experiments. G. S. FRAPS. Texas Agr. Expt. Sta., *Bull.* 174, 5-13(1915).—Impure dihydroxystearic acid has little injurious effect upon corn or sorghum grown in pot expts. when applied before planting at the rate of 500 parts per million of soil. In water culture expts. of other workers 10 parts per million injured the growth of seedlings. Vanillin and quinone applied to the soil at the rate of 100 parts per million of soil before planting injured the growth of only 1 of 8 crops. Vanillin and coumarone are oxidized in the soil, a considerable portion disappearing in 2 weeks and little remaining at the end of the pot expts. in which the tests were made. Six successive additions of coumarone, vanillin or quinone at the rate of 100 parts per million did not kill the plants. There was little evidence that fertilizers overcome the injurious action of these. Pyrogallic acid and carbon black showed no beneficial action in pot expts. while acid phosphate or other fertilizer are decidedly beneficial to the soils and produced decided increases. The conclusion is that these poor soils need the plant food supplied by the fertilizers and that the action of the fertilizer is to supply plant food and not to overcome toxic substances. Results of pot expts. may be quite different from results of water culture expts.

R. C. ROARK.

Effect of additions on availability of soil phosphates. G. S. FRAPS. Texas Agr. Expt. Sta., *Bull.* 178, 5-15(1915).—When N and K are supplied, the addition of CaCO_3 at the rate of 5 tons per acre increased the size of the crop and the amt. of P withdrawn from the soil phosphates on the 6 soils tested in the pot expts. The effect of the lime was small at first but usually increased with succeeding crops. The addition of starch, sawdust or cobs had some effect on the crop in 2 soils but little with the other 4 soils. The presence of CaCO_3 or of vegetable matter may bring about differences in the quantity of P assimilated by plants from soils containing equal quantities of active phosphoric acid. No relation can be traced between the additions and the P content of the crops. The phosphoric acid taken up by the plants was evidently drawn largely from the more insol. phosphates.

R. C. ROARK.

Limestones of New York with reference to their agricultural use. R. C. COLLISON AND J. F. BARKER. New York Expt. Sta., *Technical Bull.* 47, 3-38(1915).—A brief description of each of the 49 limestone formations found within the state of New York is given, together with results of analyses of samples of each. A limestone map accompanies the bulletin, showing the area of outcrop of each of the more important formations.

R. C. ROARK.

Potash. T. E. KERR AND C. J. KING. South Carolina Agr. Expt. Sta., *Bull.* 182, 3-16(1915).—The soil and crop requirements for potash and commercial and home sources are discussed. Analyses are presented of wood ashes, crop residues, plant materials not crop residues, such as marsh grass, mucks, and manures, showing content of K and other fertilizer ingredients. The liberation of soil potash by NaNO_3 , org. matter, gypsum and lime is discussed, and the conservation of all materials going to waste on the farm that contain plant food is urged.

R. C. ROARK.

Experiments with fertilizers. FIRMAN E. BEAR. West Virginia Agr. Expt. Sta., *Bull.* 155, 3-19(1915).—Fifteen years' expts. with fertilizers on different field crops are summarized. The value of manure is emphasized. Acid phosphate is a valuable crop producer and its use in liberal quantities is recommended. NaNO_3 and acid phosphate in combination gave 2.5 times as much increase per acre as acid phosphate alone; while K_2SO_4 in combination with these two gave 3 times as much increase per acre as acid phosphate alone.

R. C. ROARK.

Cotton-varieties and limiting factor tests. W. L. HUTCHINSON. South Carolina Agr. Expt. Sta., *Bull.* 185, 3-19(1916).—In 1914-15 N was the limiting factor for cotton and corn grown in succession, but for other seasons not so good, moisture may become the limiting factor. Detailed results of fertilizer treatment are presented in tabular form.

R. C. ROARK.

Miscellaneous insecticide investigations. E. W. SCOTT AND E. H. SIEGLER. U. S. Dept. Agr., *Bull.* 278, 1-47(1915).—Detailed results are given of spraying expts. with various arsenicals, kerosene emulsion, Bordeaux mixt., lead chromate, lime-sulfur, nicotine, soap, and various other substance, separately and in combination. Lead arsenate proved to be the most consistent and valuable stomach poison tested, and was equally effective in either the paste or powdered form. The triplumbic arsenate is less rapid as a poisoning agent than diplumbic arsenate, but is safer for use on tender foliage. Lead arsenate may be combined with nicotine, lime sulfur or kerosene emulsion. Lime sulfur and soap should not be combined, owing to the formation of an insol. Ca soap. The most promising new insecticide developed is Ca arsenate. R. C. R.

Relation of green manure to failure of certain seedlings. E. B. FRED. Univ. Wis. J. Agr. Res. 5, 1161-76(1916).—It was desired to det. why decrease of germination follows green fertilizing. A study was made of the effect of soil type, of increased aeration, temp., CO_2 , CaCO_3 and certain decompn. products on germination. Results indicated the injury was due to parasitic fungi, and oil seeds especially are damaged; starchy seeds are resistant. Germination of oil seeds is not effected if two weeks elapse after green fertilizing before planting. Small applications of CaCO_3 increase the injury.

R. O. E. D.

Utilization of the nitrogen of urine industrially. F. W. DAFERT AND ALFRED UHL. Z. landw. Versw. 19, 1-13(1916).—Utilization of the N of urine by means of micro-organisms proved impracticable: treatment of the urine with hot CaO promises better. The chief difficulty lies in the collection of the urine. D. and U. recommend a practical study at concn. camps.

L. J. GILLESPIE.

Talbot slag as fertilizer. O. REITMAIR AND TH. ALEXANDER. Z. landw. Versw. 19, 14-44(1916).—Phosphate meals from Talbot and from Thomas slag are of equiv. effectiveness in the field.

L. J. GILLESPIE.

New methods for analysis of lime-sulfur solutions. R. M. CHAPIN. J. Ind. Eng. Chem. 8, 151-6(1915); cf. C. A. 9, 686.—Methods are given for detg. the presence of excess base or excess acid and the concn. of both in solns. of lime-S. The methods are all based on the use of 0.1 N solns. titrated with lime-S solns. and measure the amts. of CaA_2 or M_2S_x . HCl soln. is used in detg. the sulfide base with methyl orange as indicator. For detg. the reaction figure 0.1 N I is mixed with 0.1 N $\text{Na}_2\text{S}_4\text{O}_6$ until color is nearly discharged, a little 0.1 N HCl is added to destroy iodate, and the soln. is titrated with 0.1 N $\text{Na}_2\text{S}_4\text{O}_6$. NH_4Cl soln. is added and one drop methyl red and titrated with 0.1 N NaOH. Equiv. difference between the alkali and acid solns. gives the "reaction figure." For sulfide-acid figure, method "A," algebraically subtract reaction figure from sulfide-base figure; method "B," the liquid from detg. the reaction figure contains thiosulfate exactly equiv. to M_2S_x originally present in sample. After addition of starch titrate with 0.1 N I and subtract from the result the thiosulfate titration; method "C" is applicable for dipping baths. It consists in titrating ammoniacal soln. of the sample with standard tetrathionate, using a 1% soln. NiSO_4 as indicator. Some of the methods offer promise of use in detg. H_2S or compds. of it in other materials.

R. O. E. D.

New methods for analysis of lime-sulfur solutions. II. Estimation of poly-sulfur. R. M. CHAPIN. J. Ind. Eng. Chem. 8, 339-41(1916); cf. C. A. 9, 686 and preceding abstract.—The S may occur in soln. as mono-S or as poly-S; general formula for Ca-

poly-S is expressed as $\text{Ca}(m - \text{S})(p - \text{S})_y$. The reaction $\text{Ca}(m - \text{S})(p - \text{S})_y + y\text{Na}_2\text{SO}_3 = \text{CaS} + y\text{Na}_2\text{S}_2\text{O}_3$ is the basis for the method. Mono-S is removed by ZnS and excess of sulfite as insol. Sr compd., after which thiosulfate is detd. by titration with I soln. From the total thiosulfate thus obtained must be subtracted the thiosulfate originally present in the lime-S soln. Details of carrying out the methods are given as well as notes on prepn. of solns. and certain precautions.

R. O. E. D.

Cactus solution as an adhesive in arsenical sprays for insects. M. M. HIGH. U. S. Dept. Agr., *Bull.* 160, 20 pp.(1915).—The work was undertaken for the purpose of discovering a good adhesive for use in arsenical sprays. This adhesive was found in cactus. It was demonstrated that it yields a high % of mucilaginous matter. Satisfactory results were secured with a mixt. of 15 lbs. cactus, 3 lbs. of Zn arsenate and 50 gal. of H_2O . A number of insecticides gave satisfactory results when used with cactus; the arsenical sprays were most effective. The chem. compns. of several varieties of cactus are given.

J. J. SKINNER.

Fate and effect of arsenic applied as a spray for weeds. W. T. McGEORGE. Hawaii Agr. Exp. Sta. *J. Agr. Research* 5, 459-63(1915); *J. Ind. Eng. Chem.* 8, 199 (1916).—Soils possess strong fixing power for As and when a Na_2AsO_3 spray is used for destroying weeds the As will ultimately be deposited in the surface soil, there to remain in spite of the leaching effect of rains or irrigation. The chem. reactions involved in the fixation are a replacement of soln. of Fe, Ca, Mg and humus, owing in part to a hydrolysis of the Na_2AsO_3 in soln., and to a combination with the dibasic and tribasic elements to form the difficultly sol. arsenites or arsenates.

W. H. FRY.

Potash from kelp (LAUCKS) 18. The question of the commercial monopoly of nitrogen (v. MARTIUS) 18.

Fertilizer. S. B. NEWBERRY and H. N. BARRETT. U. S., 1,174,176, Mar. 7. A mixt. of natural Ca phosphate with 10-25% of NaCl or KCl is calcined at a temp. which is gradually raised nearly to a white heat, in an atm. of combustion gases rich in SO_2 and H_2O vapor (produced by burning fuel rich in S). The chloride is first decomposed to sulfate with formation of HCl and the sulfate is then decomposed at a higher temp. with liberation of SO_2 . A residue of porous fragments of phosphate nearly free from chlorides, or sulfates is obtained.

16. FERMENTED AND DISTILLED LIQUORS.

ROBERT WAHL.

Longevity of artificial cultures of wine yeasts preserved in a ten percent sugar solution. R. MEISSNER. *Z. Weinbau. Weinbehandlung* 2, III, 103-7(1915); *Bull. Agr. Intelligence* 6, 1234-5(1915).—Among 25 cultures of yeast stored for 13 years in a 10% sugar soln., 12 strains of yeast had lost none of their fermentative power. One of these showed a greater activity than the cultures which had been kept fresh by transplantation. The expts. are being continued.

L. W. HAAS.

Experiments on vinification in a sulfurous medium with and without selected ferments. G. DALMASSO AND L. SUTTO. *La rev. viticoltura, enologia agraria* 21, 385-93(1915); *Bull. Agr. Intelligence* 6, 1525.—The must was placed in 5 vats of equal capacity, one was used as a control and the others treated in the following manner: (1) with "biosulfite Jacquemin," (2) with KHSO_3 , (3) with "biosulfite Jacquemin" and "multilevures Jacquemin."

-t of this expt

"multilevures Jacquemin" alone. The chief
the two methods is to be preferred when "oxi-

dasic break" (casse) or "turn" occurs in a wine. The following conclusions are drawn: The sulfitation method is always the most economical and the most certain for obtaining spontaneously limpid white wines and is a certain preventive of oxidasic break, and malolactic fermentation. These expts. show no special advantage from the use of "biosulfite Jacquemin" in place of the ordinary KHSO_5 . No advantage was found in the use of selected ferments. In the absence of SO_2 they did not give favorable results in this particular expt., but this does not mean that they have no useful functions in modern wine-making. On the contrary, selected ferments have been of great use in the vinification of grapes damaged by hail, diseases and insects. L. W. HAAS.

Shortened determination of extract in barley. L. HEINTZ. *Wochenschr. Brau.* 33, 65-7(1916).—H. uses for ext. detns. the cleaned barley or the portions retained by the 1st and 2nd screen of the screening app. The ext. is detd. as follows: 25 g. of fine barley meal are mashed in with 75 cc. malt infusion (200 g. light malt, finely ground, are digested for 10 min. with 1 l. distd. water at 45° , filtered through 3 filters, and then cooled) kept for 1 hr. at 50° , then heated quickly to 70° . After 15 min. 20 cc. distd. water at 70° is added and the mash held at 70° for 15 min. longer; the water in the bath is then heated to boiling, and maintained for 15 min., cooled to 70° , 25 cc. malt infusion added and the mash after being held at 70° for 15 min. more, cooled, weighed up to 225 g., filtered and treated in the usual manner. The method is claimed to give very satisfactory results; the time for a detn. is reduced from 22 to 4 or 5 hrs. L. W. H.

The spirits and spirits preparations industries in the year 1914. H. RÜDIGER. *Chem. Ind.* 38, 485-500; 533-45(1915).—A review. F. W. SMITHER.

New scientific conceptions and their application to quality and methods of preparing beer. R. WAHL. *Am. Brewers' Rev.* 29, 271-4, 365-8, 557-9(1915).—The importance of the H^+ concn. for brewing, the significance of colloidal matter for chill-proofness of beer and the usefulness of the electronic conceptions in disclosing the structure of matter are demonstrated and discussed. L. W. HAAS.

New use for dried potato-pulp. E. PAROW. *Z. Spiritusind.* 39, 67(1916).—On account of its moisture-bonding properties, dried potato pulp may be used for preservation of products high in moisture (as grated potatoes and beets); these then may be worked into durable fodder which also may serve as raw material for technical industries (distilling, yeast and lactic acid manufacture). When grated potatoes and dried pulp are mixed in equal quantities the product may be pressed into solid briquets without the loss of water. These briquets rapidly dry out (the water content of 44.8% of the fresh mixt. decreased to 17% in the briquets exposed to air for a few days), and represent a hard, durable and easily transportable feed. Molasses, fodder yeast or other feed-stuffs may be incorporated. L. W. HAAS.

Sucrose in grapes of American origin (GORE) 12. Sucrose in relatively large amounts in a new seedling grape (ALWOOD) 12.

Purifying yeast. P. KNOBLAUCH. *Ger.*, 286,180, Apr. 25, 1914. An app. is provided on fermentation vats for removing impurities from the yeast.

Pressed yeast. J. EFFRONT and A. BOLDIN. U. S., 1,176,528, Mar. 21. Cooked maize or other grain is liquefied by treatment with a small amt. of malt at about 75° , cooled to 40° , rendered slightly alk. and strongly aerated after the addition of peptonizing bacteria. The fermentation is stopped when the greater part of the nitrogenous substances are rendered assimilable and the product is heated to $62-4^\circ$ and saccharified by the malt. The bacteria used are acclimatized previously to alk. and aerated solns.

Denatured alcohol. J. W. KENEVEL. U. S., 1,176,462, Mar. 21. Products of

destructive distn. of wood or other organic matter are distd. with alc. from fermented vegetable matter and the distillate is rectified to remove substances boiling at temps. either much above or much below the b. p. of alc.

Denatured alcohol. J. W. KENEVEL. U. S., 1,176,150, Mar. 21. Products from the destructive distn. of straw, flesh, bone, lignite, coal or wood, after being freed from gases and constituents boiling at 100° or higher, are mixed with fermented alcoholic mash and the mixt. is distd. and rectified to produce denatured alc.

Mannitol from natural musts. G. P. GUIGNARD. U. S., 1,175,747, Mar. 14. Natural musts are inverted, neutralized, sterilized and concd. until they contain at least 15% levulose and are then acted on with a mannitol ferment which has been acclimatized to a must of this concn. The alc. produced is distd. off, the remaining vinasse is desiccated and washed with cold alc. satd. with mannitol, the alc. is evapd. from the soln. thus obtained and the residue is dissolved in H₂O, treated with FeSO₄ to form Fe lactate and acetate and CaSO₄, evapd. to dryness and the mannitol is extd. with hot alc. and pptd. by cooling.

Preserving must. JEAN-AUGUSTE DEJEANNE. Fr., 477,953, July 8, 1914. The fruit is not crushed nor expressed until freed from microorganisms which generally are found upon the outer skin of the fruit. This is effected by means of suitable sterilizing agents.

A protective lining for metal tanks for transporting beer. WICKÖLER-KÜPPER-BRAUEREI AKT.-GES. Ger., 285,795, Dec. 14, 1912. The inner surface of the container is coated with one or more layers of lacquer, burned in, and upon this is applied a layer of pitch. Before lacquering the surface may be tinned. Cf. C. A. 9, 1849.

Apparatus for testing wort. G. BANZER, R. HALDER and A. STADLER. Ger., 283,593, Nov. 27, 1913. The app. is devised for testing the wort as it flows from the acid vat.

17. PHARMACEUTICAL CHEMISTRY.

M. I. WILBERT.

A new color reaction for aloes. C. E. STACY. *Analyst* 41, 75(1916).—A pink coloration sufficiently delicate to detect one part of Barbadoes aloes in 10,000 is produced in 5–15 min. by the addition of a freshly prepd. soln. of K₃Fe(CN)₆ to the cold aq. soln. of aloes. If excess of either test soln. or reagent is employed, no color is produced. The color is permanent, and is rendered apparent more rapidly by heating just to boiling. Minute quantities of the reacting substances are removed by petroleum ether, C₆H₆, CHCl₃, but none by ether or AcOEt. After removal of the ordinary principles of aloes (aloin, emodin, etc.) the bulk of the reacting material remains. In 10% solns. the color is blood-red. Socotrine and Cape aloes and commercial aloin give an emerald-green color. No reaction is given by *Cascara sagrada* or rhubarb. The color is destroyed by acids and large amts. of alkali. Small amts. of alkalies intensify the reaction and introduce a brown color.

P. B. DUNBAR.

Neurokardin. C. MANNICH AND F. SCHIRMER. Univ. Goettingen. *Apoth. Ztg.* 31, 79(1916).—According to the analytical findings this alleged nerve tonic consists of an artificially colored red aq. ext. of Kava root, stabilized with salicylic acid.

W. O. E.

Estimation of the oxychloride and free hydrochloric acid in ferric chloride solutions. K. FEIST. *Arch. Pharm.* 253, 451–6(1915).—A discussion of Romijn's expts. (cf. C. A. 9, 1971, 2285) on this subject, as also the Pharm. tests for the prepn., particularly the Na₂S₂O₃ test.

W. O. E.

Bismuth *o*-acetoxybenzoate. L. VANINO AND FR. MUSSAGNUO. *Arch. Pharm.* 253, 511-2(1915).—On adding a concd. aq. soln. of 16 g. Bi nitrate and 6 g. mannitol to a soln. of 20 g. $\text{AcOC}_6\text{H}_4\text{CO}_2\text{Na}$, the salt, $\text{C}_{27}\text{H}_{21}\text{O}_{12}\text{Bi}$, is pptd., easily sol. in acetone and AcOH , difficultly sol. in CHCl_3 and C_6H_6 , insol. in alc., Et_2O and petr. Et_2O . It is easily decomposed. W. O. E.

Croton resin. R. BOEHM. Univ. Leipzig. *Arch. Pharm.* 253, 574-85(1915); see C. A. 10, 497. W. O. E.

Simplification of the exact fatty acid determination in *sapo kalinus*. E. WENDE. Univ. Koenigsberg. *Arch. Pharm.* 253, 585-9(1915).—Weigh out 2 g. thoroughly mixed sample on a piece of parchment paper, roll the latter and introduce into a 100 g. medicine bottle. Add about 50 g. hot H_2O and agitate until soln. results, then acidify with 10 g. dil. H_2SO_4 and heat on the vapor bath until the fatty acids are completely pptd. Add to the cold mixt. about 20 g. benzine (petr. ether), close bottle and agitate until the fatty acids are dissolved, then invert the container and by carefully opening it withdraw all but about 2 g. of the aq. liquid. To the residual contents of bottle add 0.5 g. powdered tragacanth and by means of about 20 shakes separate the fatty acid soln. from the resulting jelly. Pour the clear benzine soln. into a weighed Soxhlet flask, washing the jelly with 3-5 cc. portions benzene. Evap. the united solvent portions on a vapor bath, drying the residue to const. wt. at about 80° . The wt. of fatty acids thus obtained should amount to at least 0.8 g., corresponding to a minimum content of 40% fatty acids. W. O. E.

Lemon oil. A. H. BENNET. *Boll. della Camera Agrumaria*, 1, Pt. 5, 23-4(1915); *Bull. Agr. Intelligence* 6, 1248-9(1915).—The factors concerned in the valuation of essence of lemons are citral content, d. and opt. rotation. While the citral content is a real indication of the quality of the essence, B. considers the rotation of less value as a diagnostic factor. A minimum of 58° would exclude from the market all the richest essences of the Messina district, while a minimum of 61° (Australian law) is reached by only a small proportion of the production which, according to other standards, is not of the best quality. On the other hand the rotation standard was justifiable when the essence was most commonly adulterated by turpentine, which lowered the index of rotation. This fraud is now easily detected by other tests; hence other means of adulteration are practised such as addition of terpenes obtained from the prepn. known as "essence without terpenes" or addition of refined fixed oils (as white vaseline, etc.) which are easily recognizable. Furthermore, a high citral content is generally accompanied by a low rotation and this year's crop is characterized by an exceptionally high % of citral. B., therefore, recommends the establishment of a minimum for citral content, and in place of a standard for the rotation, adopting the surer tests for purity. Expts. have been started on the keeping qualities of the essence under different conditions. The results obtained after 3 months with (a) unfiltered essence stored in Cu, (b) filtered essence stored in Cu, (c) filtered essence stored in glass, in each case not freed from moisture, and (d) with dried essence in contact with Na_2SO_4 , have shown that there is no remarkable change and only a small decrease in citral content. Expts. are being continued to study any possible changes due to the warmer months of the year. W. O. E.

Change of methyl alcohol by the addition of essential oils. ROBERT BUNESTEN-BINDER. *Deut. Parfumerie-Ztg.* 1, 32-3(1915).— MeOH is not inherently toxic but becomes so only through the formation of CH_3O and HCOOH . Since the addition of essential oils promotes oxidation, MeOH should not be employed in the prepn. of schnaps. W. O. E.

Chemical changes in resweating of seedleaf tobacco. H. R. KRAYBILL. *J. Ind. Eng. Chem.* 8, 336-9(1916).—The principal results of the investigation are summarized as follows: (1) The greatest loss of dry matter during the resweating process

occurs in the proteins, nicotine, H_2O ext. and N-free ext. The total N, NH_3 , HNO_3 , and crude fiber show slight losses. (2) The amides and reducing substances show an increase. (3) The changes during the resweat are quite similar to those of the first sweating process. It seems, therefore, that the resweat is a continuation of the first sweating process. The changes during the resweat seem to be greater than during the first sweat, but this is what we should expect because the resweating process is more severe. (4) The loss in protein N minus the gain in amide N is 0.06% and this plus the loss in NH_3 (0.09%) and HNO_3 N (0.18%) equals 0.32%. The total loss in N is 0.61%. The difference between the total loss of N and the loss of N as HNO_3 , NH_3 , and amides (loss of protein N minus amide gain in N) is 0.28%. It appears from this that the most of the nicotine which is lost, is lost by volatilization. This is in accord with the results of Garner. (5) It is evident that a breaking down of proteins into amides occurs. From this we can readily see that there is probably an enzyme present which is capable of breaking down the proteins. (6) Since the increase in amide N is not so great as the loss in protein it suggests that there may be present a ferment which breaks up the amino acids, although no definite conclusions can be drawn. (7) The total loss of org. matter in the leaf samples was 11.11% and in the midveins 2.32%. Behrens reports a loss of 5.6%. (8) The changes in the midveins are similar to the changes in the leaf but are not so great.

W. O. E.

Comparison and identification of various types of smoking opium. F. D. SIMONS. *J. Ind. Eng. Chem.* 8, 345-51 (1916).—The exptl. work comprized an examn. of the following samples: (1) Two samples of raw Smyrna opium imported through the port of Baltimore; partly dried when exptd. with. (2) Aq. exts. of duplicate samples of the above; made in conformance to the directions given for the former U. S. P. ext. of opium (moist). (3) Insol. residues left after making the above exts. (4) Tschandu (not fermented) prepd. in the laboratory from duplicate samples of the raw opium ((1) above) and as nearly as possible in accordance with the method already described. (5) Exhausted residues (from which ching ko is extd.) obtained in the prepn. of the tschandu ((4) above). (6) Two samples of smuggled opium, representing a seizure made by U. S. Customs officers at Baltimore, of a number of cans of smoking opium. The cans, weighing about 5 taels ($6\frac{2}{3}$ oz.) each, bore labels inscribed with Chinese characters, and may or may not have been manufactured in China. (7) One sample of yen shee; the residue and ext. examd. separately. (8) One sample of moist ext. of opium prepd. by a manufacturing chemical company for medicinal use; dried somewhat. (9) Average of 4 samples of regularly imported Smyrna opium. *Summary of tests:* To det. whether samples of type (1) were manufactured for medicinal use or prepd. solely for smoking purposes, dependence must be placed upon the H_2O content, which, while its line of demarkation between the 2 classes is very faint, still can afford the basis for comparatively reliable judgment. In the case of "moonshine" ext. of opium, however, a decided variation of the morphine content from the 20% requirement of the Pharmacopoeia should be valuable circumstantial evidence in support of an opinion. Samples of type (2) are partly demonstrated by the proportion of morphine found in the total alkaloids, and may be conclusively identified by the practical absence of codeine, papaverine and narceine, and the diminished amt. of thebaine in the smoking opium under examn. The ratio of morphine to total alkaloid for tschandu should lie between 1:1.11 and 1:1.50, and the amt. of morphine should never be less than $\frac{2}{3}$ of the entire alkaloid content. For the ext. of the unroasted opium the ratio should vary between 1:1.50 and 1:2+, and the proportion of morphine should naturally be the reverse of that for tschandu. Samples of type (3) will show an abnormal alkaloid compn. similar to that of tschandu; this, however, may be moderated or exaggerated, depending on whether yen shee was added to the ordinary ext. or to tschandu. Suspicion will also be directed toward a

sample when its ash % exceeds 8.0, or its H_2O -insol. residue (consisting largely of C. exceeds 5.0 in the dry material. The peculiar and characteristic odor of *yen shee* may also furnish a clue if noticed in the smoking opium. Samples of type (4) may be identified by the usual physical, chem. and microscopic tests. W. O. E.

Terpacid and its preparations. I. SCHLESINGER. *Klin. Ther. Wochenschr.* 21, No. 48-9(1915).—Terpacid (fenchone), $C_{10}H_{18}O$, the synthetic oxidation product of fenchyl alcohol, is a very mobile liquid having a camphor-like odor and a bitter burning taste, easily sol. in most org. solvents, d. 0.95, b. $193-6^\circ$. Its use as a substitute for camphor is recommended. W. O. E.

Enesol. HANS SCHMIDT. *Pharm. Ztg.* 61, 107(1916); cf. C. A. 10, 951.—This prepn. contains mercuric salicylate and Me arsonic acid in alk. soln., the content of the Hg compd. being not quite half as great as stated by the mfr., while that of As is twice as great. W. O. E.

Report of Chemists Sub-Committee on Standardization and Drug Testing. F. P. SUMMERS, et al. *8th Ann. Meeting Am. Assoc. Pharm. Chem.*, 1915.—The report, among other things, presents data covering a considerable number of tests on tablets made with single, double and multiple punch machines, and offering suggestions and explanations relative to the variations observed. Comments are likewise made on the prepn. of pepsin tablets, as also on the methods in vogue for the assay of pepsin. Finally, assay methods for surgical dressings (gauzes) and opium prepn. are discussed. W. O. E.

Testing water intended for salvarsan solutions. J. TILLMANS AND H. MILDNER. *Z. angew. Chem.* 28, I, 469-74(1915).—The chief results of the investigation are summarized as follows: (1) Water intended for the prepn. of salvarsan solns. may be contaminated in one or all of 3 ways, namely, presence of bacteria, glass constituents and heavy metals. (2) Detn. of the first named contamination is largely a bacteriological question. Bacteriological testing, however, should be amplified by a detn. of the reducing power with respect to $KMnO_4$, as also the detection of NH_3 and HNO_3 . Detn. of the reducing power must be subjected to more careful scrutiny than heretofore, to which the following procedure is suggested: Measure off 100 cc. of the sample into an Erlenmeyer, add 5 cc. dil. H_2SO_4 (1 + 3) and run in from a buret (graduated to 0.05 cc.) 8 cc. 0.01 N $KMnO_4$. Heat to boiling on wire gauze exactly 10 min. (counting from the time it begins to boil), then add 10 cc. 0.01 N oxalic acid and agitate the liquid, finally titrate the excess of oxalic acid (above that required to offset the $KMnO_4$ with 0.01 N $KMnO_4$. For purposes of control, measure into a Jena beaker 200 cc. distd. H_2O , 10 cc. dil. H_2SO_4 (1 + 3) and 2 drops 0.01 N $KMnO_4$, then heat to boiling on wire gauze. If the red color disappears, add another drop and boil. Continue to add the reagent and boil until a pink color persists. Of this soln. take 100 cc., transfer to an Erlenmeyer as in the main expt., repeating the operations above prescribed therefor. The total amt. expended $KMnO_4$ ascertained for the control is subtracted from that found in the main expt. A distd. H_2O yielding a difference of more than 0.2 cc. 0.01 $KMnO_4$ between main expt. and control contains appreciable amts. of org. matter and hence should be rejected for salvarsan injection. (3) Detection of glass constituents can be effected by treating the boiled distd. H_2O with rosolic acid, which in the event of the presence of glass constituents develops a reddish color. This test becomes illusory only with the simultaneous presence of tap H_2O , an event easily detd. through qual. tests for Ca, Cl or HNO_3 . (4) Of heavy metals which might possibly come in contact with distd. H_2O and, therefore, contaminate it is Fe, which, however, must be regarded as harmless. Of the other metals Sn may be disregarded for the reason that it is not dissolved by distd. H_2O . (5) The presence or absence of Pb, Cu, Ni and Zn is demonstrated by the application of an analytical scheme involving specific reactions

For each metal. Water containing either one of these 4 metals should not be used in salvarsan medication. W. O. E.

Cassia and cinnamon barks. E. M. HOLMES. *Perf. Essent. Oil Record* 7, 14-7, 41-3(1916).—A discussion of the sources, characteristics, and chem. constituents of different cassia and cinnamon barks. C. O. EWING.

Bay oil experiments in Montserrat. ANON. *Perf. Essent. Oil Record* 7, 34-5 (1916).—It has been found that a better quality of bay oil, with higher d. and phenol content, is obtained by continuing the distn. for 9 hrs. instead of the usual 6 hrs. A table shows the yield of oil per hr., with the phenol content and d. of each fraction. With regard to keeping quality, a sample kept on a shelf for 2.5 years had not changed in phenol content, but there was a slight rise in d. due probably to polymerization of myrcene, which is an important constituent of bay oil. C. O. EWING.

Optical rotation of camphor in alcoholic solution. J. C. UMNEY. *Perf. Essent. Oil Record* 7, 46(1916).—The highest $[\alpha]$ for camphor ($+42^{\circ} 20'$) was obtained with a weak soln. (5%) in strong (90%) EtOH. The $[\alpha]$ diminished as the EtOH was replaced by H_2O , and also diminished in the same concn. of EtOH as the concn. of camphor was increased. C. O. EWING.

Oil of Eucalyptus macaurethuri. J. C. UMNEY. *Perf. Essent. Oil Record* 7, 46 (1916).—This oil is remarkable for its high % of geranyl acetate. Analysis: d. 0.926, $[\alpha] -2^{\circ}$, esters as geranyl acetate 66.7%, total geraniol 76.3%, sol. in 3 vols. EtOH. Neither phellandrene nor eucalyptol were detected but a small amt. of pinene was present. The price is too high to make the oil of commercial importance. C. O. EWING.

Sapo Medicatus and Sapo Kalinus of the German Pharmacopoeia. PRESCHER. *Pharm. Zentralhalle* 56, 611-3(1915).—In the prepn. of Sapo Medicatus, equal parts of mutton tallow and peanut oil are recommended in place of lard and olive oil which are now very high in price, as are also other possible substitutes such as palm, cottonseed and sesame oils. In the prepn. of Sapo Kalinus, the use of alcohol is not necessary, the glycerol formed during the saponification serving the same purpose. Calcined soda which gives a clear soap can be substituted for K_2CO_3 . C. O. EWING.

Cholic acid and some of its preparations. R. WERNER. *Pharm. Zentralhalle* 56, 591-4(1915).—A review, with bibliography, of cholic acid and some of its important pharm. prepn. C. O. EWING.

The use of talc in dermatology. P. ROHLAND. *Pharm. Zentralhalle* 56, 575-7 (1915).—Talc possesses a strong adsorptive power for color substances, colloidal solns., fats and oils, and strong odors. This property makes it useful in dermatology. The adsorptive power can be detd. by shaking 10 g. with 100 cc. of a soln. of methylene blue of definite concn., filtering and detg. colorimetrically the amt. of dye left in the filtrate. Cf. C. A. 9, 3288. C. O. EWING.

Cleaning and sterilizing of glass medicine containers and laboratory apparatus. A. G. BARLADÉAN. *Pharm. Zentralhalle* 56, 631-7(1915).—A discussion, with an extended bibliography of the advantages and disadvantages of the well-known methods of cleaning and sterilizing medicinal and chemical glassware in the lab. The best method is to rinse with steam. For this purpose a simple app. consists of a flask fitted with a funnel, within the neck of which is a cork carrying a tube. H_2O , made slightly alkaline to fix CO_2 , is boiled in the flask. The steam passes up through the tube and condenses on the sides of the vessel to be cleaned which is inverted over the tube and drains down into the funnel. C. O. EWING.

Purification and physiological action of animal charcoal. A. G. BARLADÉAN. *Pharm. Zentralhalle* 56, 683-7(1915).—Com. animal charcoal contains some uncar-

bonized org. material. Before being administered internally it should be carbonized again. Maceration in distd. H_2O will remove many sol. impurities. Boiling in concd. NaOH and then in concd. HCl removes some others. When the charcoal was carbonized and treated with concd. NaOH and concd. HCl daily for two weeks, some material was still taken up by a nutrient soln., as shown by germination expts. with wheat.

C. O. EWING.

Peppermint tablets for diabetes sufferers. C. A. HUBER AND P. VAN DER WIELEN. *Pharm. Weekblad* 52, 865-7(1915).—The tablets prepd. by the authors have the following compn.: Levulose 10, Olei Menthae pip. gtt. I, Sol. Gelatinae 20% q. s., M. F. trochisc. Nr. 20.

P. v. d. M.

Reduction of bismuth nitrate. A. ROBERTSON. *Pharm. Weekblad* 52, 945(1915).—The blackening of a prepn. which contained NaBr, Mag. bismuthi, water, and sugar, in the sunlight was found to be due to the formation of metallic Bi. The acid reaction of the Bi salt brings about inversion of the sugar, which then causes reduction. The reduction also takes place in the absence of water, but the presence of the Br salt is essential.

P. VAN DER MEULEN.

The fat of nux vomica. H. E. WATT AND G. B. ANGUS. *J. Soc. Chem. Ind.* 35, 201(1916).—Nux vomica contains 1-2% of a concrete oil or fat which consists principally of the glycerides of capric, caprylic, caproic, butyric and palmitic acids. The unsaponifiable matter consists of a satd. alc. $C_{25}H_{51}OH$, and an unsatd. alc. $C_{25}H_{49}O_5H_2O$ behaving like syroceryl alc. The oil is dark brown in color and possesses an unpleasant odor. An analysis gave: $d_{16.6}^{100}$ 0.892, sol. point 60° , sapon. no. 152, I no. (Hübl) 54, Reichert-Wollny no. 1.0, acetyl no. 31.2, acid no. 33.7.

E. A. TSCHUDY.

Goa ipecac root. LÉCOQ. *Bull. des Sci. Ph. Sep.*, 1915; *Schweiz. Apoth. Ztg.* 53, 695(1915).—The root of *Naregamia alata* (Meliaceae), a small plant occurring in Travancore and near Goa, is very aromatic, bitter, reddish yellow and is sometimes used as an adulterant of ipecac root. Aside from being different in appearance, it is rich in oleoresin. It also contains an alkaloid, naregamine (Hooper, 1887), which differs from emetine by readily forming acicular crystals with acids. A tincture prepd. from this root has been successful in dysentery, and as an expectorant, being non-toxic, and harmless towards the digestive and urinary organs.

S. WALDBOTT.

The tonka bean. EDWARD ALBERS. *Bull. Pan-American Union; American Perfumer; Midland Druggist* 50, 109-13(1916).—A descriptive account, with photographic illustrations.

S. WALDBOTT.

Assay of folium and extractum belladonnae and hyoscyami. JOHANNESSEN. Copenhagen. *Farmaceutisk Tidende; Schweiz. Apoth. Ztg.* 53, 730-4(1915).—For *Folium belladonnae*, J. replaces the EtOH extn. method of the Pharm. Helv. IV by the following "water" method: Macerate 15 g. of powdered leaves for 24 hrs. with 145 g. of 0.1% HCl, filter and evap. 60 g. of filtrate (= 6 g. of leaves) on water bath to about 5 g. Rinse into a bottle with 7 g. of H_2O , treat as in Pharm. Helv. IV with Et_2O 90 g., and NH_4OH 3 cc., filter 75 g. soln. through cotton, wash with 3×5 cc. Et_2O and evap. Add 30 cc. Et_2O , 25-40 cc. H_2O and 3 drops of iodoeosin, then a definite excess (10-20 cc.) of 0.01 N HCl and titrate back with 0.01 N NaOH. The H_2O used in the prepn. of the solns. must be strictly neutral, as iodoeosin is a very sensitive indicator. In Table I, a summary of 16 detns. is given. The alkaloids vary from 0.354 to 0.601%. The method of the Pharm. Helv. IV and the "water" method give the best results; that of Caesar and Loretz (*Jahresb.* 1913, i. e., maceration of leaves with Et_2O and NH_4OH) is useful in experienced hands; the method of the German Pharm. 1910 is inexact and tedious owing to emulsions; the results with the method of the new Norwegian Pharm. are too low. Shaking-out expts. with pure atropine

show that direct titration and shaking-out from NH_4OH soln. with CHCl_3 (Caesar and Loretz) give exact results. For *Folium hyoscyami*, J. recommends his "water" method. The results of 16 detns. are given in Table II. The alkaloids vary from 0.017 to 0.038% (German Pharm. standard 0.07%; cf. Anselmino and Gilg, *C. A.* 8, 778). For *Extractum belladonnae*, the method of H. Thaysen (*Archiv for pharm. og kemi*, 1910) is recommended. 4 g. of ext., 75 g. H_2O and 10 drops of dil. HCl are warmed on a water-bath, the mixt. is cooled, weighed (giving a total of 80 g.), and filtered. 65 g. (= 3.25 g. ext.) of the filtrate are evapd. to 13 g. 12 g. thereof are treated as in Pharm. Helv. IV. Care must be taken that the chlorophyll seps. in fine division, not in lumps. The amts. of alkaloid found were 1.162–1.688%. For *Ext. hyoscyami*, H. Thaysen's method was again used; 18 exts. gave 0.116–0.341% alkaloids. To standardize exts., Beuttner's method is followed, i. e., the percolate is evapd. somewhat, examd. for alkaloids and dry residue, the calcd. amt. of lactose is added and the mixt. evapd. to the proper wt. *Ext. belladonnae siccat.* was assayed as follows: 6 g. dry ext. are macerated for 1 hr. with 57 g. of 0.2 *N* HCl and filtered. To 42.5 g. of the filtrate are added 7 cc. *N* NaOH and the mass is evapd. to 8.5 g. Shake 8 g. with 60 g. of Et_2O and 3 g. NH_4OH . 45 g. Et_2O soln. (= 3 g. of dry ext.) are treated further as usual. The results were concordant. *Ext. hyoscyami siccat.* was assayed similarly. The addition of licorice seems to influence the alkaloidal content. J. found in ext. of licorice root with K_2BiI_6 a faint reaction, possibly of an alkaloid. S. WALDBOTT.

Some experiments with proposed formulas for camphor ice. CURT P. WIMMER. *Midland Druggist* 50, 63–5 (1916).—After a discussion of an old formula by Septimus Piesse (1856) and 7 proposed subsequently, W. gives the following basic formula: White mineral oil 20, paraffin 20, spermaceti 5, camphor 20. The resulting prepn. has a cryst. surface, is semitranslucent, like ice, has the proper consistency, and the cooling action of camphor. The addition of white wax, lard, suet or vegetable oils tend to affect color and transparency and to impair the keeping quality of the prepn.

S. WALDBOTT.

Laboratory notes. RAPP. *Pharm. Ztg.* 1915, No. 45; *Schweis. Apoth. Ztg.* 53, 721–3 (1915).—The manufacture of Et_2O and of CHCl_3 for anesthetic purposes, and the prepn. of zinc rubber plaster are included.

S. WALDBOTT.

Ambergris. BRUFF. Christiania. *Tidskrift f. kemi, farmaci og terapi* 1915, 125; *Schweis. Apoth. Ztg.* 53, 729 (1915).—Lumps weighing from 0.5 to 75 kg. occur in Norway commerce. Genuine samples have low sapon. no., show concentric layers of dark and light colors, yellow gray to brownish black, and contain the horny gills of a cuttlefish species which serves as food for the whale. At 60° where it is said to melt, it becomes ointment-like, but melts at a higher temp. B. found d. = 0.950 instead of 0.908 to 0.920. Sapon. no. 17, 19 and 35 in 3 expts.; ash only traces. It is used in perfumery as a fixative for other aromatics, and is liable to be adulterated with tallow, gum benzoin, olibanum, etc.

S. W.

Artificial lanolin and "Pommade Bourget." E. ANSELMIER. *Schweis. Apoth. Ztg.* 53, 736–7 (1915).—A mixt. of yellow wax, 0.3, solid paraffin 0.7, yellow vaseline, 9.0, preferably "Chesebrough" or "Wilburine," is useful as a substitute for lanolin, which is scarce. "Pommade Bourget" which lends itself well to mixts. with other medicaments, contains $\text{C}_6\text{H}_4\text{OHCO}_2\text{H}$ 10.0, oil of turpentine 10.0, tallow 70.0, yellow wax 2.5, and solid paraffin 7.5.

S. WALDBOTT.

Camphor and camphor oil. B. J. EATON. *Agr. Bull. Fed. Malay States* 3, 403–4 (1915).—In connection with expts. on the prepn. of camphor from the Japanese camphor tree *Cinnamomum camphora* samples of camphor and of camphor oil were sent to the Imperial Institute, London, for further investigation and valuation. Two sam-

ples of camphor oil were found to have the following consts., resp.: d_{44}^0 0.913, 0.900; $[\alpha]_D^{41}$ 1' at 18°, 38° 23' at 22°. Camphor content on cooling to -10°, to -12° 19.3%, 12.8%. An interesting feature of both samples is the absence of safrole, due it was supposed to the fact that the distillate was obtained from young twigs and leaves, whereas the ordinary Japanese camphor oil is derived from old wood and mature trees. The crude camphor was submitted to a firm of commercial experts who reported that it was very similar to Chinese "leaf" camphor and would be readily saleable in London.

M. I. W.

Oil of Strophanthus and the emetic action of strophanthus. ROBERT A. HAYCORN. *J. Am. Pharm. Assoc.* 5, 157-62(1916).—Strophanthus contains a fixed oil but the suggestion that this oil is responsible in part at least for the nausea and vomiting occasionally seen after the therapeutic use of the tincture has not been proved. It has been shown conclusively that all of the digitalis compds. induce nausea and vomiting through the action on the vomiting center and the emetic action of oil of strophanthus is largely, though not entirely, due to the fact that the oil usually contains traces of strophanthin. Oil of strophanthus freed from strophanthin is apparently capable of causing nausea and vomiting when administered to cats in doses of 850 mg. per kg. The tincture of strophanthus contains only traces of fixed oil and the average therapeutic dose of the tincture contains an amt. of the oil corresponding to less than 1/100 of that required to cause nausea and vomiting in the cat relative to weight.

M. I. W.

The rapid separation of heroine and morphine. JAMES M. DORAN. *J. Am. Pharm. Assoc.* 5, 163-5(1916).—The usually accepted method of sepg. heroine and morphine is based upon the soly. in Et₂O of the free base heroine from an ammoniacal soln., morphine being relatively insol. and remaining in the aq. soln. In practice this method did not prove satisfactory because of the presence of EtOH and the ready soly. of this. Chemically pure CCl₄ proved to be a more satisfactory solvent, the free heroine being readily sol. while morphine is only very slightly sol. Settling of the solvent is rapid owing to its sp. gr. and there is practically no emulsion formed. CCl₄ also dissolves the free bases of dionine (ethyl morphine), peronine (benzoyl morphine), and codeine (methyl morphine).

M. I. W.

Selection and technic of an appropriate method for estimating phenol. JOHN W. FORBING. *J. Am. Pharm. Assoc.* 5, 166-9(1916).—A summary of the several methods and modifications of methods for the estimation of phenol with comments. The choice rests ultimately on 3 factors: accuracy, time and economy. F. outlines a further modification of Sutton's modification of the Koppeschaar method. In practice this modified method was found to give slightly lower results than the U. S. P. modified method for phenol.

M. I. W.

Hydrolysis of some of the common vegetable oils (RUDD) 27.

Methylenetetrahydropapaverine. A. PICTET. U. S., 1,176,597, Mar. 21. Hydro-papaverine is condensed with methylal in acid soln. The product in the form of the free base forms colorless crystals, m. 157-8°, easily sol. in alc. and CHCl₃ and difficultly sol. in ether and cold C₂H₄. The hydrochloride m. 228-30°. The condensation product with acetal m. 148° and that with diethylbenzacetal m. 260-2° (hydrochloride m. 304-6° with decompn.).

Distillation of formic acid. A. BRAUER. U. S., 1,174,663, Mar. 7. A thin layer of a mixt. of Na formate and H₂SO₄ is applied to the surface of a heated drum within a closed reaction chamber and the solid residue is continuously scraped off the drum after distn. of the HCOOH produced.

Acetic acid. N. GRÜNSTEIN. U. S., 1,174,250, Mar. 7. HOAc is made by the reaction of C_2H_2 , H_2O and O at a temp. of $70-90^\circ$ in a soln. formed of HOAc, H_3PO_4 and HgO (or other Hg compd.). C_2H_2 and O are alternately introduced and a 90% or higher yield of 95% HOAc is produced.

Catalytic hydrogenation. C. F. BOEHRINGER & SÖHNE. Brit., 21,948, Nov. 3, 1914. In the hydrogenation of unsatd. substances in the presence of a suboxide of the Ni group as catalyst, the substances are treated when in soln. or suspension in an alc. instead of in H_2O as in the process described in 21,883 C. A. 10, 1081. In examples, dihydroquinine is obtained by treating quinine-HCl in soln. in MeOH or EtOH in the presence of Ni suboxide, and cinnamylcocaine is hydrogenated when in soln. in EtOH in the presence of Ni suboxide.

Acetic anhydride; acetaldehyde. BOSNISCHE ELECTRICITÄTS AKT.-GES. Brit., 23,190, Nov. 27, 1914. Ac_2O is obtained by heating ethylidene diacetate above its b. p., or by heating it with catalysts. The catalysts specified are H_2SO_4 or $HgSO_4$. AcH is obtained as by-product in the above process. Cf. C. A. 10, 666.

Organic acid anhydrides. R. MÜLLER and DEUTSCHE CELLULOID-FABRIK. Aust., 70,783, Dec. 27, 1915. In the manuf. of anhydrides of organic acids, or their mixts. with the corresponding acids, N oxides, together with air or O, or N_2O_5 alone, are conducted over the salts of the corresponding organic acids. Cf. C. A. 9, 3118.

Unsymmetrical arseno compounds. FARBW. v. M. L. & B. Aust., 70,778, Dec. 27, 1915. In a modification of the process of 59,292, organic arsinic acids or arsenoxides, in admixt. with inorganic As compds., are subjected to reduction.

Arsenic antimony compounds. FARBW. v. M. L. & B. Aust., 70,779, Dec. 27, 1915. In a modification of the processes of 59,292 and 70,778 (*supra*), for the production of unsymmetrical arseno compds., As-Sb compds. are obtained by subjecting to reduction an Sb compd. in admixt. with an organic arsinic acid or an arsenoxide. Cf. C. A. 9, 694.

Acetone and alcohol. BAYER & Co. Ger., 286,148, Jan. 25, 1914. See Brit., 14,371 (C. A. 9, 3326).

Alcohols. C. DILL. Fr., 477,812, Oct. 6, 1914. An alkyl halide is made to react with a basic compd. in the presence of a liquid while the entire mass is in intimate admixt., and at an elevated temp., or under increased pressure, or by combining all these factors.

Medicinal, cosmetic, or edible salve-like products. REICHHOLD, FLÜGGER & BOECKING STADLAUER LACKFABRIK. Aust., 70,772, Dec. 27, 1915. Aq. alc. soln. of cellulose hydroacetates or cellulose sulfoacetates are mixed, preferably with heating, with therapeutically active substances, perfumes, sweetening, or taste correctives, which either possess themselves a solvent power for the particular acetylcellulose, or dissolve in indifferent solvents or softening agents, or combine therewith during the process of manuf.

Lactide. CHEM. WERKE v. H. BYK. Aust., 70,776, Dec. 27, 1915. Pure or tech. inactive lactic acid, preheated or not, is heated to temps. above 135° , converting it thereby first into a wholly or partly anhydrous high mol. product, which breaks up when heated to a temp. above 200° , preferably by distn. *in vacuo*, in the presence or absence of a gaseous or liquid vehicle.

Gallic acid from gall-nuts. NITRIFABRIK AKT.-GES. Aust., 70,784, Dec. 27, 1915. Gallic acid is obtained by extn. of fermented gall-nuts, sumac, and the like, with alc., ether, or other suitable solvents. After the fermentation is complete, the mass is dried, preferably at an elevated temp., in order to render the slimy impurities formed during fermentation insol. in the solvent.

Anti-tubercular serum. REICHOLD, FLÜGGER & BORCKING STADLAUER LACK-FABRIK AND H. DOSTAL. *Aust.*, 70,773, Dec. 27, 1915. Tubercle bacilli are subjected to the action of physiological salt soln. with the introduction of a sufficient amt. of O, the resulting new, heretofore unknown coccus-like cultures are injected into animals of various ages, and then the serum is obtained from the blood of these animals in the known manner.

Water-soluble silver glycocholate compound. FARBW. v. M. L. & B. Ger., 284,998, Jan. 30, 1914. NH_3 is allowed to act upon Ag glycocholate.

18. ACIDS, ALKALIES, SALTS AND SUNDRIES.

T. LYNTON BRIGGS.

The introduction of finely divided water into lead chambers. G. SCHUPHAUS. *Metall u. Erz* 12, 504-6(1915).—Introduction of steam into H_2SO_4 lead chambers entails the expense of a boiler plant. Water may be substituted for the steam provided it is introduced as a fog.
CARLE R. HAYWARD.

Potash from kelp. I. F. LAUCKS. *Met. Chem. Eng.* 14, 304-8(1916).—Kelp (*Nereocystis luetkeana*) from Puget Sound is being treated to make its K content available for fertilizing purposes. The kelp is harvested by an app. consisting of submerged reciprocating knives behind which a conveyor is placed to carry the cut kelp aboard a scow. A chopping machine cuts it into short lengths for convenience in unloading. The kelp is conveyed from the scow to water-tight bins having provision for drainage to the dryers, since a large percentage of the water in the kelp squeezes out under its own pressure when piled, and this liquor carries with it a proportional amount of the K. The kelp is shredded in a Williams hammer-type mill during which considerable liquor is also set free before being fed to the direct-heat, rotary dryer. Efficient drying calls for prevention of burning of the material in the dryer since this causes loss of N. The dryer must be equipped with suitable dust collectors since as much as 20% of the weight of product is sometimes collected from the dust chambers. The product of the dryer with such a feed is fine enough so that it requires no further reduction to mix with other fertilizing materials. It is packed in paper-lined sacks and marketed. The K and N are sold on a unit basis. The N in kelp has been shown to be as available as other nitrogenous fertilizing materials, while the high organic matter is valuable in furnishing humus to soils. Pure KCl and K_2SO_4 may be obtained from dry kelp by counter-current leaching. The KCl is sepd. from the NaCl by crystn. The I left in the mother liquors can be obtained by ordinary methods. Algin, the colloid substance found in kelp, shows promise of becoming valuable. Costs and yields are discussed.
E. A. TSCHUDY.

Potash from kelp in southern California. H. L. GLAZE. *Met. Chem. Eng.* 14, 355-7(1916).—A review and discussion of many of the processes being tried in the development of the industry.
F. W. SMITHER.

A method for the utilization of niter-cake. J. GROSSMANN. *J. Soc. Chem. Ind.* 35, 155-6(1916).—Niter-cake showing by test about 30% free H_2SO_4 could be expressed by the formula $5\text{Na}_2\text{SO}_4 + 3\text{H}_2\text{SO}_4$ which corresponds to 70.7% Na_2SO_4 and 29.3% H_2SO_4 . A soln. of niter-cake and CaSO_4 would decompose as follows: $(5\text{Na}_2\text{SO}_4 + 3\text{H}_2\text{SO}_4) + 6\text{CaSO}_4 = 2\text{Na}_2\text{SO}_4 + 6\text{NaHSO}_4 + 6\text{CaSO}_4$; further, $2\text{Na}_2\text{SO}_4 + 6\text{NaHSO}_4 + 6\text{CaO} = 2\text{Na}_2\text{SO}_4 + 6\text{NaOH} + 6\text{CaSO}_4$. The original amt. of CaSO_4 suffices for any number of operations. After sepn. from the CaSO_4 the soln. contains mainly NaOH and Na_2SO_4 . On boiling down, the Na_2SO_4 is fished out, and the final liquor is either used as caustic or further concd. and made into solid caustic soda.

The CaSO_4 produced may be made into pearl hardening. The actual yield from 100 tons of niter-cake was 36 tons of pure Na_2SO_4 and 15 tons of caustic soda. Costs of production are discussed.

E. A. TSCHUDY.

Salt industry and resources of the Philippine Islands. A. J. COX AND T. DAR JUAN. *Philippine J. Sci. (A)* 10, 375-401 (1915).—A detailed account with numerous illustrations, tables, diagrams, etc. The majority of the plants in the Philippine Islands use solar heat, a few direct artificial heat, and none steam heat or grainer methods. (cf. 7th Ann. Rept. U. S. Geol. Survey 505 (1886).) Analyses of the waters used, the soil, and the commercial product are given. Philippine salt contains from a trace to 6.1% CaO and from a trace to 1.9% MgO . *Conclusions:* "The brine should not be transferred to the crystallizing ponds until the salt is ready to crystallize out ($d_{20} 1.205$), since in the evapn. reservoirs large quantities of gypsum and other matter had pptd. before the salt settled out. If there is a proper balance in the plant, in at least the last 2 reservoirs large quantities of undesirable substances will be removed and a purer grade of salt will result. The area occupied by the crystallizing ponds should be as small as possible to accommodate the brine concd. in the evapn. reservoirs, for in that way as much salt is obtained with less labor. When the brine in the crystallizing pond has a $d_{20} 1.275$, it should be drawn off and worked over for the by-products or should be discarded. Expts. show that salt with a purity of 99.63% NaCl may be obtained with these precautions. Efforts should be made to improve the quality of the output and to develop a larger industry in the Philippines." Numerous references to the literature are given.

F. W. SMITHER.

The technical production of hydrogen and its industrial application. H. L. BARNITZ. *Met. Chem. Eng.* 14, 391-5 (1916).—A review.

F. W. SMITHER.

Wood flour. F. W. KRESSMANN. *Met. Chem. Eng.* 14, 372-4 (1916).—A description of the processes of production, properties, and uses of wood flour.

F. W. S.

The question of the commercial monopoly of nitrogen. C. A. V. MARTIUS. *Chem. Ind.* 38, 525-7 (1915).—A discussion of German conditions.

F. W. SMITHER.

Russian chemical trade and its obstacles. H. G. *Chem. Ind.* 39, 14-5 (1916).—Discussion.

F. W. SMITHER.

Chemical, electrochemical and metallurgical industries of Scandinavia. ANON. *Chem. Trade J.* 58, 275-6, 297 (1916).—A general description under the headings electrochemistry, electrometallurgy, metallurgy, nickel, inorganic industries of Norway and inorganic chem. industry, metallurgy, organic chem. industries of Sweden.

E. H.

Use of niter cake in the manufacture of ammonium sulfate (COOPER) 21.

Fluosilicic acid. P. A. RACICOT. U. S., 1,175,294, Mar. 14. SiF_4 and HF are brought into a mixing chamber and treated with H_2O .

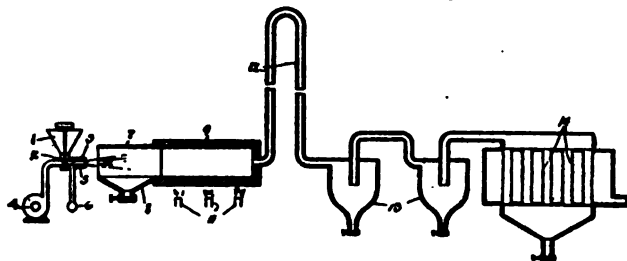
Potash from alunite. C. F. HAGEDORN. U. S., 1,175,439, Mar. 14. Calcined alunite is heated under pressure with H_2O to effect soln. of the K and the soln. formed is filtered at a temp. of 90° or higher to retain all the dissolved K in soln. during filtration.

Apparatus for digesting bauxite with alkaline solutions. H. HOWARD. U. S., 1,175,147, Mar. 14. The app. consists of a digester capable of withstanding heavy internal pressure and provided with an internal steam coil and stirrer and an external heat-insulating covering.

Precipitating oxides and hydroxides from metal chloride solutions. A. O. BLICKLE. U. S., 1,175,587, Mar. 14. To effect selective recovery of Cu and Zn from chloride

solns., just sufficient Ca(OH)_2 or CaCO_3 is added to the soln. to ppt. a basic salt of Cu and then the ppt. is heated with additional Ca(OH)_2 to convert it into oxide or hydroxide. The residue of Cu compd. is lixiviated to recover Zn or other metals from it, and remove CaCl_2 .

Lead arsenate. L. SHEPHERD. U. S., 1,175,565, Mar. 14. A mixt. of PbS and As_2O_3 is burned with air and a blast of hydrocarbon fuel and the cooled solid product is collected in settling chambers. An app. for carrying out the process is shown, in which an air blower 4 and gas pipe 6 supply a blast flame into which material is fed by a screw from the hopper 1. From the



combustion chamber 7 and flue 9 the products pass through a cooling pipe 12 to settling chambers 13 and bag filters 14 and exhaust gases are discharged through the stack (not shown).

Sodium sulfate; chlorine; sulfuryl chloride. GOLDSMIDT AKT.-GES. Brit., 23,287, Nov. 30, 1914. Na_2SO_4 and Cl are obtained by Hargreaves' process at temps. above 505° and below the m. p. of the salt present at any time. The reaction may be carried out in an inclined rotary furnace on the counter-current principle, powdered salt being employed. The temp. may be regulated by regulating the velocity of the gases or the proportion of O. Cf. 20,604, 1893. By using excess of SO_3 , SO_2Cl_2 is obtained.

Hydrogen sulfide and the sulfides of the alkalis and the alkaline earths. S. KUNSTSEIDENFABRIK A.-G. Ger., 286,947, Nov. 24, 1914. The object of the process is to work S-containing residues of all kinds, *e. g.*, the sepd. S or S-gypsum mixt. from the denitration waste liquors upon treatment with acid, which contains also organic substances, with a view to obtaining H_2S and sulfides or acid sulfides. The S-containing residues, after being mixed with alkalis or alk.-earths, alone or together with reducing organic substances, are heated to dull redness. A part of the S reacts with the H_2O present in the mixt. to form H_2S , while another portion is combined with the alkali, with the formation of sulfites, sulfides, or polysulfides. The latter constitute a very active reducing agent for the sulfates present in the mixt., so that finally, for the complete reduction to CaS , they need be heated for a short time only, supposing sufficient organic substances were present. Due to the alkalis or alk.-earths, not only is sublimation of free S prevented, but also, by the reducing action of the resulting polysulfides on the sulfates, a technical effect, not anticipated, is secured. An especially suitable admixt. for the S-containing residue appears to be the so-called sugar-lime slime, which, in addition to CaCO_3 , shows a high content of organic substances. A mixt. of gas is obtained which consists almost exclusively of H_2S and CO_2 , and, because of the absence of indifferent gases, has proved suitable for the subsequent reaction with CaS or alkalis, or for the manuf. of acid sulfides. *E. g.*, S-gypsum mixt. 100 kg. is mixed intimately with sugar-lime mixt. 100 kg., and heated to dull redness in retorts, in an air-dry condition. The resulting gas mixt. is composed essentially of H_2S and CO_2 . This mixt. is collected in a gas holder over oil, and can be worked up into alkali and alk.-earth acid sulfides. The retort residue is reduced in a reverberatory furnace or lime kiln to CaS which is slimed in H_2O and converted into CaCO_3 and Ca(HS)_2 by the introduction of the retort gases composed of H_2S and CO_2 .

Titanium salts. H. SPENCE, H. WRIGLEY and SPENCE & SONS. Brit., 23,089, Nov. 26, 1914. Ti oxalate in a sol. form, in which the mol. ratio of TiO_2 to C_2O_3 is approx. 1:1, is obtained by treating a Ti alkali sulfate or Ti sulfate with alkali oxalate, or $(\text{HOCO})_2$, or both. The reagents may be intimately mixed in a solid or moist state, or may be heated and dried together.

Alkali sulfates; chlorine; sulfuryl chloride. F. BERGIUS. Brit., 23,288, Nov. 30, 1914. In the production of alkali sulfates and Cl by treating chlorides with SO_2 and air or O, the temp. of the salt mixt. is kept below its m. p., which varies during the process, the lowest point being the eutectic point (about 623°) when about equimol. proportions of chloride and sulfate are present. The chloride is preferably powdered and may be treated in an inclined rotary tube, no external heat being required except to heat the end at which the hot gases enter to about 500° to start the operation. If an excess of SO_2 is used, Cl_2SO_2 is formed. The temp. is regulated by regulating the rate of flow of the gases. Cf. 15,152, 1899.

Sodium carbonate. M. SPAZIER. Fr., 477,964, Mar. 9, 1915. An app. for the manuf. of $\text{Na}_2\text{CO}_3 \cdot 10\text{H}_2\text{O}$, comprizing 2 crystg. vats, a reservoir vat situated above these crystg. vats and provided with means for delivering the soln. into one or the other of them, and a dripping table arranged over said crystg. vats and discharging into them. Cf. C. A. 9, 849.

Extracting sea-salt from sea water. LUCIEN-PAUL BASSET. Fr., 477,928, July 8, 1914. The water is fed continuously on to a bed of impermeable soil, in a very thin layer, whereby the evapn. process is rendered intensive.

Potassium salts from feldspar. E. L. ANDERSON. U. S., 1,174,795, Mar. 7. Feldspar is decomposed by heating to $135\text{--}175^\circ$ under a pressure of 50–75 lbs. per sq. in. with a soln. of HF 5% and H_2SO_4 95%. An excess of feldspar is preferable and steam is blown off during the heating to maintain the concn. of the H_2SO_4 . The K is recovered as K_2SO_4 or K alum.

Aluminium sulfate. P. R. HERSMAN. U. S., 1,176,292, Mar. 21. $\text{Al}_2(\text{SO}_4)_3$ is produced from Al skimmings, screenings, slags or other crude material by washing with H_2O , treating the residue with dil. H_2SO_4 to dissolve out most of the Fe, then treating the residue with strong H_2SO_4 to dissolve the Al, neutralizing the excess of acid present by addition of raw material partially freed from Fe and crystg. the $\text{Al}_2(\text{SO}_4)_3$ from soln. after pptn. of any Cu which is present.

Separating thallium and radioactive metals from lead ores, and making a white lead pigment. J. B. HANNAY. U. S., 1,175,146, Mar. 14. Pb ores containing Tl and radioactive metals are volatilized with hot CO and N or other reducing gases free from O and the fume produced is mixed with a large excess of air just after leaving the heating zone. The oxidized fumes are gradually cooled and the deposits formed are successively collected in a series of settling chambers. A pigment of the approximate compn., $3\text{PbSO}_4 \cdot \text{PbO}$, is obtained. The deposits carrying Tl and radioactive materials are again subjected to the same operation to effect concn.

Reducing tungsten compounds. C. BOSCH and A. MITSCH. U. S., 1,175,693, Mar. 14. Pure WO_3 is reduced with H at a temp. of about 600° or slightly higher under a pressure of over 10 atm., preferably 80–150 atm., to obtain a finely divided W suited for use as a catalyst in the synthesis of NH_3 .

Ammonia from its elements. BAYER & Co. Ger., 286,719, Jan. 15, 1914. Addition to 285,698 (C. A. 10, 668). According to the principal patent the decompn. products obtained by heating the alkali and alk.-earth salts of hydroferro- and -ferri-cyanic acids, with exclusion of air, are used as contact bodies. Experience has shown that these products catalyze a mixt. of N and H more effectively, if they have been

produced, at a temp. below 500° , in a current of N and H or of one of these gases, if necessary, under increased pressure. *E. g.*, dehydrated $\text{Ba}_2\text{Fe}(\text{CN})_6$ is heated gradually, under high pressure, in a high pressure app., in a current of a mixt. of N and H. Even at 300° the contact body is formed, with the formation of NH_3 . At 430° , and a pressure of 180 atm., a continuous formation of NH_3 results, with a yield of 17-18% by vol.

Apparatus for producing ammonia from its elements. CENTRALSTELLE FÜR WISSENSCHAFTLICH-TECHNISCHE UNTERSUCHUNGEN G. M. B. H. Ger., 286,666, Feb. 25, 1914. In the synthesis of NH_3 by heating a mixt. of N and H under pressure in the presence of a catalytic agent, in a double-jacketed tubular reaction chamber, the outermost wall is protected from the destructive action of diffusing H by means of the middle wall, of Al, which resists the chem. action and diffusion of the H. A thin-walled Al tube is fitted tightly in a thick-walled Fe pressure tube, and into this Al tube is forced a thin tube of low-C Fe. By turning over the projecting ends of both of the inner tubes and screw-fitting, the gas under pressure is prevented from entering between the tubes. Upon the introduction of pressure, the inner tubes are forced outwards against the outer Fe tube. While, after heating, the innermost tube allows the passage of H, but not that of N by which the Al tube would be attacked, this Al tube prevents the diffusion of H. The outer pressure tube of Fe is completely protected from the injurious action of the H. The outer pressure tubing is made preferably of alloyed steel.

Nitrogen oxides and ammonia from the combustion of a highly concentrated mixture of ammonia gas and air. FARBW. v. M. L. & B. Ger., 286,751, Feb. 20, 1912. An amt. of air is employed such that after oxidation and cooling, there remains, besides N oxides, only pure N, which is converted into NH_3 in the known manner. In the combustion, *e. g.*, of an NH_3 -air mixt. with 10.7% NH_3 , NO is obtained in the furnace, with almost theoretical yield, calcd. to the N of the NH_3 . Upon cooling, this NO is oxidized, as a second step, with the aid of residual O, to N_2O_4 . Upon sufficient cooling the H_2O resulting from the combustion of the NH_3 seps., partly in the form of aq. HNO_3 as a product of reaction with N_2O_4 . The O required for this third oxidation step is taken from a part of the N_2O_4 , with the formation of some NO. In the event of the sepn. of HNO_3 , the NH_3 concn. must be somewhat less in order that, after the production and removal of the aq. HNO_3 and the N_2O_4 , as such or in the form of nitrate and nitrite, the waste gases may be free from NO.

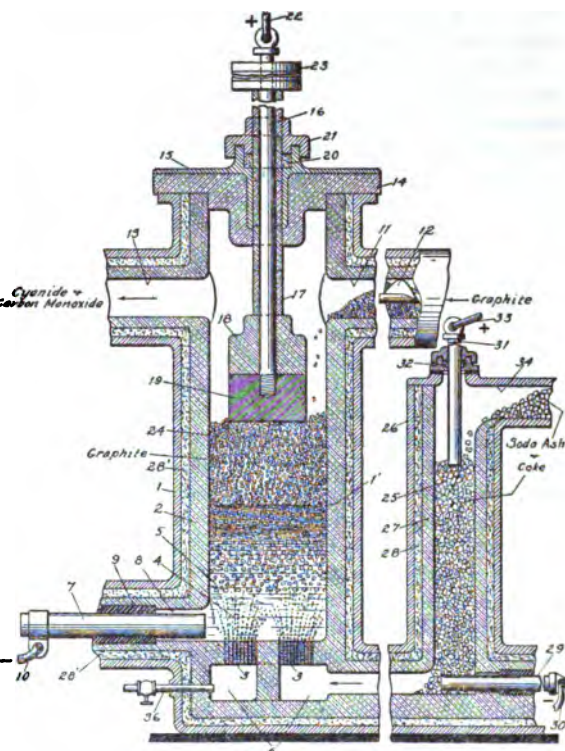
Cyanogen compounds. NITROGEN PRODUCTS CO. Fr., 477,918, Mar. 8, 1915. In the manuf. of compds. of $(\text{CN})_2$ with the aid of N, C, and an alkali or alk.-earth metal or a compd. thereof, under the influence of a molten metallic catalyzer such as Fe, satd. with C, a mass of the material is plunged into the molten catalyzer in such manner as to break up bubbles arising in the bath from gaseous materials which have been introduced, thereby increasing the period of contact with the catalyzer.

Electric furnace for fixing nitrogen. J. E. BUCHER. U. S., 1,174,667, Mar. 7. The furnace is designed for fixing N as CN compds., *e. g.*, forming NaCN by heating a briquetted charge of Fe, C and Na_2CO_3 which serves as elec. resistor in the furnace.

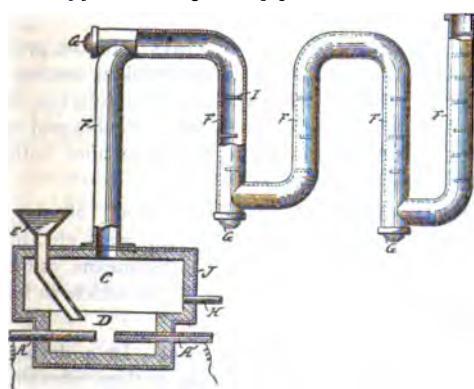
Fixing nitrogen in an electric furnace. J. E. BUCHER. U. S., 1,174,668, Mar. 7. A briquetted mixt. of Fe, C and Na_2CO_3 is heated in a current of N by annular Fe electrodes to form NaCN, the charge itself serving as an elec. resistor. Hot gases are used to preheat the charge.

Fixing nitrogen. J. E. BUCHER. U. S., 1,174,944, Mar. 7. A mixt. of alkali metal vapor and N or NH_3 or producer gas heated to about $800-900^{\circ}$ produced in the chamber 26 is passed through the conduit 6 and allowed to bubble up through a mass

of molten Fe 5 with an overlying mass of graphite 24, heated by electrodes 7 and 10. Graphite is supplied by the screw conveyor 12 and cyanide and CO produced are led off through the pipe 13. Na vapor is formed by electrically heating a mixt. of Na_2CO_3 and coke in the chamber 26. The outer casing of the app. may be made of cast Fe, with a lining formed of powdered hard magnesia brick 50, alundum cement 50 and borax or borax glass 2-3 parts, with an intermediate layer of kieselguhr or MgO . If desired, fuel oil may be supplied through the pipe 36 to furnish C for the reaction and instead of Na vapor unreduced Na_2CO_3 in either liquid or vapor form may be introduced into the molten Fe in mixt. with N to form NaCN . Use of Mn, Ni or Co in the molten catalyst permits operation of the process at lower temps. and may facilitate the process, especially when K compds. are used. If Fe alone is used it is maintained at 1500° in making NaCN .



Fixing nitrogen. H. R. MOODY and S. A. TUCKER. U. S., 1,175,007, Mar. 14. N is supplied through the pipe H and a carbide of Ca, Ba or Li (or a mixt. of carbide-forming materials) is elec. heated in the chamber D by electrodes A, A', one of which may be made tubular to serve also as a conduit for the introduction of N if desired. Compds. containing C and N are formed, e. g., CaCN_2 , $\text{Ca}(\text{CN})_2$, or $\text{Ca}(\text{C}_2\text{N}_2)_2$, with a smaller amt. of nitride. Volatilized compds. are collected in the condenser F and removed at G. Addition of 5% of CaCl_2 to the charge facilitates the reaction.



Hydrogen peroxide. FIRMA HENKEL & CO. Aust., 70,746, Dec. 27, 1915. In the manuf. of H_2O_2 ,

continuously, by electrolysis under increased pressure according to 67,125, the interior wall of the tubular high-pressure vessel is coated with suitable electrode material, and

serves as cathode, while an anode, covered with a suitable diaphragm, is disposed axially within the vessel.

Hydrogen. W. NÄHER and M. NÖDDING. Ger., 286,960, June 13, 1914. Addition to 279,726 (C. A. 9, 1233). The principal process is modified by employing steam superheated to at least 200°, and heating the metals to at least 400°. The production of the reducing gas and the reduction of the metal oxides are effected at a temp. of at least 400°. Coal, charcoal, metallurgical coke, gas coke, soot, or graphite are employed for the manuf. of the reducing gas. In addition to the steam, small amts. of air, CO₂, generator gas, water-gas, or illuminating gas may be conducted through the coal.

Hydrogen. CHEM. FABRIK AKT.-GES. v. MORITZ MILCH & Co. and F. BERGIUS. Ger., 286,961, Nov. 21, 1913. Addition to 254,593 (C. A. 7, 1270). The process is a modification of that specified in the principal patent, wherein metals or lower oxides of metals are brought into reaction with H₂O. An almost quant. yield of H is realized, in a short time, if the H₂O is brought into reaction as steam, and not as liquid, with the metals. The process can be carried out continuously with ease, by allowing the high-pressure steam to flow, periodically, through the container filled with the reactive metal and mounted in or on the pressure bomb, while the exhausted contents of the container are regenerated by reduction by means of gas, or renewed by means of a fresh charge. By following this process the active metal is more effective and the reaction proceeds at a much lower temp. In carrying out the process, the pressure is so chosen that H can be removed, at the prevailing pressure, from the reaction chamber. If, *e. g.*, the H is to be charged into bombs, a reaction pressure of 150-200 atm. is employed. The reaction temp. should not be allowed to exceed 500°, since above this temp. the resistance of the vessel is greatly decreased. The admixt. of elec. conducting salts, such as NaCl, Fe₂Cl₆, or the like, is recommended.

Hydrogen. BADISCHE. Aust., 70,747, Dec. 27, 1915. In the production of H by the catalytically induced reaction between steam and CO, the catalytic agents used are composed of the O compds. of the rare-earth metals, especially of Ce, with the addition of activating substances. Cf C. A. 9, 2803.

Removing lead from zinc compounds. S. E. GOLDSCHMIDT & SOHN and J. ZAWADZKI. Aust., 70,743, Dec. 27, 1915. In the removal of Pb from Zn compds. with the aid of Zn(OAc)₂ solns., the process of 47,525 is modified in that dil. Zn(OAc)₂ solns. are employed, at moderate temps., to ppt. equiv. amts. of ZnO, whereupon the resulting Pb acetate soln. is pptd. with Zn to recover the Zn(OAc)₂.

Contact masses. G. SCHICHT A.-G. Aust., 70,771, Dec. 27, 1915. In the production of nickeliferous contact masses, with the employment of pulverulent carriers, kieselguhr or like porous substances are satd. with Ni(CO)₄, whereupon the carrier is heated to effect the pptn. of the metallic Ni. The nickeliferous powder so obtained is immediately worked up to a paste, with exclusion of air, in the known manner, with oil, or the substance to be hydrogenized, or a soln. thereof.

Spraying and atomizing pulverulent material. A. MAUSER. Ger., 286,637, Feb. 24, 1914. Small amts. of the material (metal, celluloid, lac, resin, glass etc., in stick or rod form) are taken, continuously or periodically, by mechanical means, as by shaving, filing, or turning, and immediately atomized or blown on to the article to be coated, by means of heated or cold compressed gas.

Drying systems. G. D. HARRIS. Brit., 23,291, Nov. 30, 1914. In a drying process, hot air is passed over one surface of a mass of material, and is then reheated to the same or a higher temp. and passed over the other surface. The material may be arranged within compartments, the walls of which form, together with the support of the material, tapering passages which retard the flow of the air.

Concentrating liquids. J. HARRIS and D. H. THOMAS. Brit., 23,414, Dec. 2, 1914. In concd. acid, alk., or neutral liquids or sirups, the liquid, fed through funnels, passes through a series of pipe-like evapg. vessels arranged in cascade. A number of series of pipes are arranged side by side in a flue, so that the pipes form floors, and ports are arranged at alternate ends of each floor for the passage of hot gases between the floors. Asbestos rope or like packing may be laid between the pipes. The pipes are provided with transverse weirs to regulate the height of liquid in them, and with outlets discharging into funnels leading to the inlet of the pipe below. The funnels have upwardly projecting sides to catch splashes. The vapors may be collected in flues formed by side walls. Cf. 7,728, 1912 (C. A. 7, 2999).

Cellulose acetate in gramophone records. A. EICHENGRÜN. U. S., 1,175,728, Mar. 14. The facing layer of records is made of acetyl cellulose mixed with a filler and a softening agent, e. g., dichlorohydrin.

Colloidal graphite. H. KARPLUS. U. S., 1,175,958, Mar. 21. Graphite is peptized by the action of strong oxidizing agents such as $\text{KClO}_4 + \text{HNO}_3$ at a temp. which is regulated by tests and is varied according to the size of granules under treatment to prevent formation of graphitic acid. The reaction products are washed and the highly dispersed portion is sepd. from that less dispersed by elutriation in an aq. soln. of saponin.

Preserving amalgams. J. W. SMITH. U. S., 1,176,176, Mar. 21. Amalgams for use in dental work are cooled and kept in a frozen condition until desired for use and are then heated to render them plastic.

Abrasive. C. C. SHATTUCK. U. S., 1,176,174, Mar. 21. A molded abrasive for sharpening edged tools is formed of pumice stone, dry white lead, Spanish white, Japan drier and turpentine.

19. GLASS AND CERAMICS.

G. E. BARTON, A. V. BLEININGER.

Influence of alumina on the fusibility of glasses. L. SPRINGER. *Keram. Rundschau* 23, 271-2, 280(1915).—Polemical (cf. Singer, C. A. 10, 102). S. states that increase of fusibility of glasses containing a small amt. of Al_2O_3 was due to replacement of SiO_2 by pegmatite. Increase of pegmatite again decreases fusibility of glass. The compn. of the glass used by S. was not the best according to the Tscheuschner formula and addition of Al_2O_3 improved them. Reply. SINGER. Examples are shown of influence of Al_2O_3 in silicate mixts. in lowering fusion point. R. K. HURSH.

The melting of glass. F. M. *Keram. Rundschau* 23, 147-8, 172, 184-5, 202(1915).—Descriptive of general operations in melting of glass. R. K. HURSH.

Permanganate as a substitute for saltpeter in the glass industry. L. SPRINGER. *Keram. Rundschau* 23, 214-5(1915).—At 250° KMnO_4 dissociates to form K_2O , MnO and O. At high temps. Mn_2O_3 and O are formed. To furnish equal amts. of O 3 parts KMnO_4 may replace 2 parts KNO_3 or 1.7 NaNO_3 . As a coloring agent it is $\frac{1}{2}$ as effective as MnO . R. K. HURSH.

Yellow coloring of burnishing silver on the back side. L. SPRINGER. *Keram. Rundschau* 23, 159-60, 177-8, 190, 207-8(1915).—Mixts. of Ag_2CO_3 , metallic, cryst. Ag and amorphous Ag with $\text{Pb}_3(\text{BO}_3)_2$ and Bi_2O_3 as fluxes were burned on 2 kinds of glass at different temps. The burning temp. is most influential in producing yellow discoloration which is more pronounced with increased temp. The nature and quantity of flux has little influence. Results with Ag_2CO_3 and amorphous Ag are much bet-

ter than with metallic, cryst. Ag or Ag containing Cu. Good white color was obtained at cone 022, higher temps. giving slight to deep yellow color. R. K. HURSH.

The future of melting pots. (Optical glass.) ANON. *Brit. Clayworker* 24; *The Brickbuilder* 1916, 46.—Years or generations of aging are required for best results. Careful building required 4 months and drying 4 to 8 months. Heating up the pots is accomplished by wrapping with straw and smoking, followed by gradual heating to redness in 5 days. Invisible cracks from too rapid heating may ruin the pot. The manuf. of optical glass is not in itself remunerative. The famous Jena thermometer glass is sold at an actual loss. Optical glass making should be combined with instrument making to distribute the cost. The real problem is pot manuf. Impurities especially iron compds., dissolve into the glass. Probably materials other than clays must be used, i. e., MgO, silundum, SiC, W, Mo, etc. C. H. KERR.

The use of ceramic raw materials and compounding fine ceramic bodies on the basis of the chemical analysis. JOS. DORFNER. *Sprechsaal* 48, Nos. 24-30 inclusive (1915).—Numerous references are made to literature on the constitution of clays and the rational analysis. D. concludes the rational analysis is inadequate since it does not show the true constitution of clays and bodies, does not give evidence of their refractoriness and does not permit a satisfactory calcn. of the Seger formula. The chem. analysis shows completely the compn. of the body and indicates its pyrometric behavior especially when expressed by means of the Seger formula, from which may be noted the compn. of the flux radical, the ratio of bases to acids and the ratio of refractory to fusible constituents. The limits of compn. in the mol. formula are given for various types of ware. The ratio, base:acid = 1:(1-2) normally. As the acid approaches the lower limit the fire resistance increases, the more it exceeds the upper limit the greater is the tendency to deform and fuse. In the R^oO high K₂O gives low, and high CaO, high maturing temp. Bodies low in K₂O are more plastic with similar materials. High CaO makes a tender faience or stoneware body; high K₂O gives a strong body. The higher the CaO in the body the less the crazing of the glaze on stoneware. The less plastic the clay, the whiter the color of the burned ware and the greater the translucency at maturity. R. K. HURSH.

Crystal glazes. C. KABUS. *Keram. Rundschau* 23, 139-40, 165-6, 178-9, 183-4 (1915).—A crystallizing substance is fritted and added in small fragments to a glaze. On burning, these form crystals in the glassy eutectic. A long period at high temp is desirable. Zn silicates require slow cooling for crystn. TiO₂ requires quick cooling to prevent soln. of the crystals. Addition of NH₄VO₃, TiO₂, MO₃ or WO₃ to the glaze promotes crystn. Formulas for flow glazes and ground glazes are given for several temps. R. K. HURSH.

The subdivision of whiteware glazes into fritted and raw portions and their relation to glaze defects. H. HARKORT. *Keram. Rundschau* 23, 273-5, 285-6, 297-5, 317-8 (1915); see C. A. 10, 260. R. K. HURSH.

Influence of fine grinding on bodies and glazes. C. TOSTMAN AND W. PUKALL. *Keram. Rundschau* 23, 145-6, 153-5 (1915).—Discussion of former article by P. (C. A. 9, 3341). T. states that fineness of 9200 mesh sieve is too great for ceramic bodies and glazes. R. K. HURSH.

A new opacifier for white iron enamels. ANON. *Keram. Rundschau* 23, 221-2 (1915).—Spinel made by heating together MgO and Al₂O₃ or ZnO and Al₂O₃ may be used. By using 5% of these and 0.5 % of a stronger opacifier instead of 10% spine; the opacity is improved. R. K. HURSH.

Refractory products without clay. E. PODSZUS. *Ceramique* 18, 178-80 (1915).—ThO₂, ZrO₂, Al₂O₃, quartz and MgO can be made into a paste by fine grinding and mix-

g with an appropriate agglomerant, as gelatin, gum tragacanth, albumin, lacquer, urnish or collodium. For pure burnt material some easily dissociating salt of the rare element which forms the base can be used, as Th acetate for ThO_2 . Continuous rapn. with a salt of the base renders the base colloidal and it can then be worked as clay. J. C. EVANS.

Classified fusible cones of French manufacture. L. LEFFREVE. *Ceramique* 18, 17-8(1915).—L. gives a table showing the melting points of the cones manufactured by Guérineau and Co. with the corresponding German cones. J. C. EVANS.

Working of clay by the dry way. ANON. *Ceramique* 19, 3-4(1916).—By uschhof's process an extremely fine powder is obtained by grinding the clay in a ball mill and separating by an air separator. This is mixed with a light addition of water, oil or other liquid and converted into clods, triturated and sieved to the required degree. This grainy mass can then be compressed. J. C. EVANS.

Colloidal clay. P. ROHLAND. Stuttgart. *Kolloid-Z.* 17, 145-6(1915).—Polemical H. I. MATTL.

Laboratory porcelain—The requirements of the chemists. ANON. *Ceramique* 18, 30-1(1915). J. C. EVANS.

Photography on porcelain or on glass. ANON. *Ceramique* 19, 4-5(1915).—F. I. Besse and E. P. Rouanet's processes are described. J. C. EVANS.

Screen for excluding intense light. A. H. PFUND. U. S., 1,176,313, Mar. 21. A thin film of Au, Cu, Pt, W or Ni, interposed between layers of clear and colored glass is used to protect the eyes from ultraviolet light and other intense rays.

Burning ceramic ware. H. L. DOHERTY. U. S., 1,175,246-7, Mar. 14. A shaft-film structure and method of firing are specified.

Transfer for printing on pottery, etc. S. LEICHTER. U. S., 1,175,779, Mar. 14. A photographic positive of the desired design is formed on glass or a transparent film, a print is made from the positive on sensitized C tissue, fixed on a cylinder or plate of polished Cu or other metal and after developing the tissue the metal is etched to form an intaglio for printing. The printing is executed in relief on paper coated with dextrin or gum in an ink containing mineral color for transfer to pottery or other materials.

Treating mica. P. G. PALMER and J. J. ROBINSON. Brit., 23,067, Nov. 25, 1914. Sheet mica has applied to it on one or both sides a compn. which, when heated to about 2000° F., forms a vitreous glaze. Any suitable pottery glaze or flux may be used. If in the form of a powder, the substance may be mixed with oil or turpentine, or both, and then applied to the mica. Suitable coloring matter also may be added. The coated sheet mica is applicable for making lantern slides, photographic proofs, plates, or prints, covers for watches and lamps, windows, etc.

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

Oil and Portland cement. SCHUMANN. *Concrete* 8, 21(1916).—The strength of cement was lowered to about the same extent by the action of petroleum, mineral oil and rape oil, where the cement was hardened a sufficient time either in H_2O or alternately in air and H_2O . The denser the mortar or concrete the better its ability to withstand the action of oils. Rape oil proved to have the most deleterious effect on mortars and concretes. By using a 1:1 mortar, carefully fabricated and hardened

1 yr. under H_2O , the resulting surface is perfectly capable of resisting the destructive effects of oil, even when continually brought in contact with it. Animal and vegetable oils are destructive to cement on account of their property of combining with CaO of the cement to form lime soaps. A dense, impervious surface is necessary whenever an oil is likely to come in contact with mortar or concrete. A. A. KLEIN.

Bamber cement-seasoning process and apparatus. ANON. *Concrete* 8, C. M. S. 23-4(1916).—Seasoning is effected with dry steam which does not come in contact with the cement until it has passed the end wall of the tube mill. The amt. of steam to be used varies with the quality, chem. and physical condition and quantity of the cement passing into the tube mill. This can be fixed after short trials of 12 hrs. With some cements made by the rotary-kiln process, the same results are obtained without the addition of gypsum but where a very slowly setting cement is required immediately upon leaving the mill it is advisable to add 0.5% to 0.75% $CaSO_4$ in the usual manner, keeping up the steam pressure to the normal amt. Too much steam causes condensation and a coating of partially set cement on the sides of the tube mill. With most cements an absorption of less than 1% by the cement is sufficient. With this process it is possible to carry a considerable increase in the lime content when desired and still produce a cement which is sound in the boiling test. A. A. KLEIN.

Concrete flows under sustained load. E. B. SMITH. U. S. Office of Public Roads. *Eng. Record* 73, 329-30(1916).—Curves are given showing continued deformation under const. load in 5 in. $\times$ 8 in. beam of 1:2:4 gravel concrete under 1225 lb. load for 18 days. In time the deformations become const. Two weeks were required for concrete to attain its max. deformation with a fiber stress of 500 lb. under the conditions of this test. Stress values obtained from deformations are rather questionable, being dependent on the time factor. This phenomenon of the flow of concrete may explain abnormal stress conditions which apparently exist in some structures. Concrete roads and pavements subjected constantly to expansion and contraction due to moisture and to temp. changes in many cases do not crack, where they apparently should. Concrete arches may also be largely protected from excessive temp. changes by the flow of the material. A. A. KLEIN.

Requirements for acceptance of concrete aggregates based upon standard test. N. Y. Public Service Commission. *Eng. Record* 73, 47-9(1916).—Tests of fine aggregates consist of (1) detn. of % retained on No. 4 sieve, (2) mechanical analysis of the portion passing No. 4 sieve, (3) detn. of silt by washing on No. 100 sieve, (4) detn. of silt by decantation, (5) compressive strength tests of 2 in. cubes, (6) microscopical examn., (7) wt. per cu. ft., (8) voids, (9) sp. gr., (10) reaction to litmus, (11) quant test of organic matter as indicated by loss on ignition, (12) density in mortar, (13) detn. of insol. SiO_2 . Tables are given showing mechanical grading limits for fine and for coarse aggregates. Complete tests of a coarse aggregate include: (1) mechanical analysis, (2) cleanliness, (3) wt. per cu. ft., (4) voids, (5) sp. gr., (6) crushing strength. A. A. KLEIN.

Slag concrete stronger than broken stone. ANON. Columbia Univ. *Eng. Record* 73, 151(1916).—Compressive strength tests of 8 in. $\times$ 16 in. cylinders of 1:2:4 concrete were made at periods from 1 month to 1 yr. Large aggregate was slag in one case and Palisade trap rock in the other. The strengths in lbs. per sq. in. were as follows:

	1 mo.	3 mos.	6 mos.	12 mos.
Slag concrete.....	2465	3496	3567	4187
Trap-rock concrete.....	1975	2961	3053	3537
% increase in strength.....	24.8	18.0	16.9	18.4

A. A. KLEIN.

Construction methods tested in Du Pont concrete road. C. UPHAM. *Eng. Record* 73, 280(1916).—Experiments to det. most suitable methods and materials to use in preventing transverse cracks by means of steel reinforcement or by the addition of hydrated lime. No standard slab length was adopted, joints being placed only when the mixer stopped for more than 15 min. The max. slab length is 460 ft. The pavement is 14 ft. 7 in. wide and 5 in. thick at the sides on a flat subgrade. Three types of reinforcing were used and up to 10% of hydrated lime. With one exception it appears that as the % reinforcement increases the transverse cracks become fewer. On one section where no lime was used the longest reinforced slab that has not developed a crack is 191 ft. When 10% hydrated lime (by vol.) was used, the longest slab to develop no crack was 210 ft. A slab with no reinforcement or lime developed 2 cracks, breaking the slab into 3 sections 299, 118, and 126 ft. long. In 2 slabs where 10% lime was used, no cracks developed, the length of these slabs being 336 and 210 ft. On another section the longest slab without lime showing no cracks was 187 ft.; with 5% lime 245 ft.; and with 10% lime 294 ft. While the data are not sufficient to warrant definite conclusions, they do indicate the advantage of the use of lime.

A. A. KLEIN.

Beach shells as concrete aggregate. A. M. SMITH. *Concrete* 8, 137(1916).—Compression tests were made on 1:1.6:2:6 concrete, using clean, fresh shells that would pass through a 1 in. mesh for coarse aggregates and both white surface and yellow sub-sand for fine aggregate. Crushing-strength tests on 4.78 in. cubes gave results varying from 1,100 to 1,320 lbs. per sq. in.

A. A. KLEIN.

Does alkali disintegrate concrete? ANON. *Eng. Record* 73, 316(1916).—Preliminary conclusions of the disintegrating effect of alkali waters and soils on concrete by the U. S. Reclamation Service engineers are as follows: The principal salts causing disintegration are sulfates, $MgSO_4$ and Na_2SO_4 . The former is thought to be more active. Leaner mixts. of concrete are more easily disintegrated than the richer; more scientifically proportioned mixts. give better results. Alkali-proof cements have not behaved any better than straight portland cement, nor have sand cements.

A. A. KLEIN.

Tests on road materials. R. G. BATSON. *Report National Physical Lab.* 1914-5, 104-13.—Report on tests to det. relative capacity of road stones to resist attrition and impact.

A. A. KLEIN.

Mortar bed for wood blocks. C. H. TRESDALE, H. S. LOUD AND F. CHERRINGTON. *Eng. Record* 73, 154(1916).—Committee of Am. Wood Preservers' Assoc. recommends a 1:4 mortar with just enough H_2O for proper setting as a bed for wood block paving instead of a sand cushion. This bed should be $\frac{1}{2}$ to 1 in. thick.

A. A. KLEIN.

The preservation of wood. G. DE LA PRAILLE. *Rev. gén. chim.* 19, 1-16(1916).—The article is a review and discussion of the methods used in preserving woods. More is to follow.

L. H. CHERNOFF.

Oil specification for creosoted wood block. HERMANN VON SCHRENK. St. Louis. *Proc. Am. Soc. Municipal Improvements* 1915, 178-209.—The preservative for wood paving blocks should be a pure coal-tar compd., but may be either straight creosote or a creosote-tar mixt. Watergas-tar products are considered unsatisfactory. Exceedingly strict specifications are not justified, for excellent results have been obtained with a wide variety of coal-tar oils. The method of treatment is more important than the properties of the oil. It is impossible to get thorough penetration in every block but it is necessary thoroughly to penetrate the sapwood and get as good penetration as possible in the heartwood. Data are given on the conditions found in a number of wood-block pavements, and the character of the oil used.

Geo. M. HUNT.

Some experiences in creosoted wood-block paving. ELLIS R. DUTTON. Minneapolis. *Proc. Am. Soc. Municipal Improvements* 1915, 167-77.—Creosote-tar mixts are satisfactory for wood-block treatment. Sixteen lbs. per cu. ft. is about the right absorption. Southern yellow pine is the best wood for the purpose. G. M. H.

Wood-block pavements with reference to economic and efficient wood preservatives. W. J. HOWARD. New York. *Proc. Am. Soc. Municipal Improvements* 1915, 238-44.—Preservative for wood block should be a straight distillate, containing no added tar or pitch. It should contain at least 10% naphthalene and 15% anthracene oil. Other requirements are suggested. GEO. M. HUNT.

Report of Sub-Committee on Wood-Block Paving Specifications. *Proc. Am. Soc. Municipal Improvements* 1915, 456-70.—A specification proposed by three members of the committee, covering timber, preservative, methods of analysis, and methods of laying the blocks is given, and four other specifications for preservative, suggested by others than committee members. GEO. M. HUNT.

The proper oil for treating creosoted wood blocks for paving. P. C. REILLY. Republic Creosoting Co., Indianapolis. *Proc. Am. Soc. Municipal Improvements* 1915, 210-37.—The addition of coal tar to creosote is an adulteration; tar-creosote mixts. are not suitable for the treatment of paving blocks. After discussing the faults of a number of oil specifications and the qualities of a variety of oils, R. proposes the following specification for improved creosote oil: It shall consist wholly of a distillate from coal tar, d_{40} not less than 1.12 nor more than 1.14; distillate up to 250° not over 1%, to 315° not over 15%, to 355° not over 40%; residue above 355° must be soft and waxy at 25° and have a d_{40} not less than 1.17; a drop heated on white filter paper shall be of yellowish amber color by transmitted light; 25 g. of the oil in an open vessel 2.5 in. diam., 0.75 in. deep, kept at 49° shall not evap. more than 5% in 72 hours; d_{40} of the fraction 400 to 420° not less than 1.12; neither of the fractions 315° to 380° and 380° to 420° shall show a sulfonation residue of over 2%. GEO. M. HUNT.

New penetration needle for testing bituminous materials (REKKE) 22.

Asphalt mixture for making pavements. R. WALLBAUM. U. S., 1,176,006, Mar. 21. A dust-like filler such as limestone is moistened and mixed with an aq. emulsion of asphalt and dried while constantly stirred. The product is then heated and compressed.

Plastic compositions. H. J. GUISE and W. G. PERRY. Brit., 23,345, Dec. 1. 1914. A MgO cement compn. is made by mixing together preferably 55 parts of burnt magnesite, 15 parts of burnt and ground China clay, 15 parts of quartz, 10 parts of asbestos, and 5 parts of wood meal, the dry powder being mixed first with $MgCl_2$ soln. of 16-36° Bé., and then with paraffin oil. One gal. of $MgCl_2$ is used to one pint of paraffin oil. The cement may be colored by adding aniline or other sol. dye to the H_2O . Compns. containing cork, powdered glass, slag, crushed sea-shells, and SiC may be made by adding these materials respectively to the dry mix. Before molding, the molds may be coated with a mixt. of 1 lb. of Russian tallow and 1 qt. of paraffin oil to prevent adhesion; or when using the compn. as an adhesive cement, the surface to be joined may be coated with a liquid consisting of 1 part each of $CaSO_4$ and calcined borax, 6 parts of kieselguhr, 12 parts of calcined magnesite, and 50 parts of $MgCl_2$ soln. of 25° Bé. The compn. may be employed for paving floors, decks, etc., for switch boards, partitions, elec. insulators, slabs, table tops, etc., and for assembling porcelain insulators with metal parts, also for uniting porcelain, stone, metals, wood, glass, and leather.

Artificial stone. J. SKLAREK. Aust., 70,775, Dec. 27, 1915. The initial material,

peat cut during the wet season, is allowed to freeze with its natural H_2O content, and then, after complete drying, it is mixed with the inorganic binders.

Seasoning timber. J. J. OWEN. Brit., 23,411, Dec. 2, 1914. In a process of seasoning timber in closed chambers by subjecting it to the action of distillates or gaseous products of wood or other vegetable matter, coal, coke, etc., the steam is conducted to a chamber containing the timber, by a pipe which may pass through a stove to superheat the steam, which, after enveloping the timber, escapes by suitable pipes. The timber is then dried by steam-heated pipes, and afterwards submitted to the action of the distillates or gaseous products, which are produced in the stove and led to the chamber by a pipe, and after enveloping the timber escape by other pipes.

21. FUELS, GAS, TAR AND COKE.

J. D. PENNOCK.

The application of surface combustion. J. H. LEDERBOER. *Proc. Australasian Inst. Mining Eng.* 1915, 39-58.—A review of Bone's work with drawings of boiler furnace settings.

H. L. OLIN.

Graphic studies of ultimate analyses of coals. OLIVER C. RALSTON. *Bur. Mines, Tech. Paper* 93, 37 pp. (1915).—R. plots the results of 10,000 ultimate analyses of coals of different types, calcd. to moisture, ash-, N-, and S-free basis, by a system of tri-linear coördinates so that $C + H + O = 100\%$. On this ternary diagram fuels classified as anthracite, semianthracite, semibituminous, bituminous and sub-bituminous coal and lignite and peat fall into definite fields that overlap to only a small extent making a narrow band across the diagram with only one distinct bend. The relationship between calorific value and the ultimate analysis is shown by isocalorific lines which are parallel to each other, are almost straight, and cut the band diagonally. Similarly, isovolatil lines run diagonally across the dot curve but make an angle of about 45° with the others. Moisture detns. made with varying humidity of the drying air are inaccurate, and curves of equal moisture content plotted from available data, are of little value. Many coals high in S are also high in H and volatile matter but no rule can be formulated without further investigation.

H. L. OLIN.

Determination of toluene, application of method to benzene and xylene. H. W. JAMES. *J. Soc. Chem. Ind.* 35, 236-40 (1916); *J. Gas Lighting* 133, 531-3 (1916).—The method consists of dividing the total distillate into 2 parts, Part I being a mixt. of C_6H_6 and $C_6H_5CH_3$, and Part II a mixt. of $C_6H_5CH_3$ and xylenes. These parts in turn are very accurately fractionated under carefully regulated conditions. The sample, distg. up to 140° , is sepd. into 6 distillates, each of a few degrees range. The 4 intermediate portions are redistd. up to 110.6° and the fractions brought together in the first and last receivers, these boiling, resp., below and above 110.6° . Fraction I is now further distd. and the distillate measured at frequent specified intervals. The percentage distillate at these temps. is calcd., and comparison with tables shows the $C_6H_5CH_3$ content. Fraction II is treated similarly, and the % $C_6H_5CH_3$ added to that found in Fraction I, is the total in the sample. A correction for paraffin hydrocarbons may be made by taking the sp. gr. of Fraction II and allowing 1% for every 0.002 variation from 0.867 at 15.5° . For naphthas containing not less than 30% $C_6H_5CH_3$, the error in this method is less than 1%. For low $C_6H_5CH_3$ samples about 40% of pure $C_6H_5CH_3$ may be added and corrected for in the calcn. Detailed instructions for carrying out the method when starting with a tar sample, and also its application to the detn. of C_6H_6 and xylene are given.

R. H. SAWENS.

Estimation of benzole in coal gas, ANON. *J. Gas Lighting* 133, 460.—A review of French methods.

R. H. SAWENS.

Naphthalene. H. SIMMONDS. *Gas World* 64, 220-1(1916); *J. Gas Lighting* 133, 470-4(1916).—Of various means tried for preventing stoppage by naphthalene, the most successful method used was by atomizing a light naphtha (sp. gr. 0.770 with compressed air, at a pressure of 25 lbs. per sq. in. into the 24 in. main at outlet of governors, the oil and air passing through $\frac{1}{4}$ in. supply pipes, the oil being regulated by means of a spindle and dial and the air by the size of the hole in the spray nozzle. It was regulated to deliver 200 cu. ft. of air and 1 gal. of oil for an hr. There was no appreciable difference in illuminating power, but a slight increase in calorific value. Total cost was equal to 0.51 d. per ton coal carbonized or 0.042 d. per 1000 cu. ft. of gas. The amt. of oil atomized equals 0.176 gal. per ton of coal carbonized. Drawing and photograph of atomizer are shown. M. L. TROWBRIDGE.

Estimation of benzole in lighting gas. ANON. *Gas World* 64, 224(1916).—A method consisting of the use of freezing mixts. in Dewar vacuum flasks by passing 25-30 l. of gas through the refrigerating tube at the rate of 10 l. per hr. M. L. T.

Burning and distilling water-gas tar. C. OTTEN, JR. *Am. Gas Light J.* 104, 149-51(1916).—O. describes the plant at Haverhill, and gives the results recorded.

M. L. TROWBRIDGE.

Carbonization of pitch. T. DUXBURY. *J. Gas Lighting* 133, 482-3(1916).—Under similar conditions ordinary coals, and coals with the addition of 5 and 10% of pitch were carbonized. Best results were obtained by using 5% pitch. In carbonizing this mixt. for each ton of coal there was an increase of 310 cu. ft. of gas, 75 lbs. of coke and 3.5 gals. of tar. The calorific value of the gas was increased from 581 to 594 B. t. u. and the c. p. from 16.20 to 16.73. The coke was improved, the heats being increased. With pitch the results were similar. Analyses of the tars showed increases in $C_{10}H_8$, $C_6H_5CH_3$, and pitch, while the moisture was somewhat lower in samples resulting from the coal and pitch carbonization. R. H. SAWENS.

Use of niter cake in manufacture of sulfate of ammonia. G. S. COOPER. *Chem. Trade J.* 58, 235(1916); *J. Gas Lighting* 133, 523-4(1916).—The article is largely a reprint of the Eng. Govt. recommendation to use niter cake in place of H_2SO_4 . A solu. of equal parts by wt. of H_2O and niter cake is mixed with chamber H_2SO_4 in the ratio of 2 to 3, and heated to about 200° F. The acidity is maintained at about 6% by frequent titrations. The first crop is largely Na_2SO_4 but a salt of the right compn. is soon obtained by maintaining proper conditions in the bath. In a cool bath Na_2SO_4 seps. Nitrates in the cake are to be avoided. The salt yields 18 to 20% NH_3 on a wet basis. On a dry basis the av. analysis is: $(NH_4)_2SO_4$ 83.2, Na_2SO_4 15.4, free acid 1.4%. The process saves from 15 to 25% H_2SO_4 . R. H. SAWENS.

"T. R. Sprayoil" apparatus for prevention of naphthalene troubles. W. THOMSON, R. H. RUTHVEN AND W. J. CARPENTER. *J. Gas Lighting* 133, 139(1916); *Gas World* 64, 51-2(1916).—A solvent oil is atomized by pressure into the mains and the lighter portion carried along with the gas. The remainder returns to the receiver and again goes through the spraying app. taking up in all about 4% $C_{10}H_8$. Deposits already in the mains may be cleared out by blowing some of the unsatd. residual oil through the mains or introducing it at high points. R. H. SAWENS.

Gas mantle metals. I. Cerium. J. SCOTT. *J. Gas Lighting* 133, 79-80(1916).—Metallic Ce and the theory of its use in the Welsbach mantle are described. S. studied the metal and its salts under the microscope. First he noted that when scratched with a knife it very readily gave off white-hot globular particles which burst after leaving the original piece of metal. The latter oxidizes very readily when exposed to the air into exceptionally fine flour-like particles which have the same incandescent property as the metal. The formation of salts with mineral acids showed the nitrate to be amorphous or semi-crystalline and very deliquescent. The sulfate first found was a

fine crystalline powder developing later into bold rhombic crystals. With HCl a film developed into polygonal pattern with resetted figuring in the meshes, the crusted portion being opaque and perforated. These eventually deliquesced to a mass of boat-shaped, scaly and notched flakes in peculiar arrangement. R. H. SAWENS.

War problems in coking industry. G. S. COOPER. *J. Gas Lighting* 133, 475-9 (1916).—The following problems are discussed: (1) elimination of As from H_2SO_4 by means of pptn. with H_2S from the NH_3 stills, (2) substitution of niter cake for H_2SO_4 in the production of $(\text{NH}_4)_2\text{SO}_4$, (3) various problems in preparing NH_3 products for the market, (4) disposal of pitch, (5) benzole recovery. R. H. SAWENS.

New penetration needle for testing bituminous materials (REEVE) 22.

Fuel. N. SULZBERGER. U. S., 1,174,199, Mar. 7. Finely divided coal is mixed with spent fuller's earth which has been used in treating oils or fats and the mixt. is molded into briquets.

Fuel for internal-combustion engines. R. WOOD. Fr., 278,070, Mar. 17, 1915. The product consists of a mixt. of alc. and ether in proportions varying between 70-30° by wt. of alc., and 30-70° by wt. of ether, preferably in equal parts by wt. NH_3 may be added in small amt. E. g., 95% alc., 54.3% by wt., ether 45% by wt., NH_3 0.5% by wt., and As 0.2% by wt.

Oxy-acetylene and like lamps. G. F. JAUBERT. Brit., 23,443, Dec. 2, 1914. A rare earth compd. for incandescent lighting by means of an oxy-acetylene or like burner contains a small proportion of an alk. polysilicate, such as ground glass, acting as a flux, so that the surface exposed to the flame hardens quickly and may be regenerated by the application of a little of the compd. in a dry or slightly moist condition. The compd. may consist of ThO_2 92 parts, CeO_2 2 parts, MgO 2 parts, CaO 1 part, and ground glass 3 parts, and may be used in a receptacle for carborundum, alundum, etc., with a circular groove near the mouth.

Surface combustion. A. ADAM. Fr., 477,958, July 9, 1914. The mixt. of the combustible gas and the gas supporting combustion is prevented until these gases have passed into the porous diaphragm.

Apparatus for carbonizing peat. O. A. FORD and J. C. LONG. U. S., 1,175,944, Mar. 21. The peat is passed through a long drum in which it is heated by hot gases and after drying is ground out of contact with the air.

Gas producer. G. M. S. TAIT. U. S., 1,175,191, Mar. 14.

Gas producer. B. VERSEN. U. S., 1,175,844-5, Mar. 14. Cf. C. A. 9, 2585.

Gas producer. J. O. CARREY. U. S., 1,176,429, Mar. 21.

Coal-gas apparatus. C. S. CHRISMAN. U. S., 1,176,432, Mar. 21. Vertical coal-gas retorts are heated from an adjacent gas producer and combustion chamber fed with coke from one of the retorts. The gas pressure at the base of this retort is adjusted so that producer gas is excluded from the retort when the coke is passed to the producer and coke is withdrawn from the bottom of the other retorts not communicating with the producer.

Retorts for making coal gas. H. A. CARPENTER. U. S., 1,174,390, Mar. 7.

Retort for the distillation, carbonization, and like heat treatment of coal. C. W. TOZER. Fr., 278,040, Mar. 15, 1915. The retort comprizes a series of chambers arranged around a central axis, all these chambers being of practically the same size, as specified in Brit., 20,158, Sep. 3, 1909. The particular construction permits of the

ter than with metallic, cryst. Ag or Ag containing Cu. Good white color was obtained at cone 022, higher temps. giving slight to deep yellow color. R. K. HURSH.

The future of melting pots. (Optical glass.) ANON. *Brit. Clayworker* 24; *The Brickbuilder* 1916, 46.—Years or generations of aging are required for best results. Careful building required 4 months and drying 4 to 8 months. Heating up the pots is accomplished by wrapping with straw and smoking, followed by gradual heating to redness in 5 days. Invisible cracks from too rapid heating may ruin the pot. The manuf. of optical glass is not in itself remunerative. The famous Jena thermometer glass is sold at an actual loss. Optical glass making should be combined with instrument making to distribute the cost. The real problem is pot manuf. Impurities, especially iron compds., dissolve into the glass. Probably materials other than clays must be used, i. e., MgO, silundum, SiC, W, Mo, etc. C. H. KERR.

The use of ceramic raw materials and compounding fine ceramic bodies on the basis of the chemical analysis. JOS. DORFNER. *Sprechsaal* 48, Nos. 24-50 inclusive (1915).—Numerous references are made to literature on the constitution of clays and the rational analysis. D. concludes the rational analysis is inadequate since it does not show the true constitution of clays and bodies, does not give evidence of their refractoriness and does not permit a satisfactory calcn. of the Seger formula. The chem. analysis shows completely the compn. of the body and indicates its pyrometric behavior especially when expressed by means of the Seger formula, from which may be noted the compn. of the flux radical, the ratio of bases to acids and the ratio of refractory to fusible constituents. The limits of compn. in the mol. formula are given for various types of ware. The ratio, base:acid = 1:(1-2) normally. As the acid approaches the lower limit the fire resistance increases, the more it exceeds the upper limit the greater is the tendency to deform and fuse. In the R'O high K₂O gives low, and high CaO, high maturing temp. Bodies low in K₂O are more plastic with similar materials. High CaO makes a tender faience or stoneware body; high K₂O gives a strong body. The higher the CaO in the body the less the crazing of the glaze on stoneware. The less plastic the clay, the whiter the color of the burned ware and the greater the translucency at maturity. R. K. HURSH.

Crystal glazes. C. KABUS. *Keram. Rundschau* 23, 139-40, 165-6, 178-9, 183-4 (1915).—A crystallizing substance is fritted and added in small fragments to a glaze. On burning, these form crystals in the glassy eutectic. A long period at high temp. is desirable. Zn silicates require slow cooling for crystn. TiO₂ requires quick cooling to prevent soln. of the crystals. Addition of NH₄VO₃, TiO₂, MO₃ or WO₃ to the glaze promotes crystn. Formulas for flow glazes and ground glazes are given for several temps. R. K. HURSH.

The subdivision of whiteware glazes into fritted and raw portions and their relation to glaze defects. H. HARKORT. *Keram. Rundschau* 23, 273-5, 285-6, 297-8, 317-8 (1915); see C. A. 10, 260. R. K. HURSH.

Influence of fine grinding on bodies and glazes. C. TOSTMAN AND W. PUKALL. *Keram. Rundschau* 23, 145-6, 153-5 (1915).—Discussion of former article by P. (C. A. 9, 3341). T. states that fineness of 9200 mesh sieve is too great for ceramic bodies and glazes. R. K. HURSH.

A new opacifier for white iron enamels. ANON. *Keram. Rundschau* 23, 221-2 (1915).—Spinel made by heating together MgO and Al₂O₃ or ZnO and Al₂O₃ may be used. By using 5% of these and 0.5% of a stronger opacifier instead of 10% spinel the opacity is improved. R. K. HURSH.

Refractory products without clay. E. PODZUS. *Ceramique* 18, 178-80 (1915).—ThO₂, ZrO₂, Al₂O₃, quartz and MgO can be made into a paste by fine grinding and mix-

ing with an appropriate agglomerant, as gelatin, gum tragacanth, albumin, lacquer, varnish or collodion. For pure burnt material some easily dissociating salt of the same element which forms the base can be used, as Th acetate for ThO_2 . Continuous evapn. with a salt of the base renders the base colloidal and it can then be worked as a clay.

J. C. EVANS.

Classified fusible cones of French manufacture. L. LEFEVRE. *Ceramique* 18, 177-8(1915).—L. gives a table showing the melting points of the cones manufactured by Guérineau and Co. with the corresponding German cones.

J. C. EVANS.

Working of clay by the dry way. AXON. *Ceramique* 19, 3-4 1916.—By Tuschhof's process an extremely fine powder is obtained by grinding the clay in a ball mill and separating by an air separator. This is mixed with a light addition of water, oil or other liquid and converted into clods, triturated and sieved to the required degree. This grainy mass can then be compressed.

J. C. EVANS.

Colloidal clay. P. ROHLAND. Stuttgart. *Kolloid-Z.* 17, 145-6 1915.—Polymical

H. I. MATTILL.

Laboratory porcelain—The requirements of the chemists. AXON. *Ceramique* 18, 130-1(1915).

J. C. EVANS.

Photography on porcelain or on glass. AXON. *Ceramique* 19, 4-5 1915.—M. I. Besse and E. P. Rouanet's processes are described.

J. C. EVANS.

Screen for excluding intense light. A. H. PFUND. U. S., 1,176,313, Mar. 21. A thin film of Au, Cu, Pt, W or Ni interposed between layers of clear and colored glass is used to protect the eyes from ultraviolet light and other intense rays.

Burning ceramic ware. H. L. DOHERTY. U. S., 1,175,246-7, Mar. 14. A shaft-kiln structure and method of firing are specified.

Transfer for printing on pottery, etc. S. LEICESTER. U. S., 1,175,770, Mar. 14. A photographic positive of the desired design is formed on glass or a transparent film, a print is made from the positive on sensitized C tissue, fixed on a cylinder or plate of burnished Cu or other metal and after developing the tissue the metal is etched to form an intaglio for printing. The printing is executed in relief on paper coated with dextrin or gum in an ink containing mineral color for transfer to pottery or other materials.

Treating mica. P. G. PALMER and J. J. ROBINSON. Brit., 23,067, Nov. 25, 1914. Sheet mica has applied to it on one or both sides a compn. which, when heated to about 2000° F., forms a vitreous glaze. Any suitable pottery glaze or flux may be used. If in the form of a powder, the substance may be mixed with oil or turpentine, or both, and then applied to the mica. Suitable coloring matter also may be added. The coated sheet mica is applicable for making lantern slides, photographic proofs, plates, or prints, covers for watches and lamps, windows, etc.

20. CEMENT AND OTHER BUILDING MATERIALS.

C. N. WILEY.

Oil and Portland cement. SCHUMANN. *Concrete* 8, 21 1916.—The strength of cement was lowered to about the same extent by the action of petroleum, mineral oil and rape oil, where the cement was hardened a sufficient time either in H_2O or alternately in air and H_2O . The denser the mortar or concrete the better its ability to withstand the action of oils. Rape oil proved to have the most deleterious effect on mortars and concretes. By using a 1:1 mortar, carefully fabricated and hardened

Temp.	Pressure.	Feed (gal. per hr.).	% oil recovered.	C ₆ H ₆ and C ₇ H ₈ (in recovered oil).	
600°	250 lbs. per sq. in.	22	35	8.6	5.7
650		22	31	10.3	9.0
700		22	26	16.1	10.0
750		22	21	25.7	9.5
800		22	17	6.5	5.3
650		18	27	8.5	8.9
650		28	25	13.6	12.4
700		11	21	18.7	13.6
700		14	25	23.2	12.0
700		18	22	20.0	12.7
700		24	25	10.8	10.0
700		27	29	5.2	7.5

Multiplying the % of C₆H₆ and C₇H₈ in the recovered oil by the % of recovered oil, the % of C₆H₆ and C₇H₈ in the original oil is obtained. In obtaining the results given in the following table a distillate oil was used, the same tube being employed:

Temp.	Pressure (lbs. per sq. in.).	Feed (gal. per hr.).	% oil recovered.	C ₆ H ₆ and C ₇ H ₈ (in recovered oil).	
600°	150	14	36.3	7.0	10.8
625	175	14	30.0	14.3	13.9
700	200	14	20.0	23.6	13.0
650	200	15	24.0	20.4	16.4
625	200	14	30.0	14.7	15.3
600	200	14	30.0	8.0	11.4
550	200	14	55.0	0.0	4.2
700	250	15	22.5	22.4	12.9
650	250	15	23.5	20.2	15.7
600	250	15	31.2	9.1	12.8

When the dimensions of the tube were made 8 in. in diam. and 14 ft. long and the pressure was kept constant at 250 lbs. the results were:

Temp.	Feed (gal. per hr.).	% oil recovered.	C ₆ H ₆ and C ₇ H ₈ (in recovered oil).	
625°	32	25	20.23	12.57
650	24	14	31.17	15.51
650	31	23.2	18.45	13.17
675	29	16	27.47	12.88
775	33	40	4.84	6.37
800	30	16.5	18.30	21.95
800	35	25.5	13.44	10.10
825	23	17	26.00	10.10
825	38	28.5	11.60	8.00
850	21	18	20.20	8.04
850	36	20	16.20	10.30
875	33	25	10.90	10.40

The av. results were less favorable than in the 10 ft. tube with same diam. The longer exposure to heat caused by the 4 ft. increase in length seems to have caused the condensation of the low-boiling aromatics into hydrocarbons of great mol. wt., as well as an increase in the formation of gases and carbon. In a tube 8 in. in diam. and 7 ft. long, the % recovery of oil was higher for the same temps., pressures, and rates of feed than with either the 8-in. by 10-ft. or the 8-in. by 14-ft. tubes. The yields of C₆H₆ and C₇H₈

were, however, less, indicating that the 7-ft. tube was too short for commercial purposes. It was finally decided that for a tube 8 in. in diam. a length of 10 ft. was the most efficient. The increase in the diam. of the reaction tubes gave consistently better results. In the latest benzene-toluene plant, tubes of 10³/₄ in. internal diam. are being successfully employed. With the increased diams., rates of feed exceeding 60 gals. per hr. have been readily obtained with satisfactory yields of aromatics. A series of six furnaces containing 10 tubes each was constructed, the individual tubes being 8 in. in diam. and 14 ft. in length. Some of the results obtained in the operation of these furnaces are tabulated below:

Temp.	Pressure (lbs. per sq. in.).	Feed (gal. per hr.).	% oil recovered.	C ₆ H ₆ and C ₇ H ₈ (in recovered oil).	
Varied from 600 to 800°.	100	18	38	7.9	5.3
	175	26	37	10.8	8.9
	250	30 (200 gal. used)	33	15.1	7.6
	250	30 (580 gal. used)	30	20.0	7.7
	250	30 (1,070 gal. used)	27	25.2	8.9
	250	30 (1,529 gal. used)	26	24.2	8.8

The % of C formation was large due to the semi-asphaltic nature of the Oklahoma crude oil. A distillate from Pennsylvania crude, boiling between 250 and 400° was used in the later tests. It was found desirable to remove the gasoline fraction, and residuum before putting any crude oil through the cracking process. At first 1 to 1¹/₂ lbs. of C per gal. of oil was formed, when the crude oil was employed. When the distillate was used, ¹/₄ to ¹/₂ lb. C per gal. was obtained. This amt. had been reduced to ¹/₁₀ lb. per gal. In order to reduce the mechanical difficulties with regard to the long stirring rods, 10 tube furnaces were built, in which the individual tubes were 8 in. in diam. and 11¹/₂ ft. long. In these expts. the rate of feed and pressure were materially reduced. The results were as follows:

Temp.	Pressure.	Feed (gal. used).	% oil recovered.	C ₆ H ₆ and C ₇ H ₈ (in recovered oil).	
600 to 800°.	150 lbs. per sq. in.	242	29.2	11.7	11.7
		590	28.0	12.1	13.9
		1,130	28.0	12.5	13.6
		1,878	25.6	11.9	13.9
		2,753	34.5	9.7	11.2

The percentages of C₆H₆ and C₇H₈ are not the max. ones, since they are based on the amt. of aromatic hydrocarbons in the distn. fraction up to 175°. The residue from the 175° cut is suitable for re-running through the furnace. At least twice the amt. of C₆H₆ and C₇H₈ would be obtained if this residual oil were put through the cracking process again. No recovery of the aromatics carried mechanically in the uncondensed gases was made. It was demonstrated that the single-tube furnace was much superior to the 10-tube furnace, because of a greater uniformity of heating conditions. The mechanical equipment as finally decided upon at the Aetna Explosives Co.'s plant consisted of a series of 10 cracking tubes, 8 in. by 11¹/₂ ft. long, fitted at the upper end with feed line for each furnace, and at the lower end with a C pot and vapor line. A stirring rod fitted with chains spirally arranged served to keep the walls of the tube free from C. The C deposit falls through the tar neck into the C pot. The vapors pass through the vapor line into the condensers, and the condensate is collected in a primary and secondary separator. The condensations were not very efficient, this accounting for the low yields of aromatics. A gas scrubber and a condensing area of 3 ft. per 1000 cu. ft. of gas are recommended. The gas scrubber may be similar to the benzene scrubbing towers

in by-product coke oven plants. The tubes are heated by gas burners, the consumption per tube being 300 cu. ft. per hr. The number of gas burners for each furnace was 22. The expts. indicated that the vapor-phase cracking process is not limited to a particular kind of oil. Certain oils formed by the destructive distn. of coal were converted readily to C_4H_8 and C_7H_8 . The production of gasoline by this process was tested in a 6-in. by 9-ft. tube, and in an 8-in. by 10-ft. tube. The oil used was a distillate boiling between 250° and 350° . The temps. in the furnace ranged from 550° to 650° , the pressure was const. at 250 lbs. per sq. in., and the rates of feed ranged from 13 to 26 gals. per hr. The results in the 6-in. by 9-ft. tube are tabulated below.

Temp.	Pressure.	Feed.	% oil recovered.	% gasoline in recovered oil.
550°	250 lbs. per sq. in.	17	54	35
550		26	92	14
600		17	79	36
600		23	78	25
625		22	76	27
650	250 lbs. per sq. in.	19	69	31
650		21	79	24
650		25	86	20

The sp. gr. of the recovered oil varied from 0.800 to 0.828. The sp. gr. of the gasoline in the recovered oil ranged from 0.772 to 0.723. Both the % of recovered oil and the % of gasoline are low due to inefficient condensation. The tests with 8-in. by 10-ft. tube showed an av. % of gasoline of 18.8, as against 19.5 in the smaller tube. In comparison with the benzene-toluene process, the gasoline process is simple in character. The order of hydrocarbon reactions described below is substantiated as a result of many tests. [Heavy petroleum hydrocarbons $\rightleftharpoons$ light petroleum hydrocarbons (satd. and unsatd.)] $\rightleftharpoons$ cymene, etc. $\rightleftharpoons$ xylene $\rightleftharpoons$ toluene $\rightleftharpoons$ benzene $\rightleftharpoons$ naphthalene, diphenyl, etc. $\rightleftharpoons$ anthracene, etc. $\rightleftharpoons$ carbon and gas. The duration of the gasoline reaction is less than half that required for the C_6H_6 and C_7H_8 reaction; hence the capacity is more than doubled. The results indicate the success of both the gasoline and the C_6H_6 - C_7H_8 processes. A bibliography of 364 references with a brief abstract in each case is appended (compiled by M. S. Howard). O. E. BRANSKY.

Petroleum and the war. A. GUTSELIN. *Mat. grasses* 9, 4451-54(1916).—G. considers the situation in Rumania, Galicia, and Alsace, and gives statistics.

E. J. KELLEY.

New penetration needle for testing bituminous materials. C. S. REEVE AND F. B. PRITCHARD. U. S. Dept. Agric. *J. Agr. Res.* 5, 1121-6(1916).—It is pointed out that there is no definite standard for penetration needles. No. 2 needles manufd. by R. J. Roberts are recommended by the Amer. Soc. for Testing Materials but these vary considerably and have to be selected. A needle is designed for standard so that it can be easily duplicated. It is made from 2 in. length of 0.041 in. annealed steel drill rod by placing the rod in a lathe and with a fine file turning the end to a point with $\frac{1}{4}$ in. taper, then tempering, grinding to fine point and polishing. The finished needle must be perfectly smooth, have a straight taper $\frac{1}{4}$ in. long and be exactly 0.04 in. above the taper.

R. O. E. D.

The chemistry of pine oil. M. FOSCH. *Mat. grasses* 8, 4355-8(1915).—F. gives a description of the methods of extn. and the properties of the oil. E. J. KELLEY.

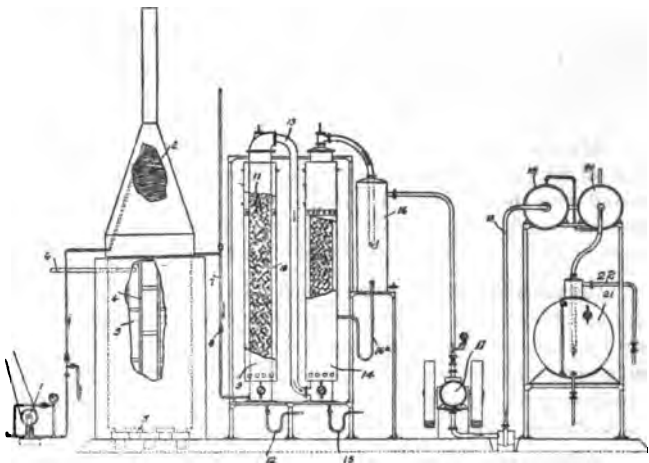
Acetic anhydride. J. T. HEWITT AND C. H. LUMSDEN. *J. Soc. Chem. Ind.* 35, 210-3(1916).—A comparison of various methods of manuf. of Ac_2O . The authors conclude that the use of the chlorides of P or S with $AcONa$ is the most suitable method.

Attempts at forming Al_2O_3 by decompn. of Fe and Al acetates by means of heat were unsuccessful. H. W. DAUDT.

Lubricants for metals (BLAIR) 9.

Cracking heavy hydrocarbons. W. A. HALL. U. S., 1,175,909, Mar. 14. See Brit., 17,121 (C. A. 9, 375).

Cracking hydrocarbon oils. W. A. HALL. U. S., 1,175,910, Mar. 14. Crude petroleum oil or a distillate heavier than gasoline is fed by a pump 1 through a coil 2 of 1-1.5 in. pipe in the furnace 3 and coils 4 heated to $540-600^\circ$ by burners 5. Cracked vapors and gases produced are led through the pipe 7 through a valve 8 (which is regulated to maintain about 75 lbs. pressure per sq. in. in the coil 4) to a dephlegmator 9 (filled with short pieces of pipe) in which the temp. and pressure are allowed to fall to 325° and 10 lbs., resp., where C separates. Heavy oil deposited is drawn off at 12. Uncondensed products are passed to the second dephlegmator 14 which has a temp. of about 180° and the condensate there sep'd. is used in a subsequent run in the coil 4. Gases and vapors passing through the separator 16 are compressed to 100-125 lbs. in the compressor 17 which effects an endothermic reaction between the constituents of the mixt. and on passing the products of this reaction through coolers 19 and 20 a yellowish light distillate collects in the tank 21. When this is mixed with fullers' earth and distd. or clarified with H_2SO_4 a water-white petroleum spirit is obtained, which is suitable for use in automobile engines.



Apparatus for distilling hydrocarbons from absorbing oils. F. PÜNING. U. S. 1,176,094, Mar. 21. The app. is arranged for continuous distn. of light hydrocarbons such as C_4H_{10} from heavier absorbing oil and is arranged so that different portions of the distg. system may be cut out for repairs without discontinuing the distn.

Removing coke deposits from oil stills. L. MOONEY. U. S., 1,174,888, Mar. 7. A chain is placed in the bottom of the still and raised to break up any cokey deposits that form above it.

Apparatus for making gas from liquid hydrocarbons. W. C. DAYTON. U. S. 1,174,970, Mar. 14.

Making gas from oil. The app. is arranged for continuous distn. of light hydrocarbons such as C_4H_{10} from heavier absorbing oil and is arranged so that different portions of the distg. system may be cut out for repairs without discontinuing the distn.

W. C. DAYTON. U. S., 1,174,971, Mar. 14. Air and oil regulates their relative amts. and pressures and subjected

STANDARD OIL CO. FR., 477,829, Feb. 27, 1915. The object of the app. is to obtain a low-boiling product from petroleum or from the

residual liquids from the distn. of petroleum. The liquid under treatment is kept in forced and rapid circulation through coils of small diam. which are heated to a temp. which cracks the liquid, circulating between the supply tank and the coils. The resulting vapors are collected and condensed, being maintained at a pressure of 3-7 atm. and at a temp. of 340-450°.

Purifying unsaturated hydrocarbons. F. E. MATTHEWS and E. H. STRANGE. Fr., 477,983, Mar. 11, 1915. See Brit., 6,897 (C. A. 9, 2466).

Purifying mineral oils. A. M. MCAFEE. Brit., 22,922, Nov. 23, 1914. High-boiling mineral oils are purified and freed from unsatd. hydrocarbons by heating them with AlCl_3 or the like at high temps. until a portion has been converted into low-boiling hydrocarbons, which distil off. This residual oil may be distd. in the presence of alkali, and may be air-blown to dry it, and is treated with AlCl_3 at 150° F. for at least 24 hrs. The treated oil is cooled, sepd. from the chloride sludge, treated with H_2SO_4 , washed with H_2O and alkali, and filtered through fuller's earth. The chloride sludge may be used for the treatment of further quantities of oil until a granular coky mass is obtained. The oil after treatment with sludge is treated with fresh AlCl_3 . The process is particularly applicable to lubricating and medical oils. Cf. C. A. 9, 860.

Motor fuel. G. E. HEYL and T. T. BAKER. Brit., 23,014, Nov. 24, 1914. A fuel for internal-combustion engines consists of gasoline, paraffin oil, or other usual spirit mixed with the 170-230° distillate of coal or analogous tar, after this distillate has been freed from acids, bases, and naphthalene by alkali, acid, and cooling, and has been distd. once or twice to a temp. approaching 230°, so long as the distillate is light colored.

Combustible hydrocarbon gas. THE NATIONAL OIL-GAS BURNER CO. Fr., 477,970, Mar. 9, 1915. Volatile hydrocarbons are vaporized, and these vapors are mixed with steam at a temp. which must not be below the temp. of decompn. of steam in the presence of hydrocarbon vapors, and, before burning, mixing the gaseous mixt. thus produced with the non-volatile residue of the hydrocarbon and an amt. of air sufficient for complete combustion.

Aluminium chloride. A. M. MCAFEE. Brit., 22,923, Nov. 23, 1914. AlCl_3 is recovered from residues obtained in processes involving the treatment of petroleum or other oils or fats with AlCl_3 for any purpose, by removing the oil, carbonizing the remaining organic matter, and then treating the hot material with Cl, gaseous HCl , or other gas containing Cl, whereupon AlCl_3 volatilizes and is collected. The oil may be removed by extg. with a solvent such as gasoline, but is preferably removed by heating until the oil becomes sufficiently liquid to be drawn or sucked off. Any suitable app. may be employed, and the process may be effected continuously. Cf. C. A. 9, 2309.

Cracking and refining oils. A. M. MCAFEE. Brit., 22,924, Nov. 23, 1914. In heating mineral oils in the presence of AlCl_3 or Al and Cl for the production of gasoline, burning oils, and other low-boiling hydrocarbons, the operation is stopped while a substantial proportion of the oil, say 30-50%, remains in the still, and the reagent is sepd. from the cooled residual oil, which is found to be free from unsatd. hydrocarbons and asphaltic constituents. The crude oil is first distd. to remove the low-boiling hydrocarbons and H_2O , and is then heated in the presence of AlCl_3 at 470-600° F. The vapors are cooled to 350° F., and the heavier compds. thus condensed are returned to the still, the remaining vapors, consisting of gasoline, etc., being condensed separately. When the evolution of vapors slackens, i. e., after about 36-48 hrs., the residual oil is cooled and treated with H_2SO_4 or steam to remove the AlCl_3 , and is further purified, as by filtration through fuller's earth. The residual oils vary in nature with the crude oils under treatment, and may be worked up into lubricating oils, fuel oils, vaseline, and paraffin wax. Oils containing S and N are freed from these elements. Coky granules containing

the reagent are formed in the still, and may be treated for the recovery of the AlCl_3 by the method described in 22,923, 1914 (*supra*).

Alcohol-soluble asphalt-like products. CHEM. FABRIK FLÖRSHEIM DR. H. NOERDLINGER. Ger., 286,630, July 17, 1914. Wood tar or wood-tar oil is treated with concd. H_2SO_4 , the resulting H_2O -sol. substances are removed, and from the remaining residue the oily portions are removed if necessary, by treatment with steam or air or by extn. with solvents. *E. g.*, heavy wood-tar oil 100 kg. is stirred up slowly with 66° Bé. H_2SO_4 50 kg. and the mixt. is heated, with stirring, for 8–10 hrs. to 90–100°. The mass is then allowed to flow into H_2O , wherein it is boiled until color is no longer extd. The tarry residue is then freed in a suitable manner, if necessary, from the oily portions, by treating it, *e. g.*, with ordinary or superheated steam, whereupon a strongly phenolic oil distils over, and the asphalt-like substances, solid after cooling, remain in the retort. The removal of the oily portions can be effected by treatment of the tarry residue with air, or by extn. with alkalis and subsequent treatment with benzene or turpentine oil. The resulting solid residue is practically insol. in alc., and is claimed to be very suitable for the manuf. of black spirit-asphalt varnish, of black polishes, especially for darkening spirit varnishes and other spirituous solns. for the manuf. of leather blacking and leather preserving preps. and the like, as a black spirit dye, for use as impregnating and insulating agents, and for many other purposes. These varnishes give surfaces which are not attacked by alkalis, acids, benzene, or lubricating oils. The alc. solns. of these asphalt-like products possess also therapeutic value.

Mixture of salts of the lower fatty acids. J. EDERER. Aust., 70,777, Dec. 27, 1915. Macerated wood is treated with lime water or other alk. solns. at the ordinary temp. or with gentle warming to hasten the reaction, and from the resulting lyes the salts or acids are recovered in the known manner.

Wood distillation. H. M. ANGLE and F. J. ROOT. U. S., 1,174,537, Mar. 7. "Hogged" and shredded pine or other wood is compressed into blocks (not more than 8 in. in diameter) and destructively distd. in tubular retorts which are almost filled by the blocks, after preliminary distn. with steam to recover turpentine.

23. CELLULOSE AND PAPER.

A. D. LITTLE.

Rapid method of detecting lead chromate in papers used for wrapping eatables. J. WOLFF. *Paper Makers' Monthly J.* 54, 7(1916).—Moisten a small square strip of paper with 90% alc., and pour off the excess. A few drops of HNO_3 spread over the surface turns the paper green, due to the production of chromium sesquioxide, aldehyde being evolved. The treated paper is washed with 10–15 cc. of H_2O and tested with 10% soln. of KI. Pb, if present, will give a ppt. of PbI_2 . This method is also applicable to papers colored green by PbCrO_4 and Prussian blue. The evolution of aldehyde detected by its odor, proves the presence of Cr; Pb is tested for as above, and Prussian blue by the usual method.

E. J. KELLEY.

Chemical control of the Kraft process. OTTO KRESS. *Paper* 17, No. 24, 30–2 (1916).—A method is given for complete volumetric analysis of sulfate white liquor involving (a) detn. of total alkali by titration with 0.5 *N* acid using methyl orange, (b) of soda as $\text{NaOH} + \text{Na}_2\text{S}$ by similar titration after pptn. with hot BaCl_2 and calcn. from (a), (c) of $\text{Na}_2\text{S} + \text{Na}_2\text{S}_2\text{O}_3 + \text{Na}_2\text{SO}_3$ by I titration and (d) of $\text{Na}_2\text{S}_2\text{O}_3 + \text{Na}_2\text{SO}_3$ by titration with I and with 0.1 *N* NaOH after conversion of the sulfites to bisulfites by treatment with alk. ZnCl_2 and neutralization with H_2SO_4 . Methods for detn. of total alkali, free alkali and Na_2S in black liquor and rapid methods for mill control of

white liquor are also given. This forms the report of the Committee on sulfate pulp of the Tech. Assoc. of the Pulp & Paper Industry. V. NUNEZ.

Some methods for the study of beating. A. B. GREEN. *Paper 17*, No. 24, 21-8 (1916).—A modified Schopper-Riegel tester is described for measuring the slowness or ratio of drainage of pulp from the beater at various stages. A sheet-forming app. which provides for uniformity in d. of stock, distribution on the wire and suction is also described, as well as a folding tester, which consists essentially of two hard plane surfaces set at an angle, from the apex of which the test strip of paper extends, being held between by surfaces at known pressure by a spring. Two rollers, so arranged that their axes are always parallel, are held against the planes at known pressure by a spring. These oscillate across the apex and fold the paper until break occurs. By the use of these apps. valuable information on the progress of beating may be obtained. V. N.

Standardization of ground-wood processes. D. L. BELLINGER. *Paper 17*, No. 24, 34(1916).—A number of points in ground-wood practice are brought forward which require standardization or elucidation. These include barking methods, dimensions of lap pulp, particulars as to basalt lava stone, proper depth to submerge the grinder stone, proper temp. for grinding, best grinding methods in hot weather, proper place to discharge water in the grinder pit. V. NUNEZ.

Substitutes for sulfur and pyrites in the sulfite pulp industry. FRANK. *Papier-Ztg.* 41, 2(1916).—Several possible sources are discussed of S to replace the imported S and pyrites which have become very expensive in Germany. The mineral kieserite, $\text{MgSO}_4 \cdot \text{H}_2\text{O}$, readily yields SO_2 on calcining with C but an adequate supply of this mineral is uncertain owing to its use in potash fertilizers. Nor is NaHSO_4 , a dependable source of SO_2 . Prepn. of SO_2 from CaS obtained by reduction of gypsum or anhydrite is possible according to the following equations: $\text{CaS} + \text{MgCl}_2 + \text{H}_2\text{O} = \text{CaCl}_2 + \text{MgO} + \text{H}_2\text{S}$ and $\text{H}_2\text{S} + 3\text{O} = \text{SO}_2 + \text{H}_2\text{O}$. The MgCl_2 may be recovered as follows: $\text{MgO} + \text{CaCl}_2 + \text{CO}_2 = \text{CaCO}_3 + \text{MgCl}_2$. A complicated plant is necessary for this process, however, and only the largest sulfite mills could undertake it independently. Recovery of S in the form of CaSO_3 by treatment of waste sulfite liquor with lime requires but simple equipment and seems promising. About 40% of the S originally present in the cooking liquor can be recovered by this means. V. NUNEZ.

Waste sulfite liquor, ground wood pulp and cellulose as nutrient in fish ponds. HOFER. *Allgemeinen Fischerei Ztg.* No. 20 and 21(1915); *Papier-Ztg.* 41, 1(1916).—Waste sulfite liquor containing no free SO_2 , wood pulp and cellulose which contain sugars or yield sugars on fermentation have been found beneficial to fish life and growth and to the growth of plankton upon which the fish feed. V. NUNEZ.

Substitutes for rosin. FERENCZI. *Papier-Ztg.* 41, 103-4(1916).—Scarcity of rosin in Germany at present makes the use of substitutes necessary. The tar size of Heuser is recommended for dark papers. Glue can be made to serve as an engine size. Starch prepn. are of some value. The claims that talc has sizing properties are considered erroneous. Hard sizing of print papers is unnecessary and very soft sizing of these sorts is urged. V. NUNEZ.

Use of talc in sulfite tissue paper manufacture. PAUL EBBINGHAUS. *Papier-Fabr.* 4, 59(1916).—Addition of talc in the beater has been found of great advantage when making tissue papers in preventing rosin spots and in effecting saving in the use of dyes. V. NUNEZ.

Zacaton as paper-making material. CHARLES J. BRAND AND JASON L. MERRILL. U. S. Dept. Agr., *Bull.* 309, 27 pp.—Zacaton (*Epicampes macroura*) is an unusually hardy, heavy cropping, perennial grass of profuse growth in Mexico and Central America. The roots are used in the manuf. of brushes. The tops form a possible source

pulp. Cooked by the soda process the grass yields 43% air-dry pulp based on the t. of the air-dry grass. Bleach consumption is around 12%. The pulp is soft, bulky and short fibered and could probably be used in about the same manner as soda poplar pulp. It works up into excellent machine-finish book paper. It would appear possible to grow zacaton as a crop in the U. S. V. NUNEZ.

Sulfite pulp from poplar. JAS. BEVERIDGE. *Pulp Paper Mag. Can.* 14, 30(1916).—By the sulfite process poplar (*Populus alba*) yields 59.34% unbleached pulp equiv. to 1352 lbs. bone dry pulp per cord. Willow (*Salix caprea*) yields 55.65% pulp. The yield from poplar is about 14% higher than by the soda process. V. NUNEZ.

The saw palmetto, a neglected fiber plant of the south. C. D. MELL. *Paper Trade J.* 62, No. 7, 181-2(1916).—Attention is directed to the leaf of the saw palmetto as a possible raw material for pulp. V. NUNEZ.

Manufacture of "photo" papers. ANON. *Papier-Fabr. Papermaker and Brit. Paper Trade J.* 50, 60(1916).—Special precautions must be taken to avoid and eliminate iron. The stock of the best paper is all rag. Ash should not exceed 4%. The papers should be hard sized except when intended for pigment printing. Uniform appearance and look through is important. Breaking length averages 2400 in. and stretch 2.4%. Dilation on moistening should be small. Premature yellowing may be traced to use of spoiled animal size, inferior stock, or the action of Fe in combination with resinic acids. V. NUNEZ.

The mineral pigments used in papermaking. H. A. BROMLEY. *Papermaker and Brit. Paper Trade J.* 50, 55-60(1916).—Nature and methods of analysis of the more common pigments. V. NUNEZ.

Colored tissue paper for artificial flowers. ANON. *Papier-Fabr.* 14, 104-6(1916).—Description of manuf. V. NUNEZ.

Barking drums and their operation. HERBERT GUETTLER. *Paper* 17, No. 24, 36-40(1916). V. NUNEZ.

Adsorption of acids by cellulose (LEIGHTON) 2. Utilization of sulfite liquor for washing purposes (LÖFFL.) 27.

Cellulose. C. HARNIST. *Fr.*, 477,895, July 6, 1914. Crude cellulose is treated in one operation, successively or alternately, with NH_4OH or other sol. alkali or alkali carbonate, on the one hand, and with SO_2 on the other hand. Compressed or liquefied NH_3 and SO_2 are used.

Cellulose in ethers insoluble in chloroform. H. DREYFUS. *Fr.*, 478,023, Nov. 11, 1914. In a modification of the process of 432,046, July 5, 1911, and additions 14,783, Sept. 13, 1911, 16,316, Aug. 5, 1912, and 16,494, Sept. 16, 1912, for the manuf., on a large scale, of cellulose ethers insol. in CHCl_3 , and for obtaining always the highest possible viscosity, or a desired viscosity, the cellulose is treated with H_2SO_4 , as a condensing agent, and in the presence of a diluent such as glacial HOAc , and placed in an acetylizing mixt. which has been previously cooled, i. e., the temp. is kept below $5-15^\circ$, preferably below 5° , as required, with removal of the heat developed during the reaction, and then the temp. is allowed to rise successively to 15, 20 and 25° , and finally even to about $30-35^\circ$. After the max. temp. has been reached, cooling is continued until it falls to about $25-30^\circ$.

Air-drying wood cellulose. R. GAMILLSCHEG. *Aust.*, 70,799, Dec. 27, 1915. The wood cellulose obtained from the wet portion is dried by allowing a warm current of air from below, and a lateral current of cold air, to act simultaneously on the wood cellulose sheets as they are moved forward.

Acetylcellulose plastic composition. F. MEYER. U. S., 1,175,791, Mar. 14. Acetylcellulose is mixed with a solvent and with sufficient non-solvent such as petroleum to inspissate the soln. before pptg. the acetylcellulose and coloring matter is mixed with the thickened soln.

Filaments from cellulose solutions. L. P. WILSON. U. S., 1,175,857, Mar. 14. Tubular threads are formed from viscose solns. or other solns. of cellulose derivs. by forcing the soln. out from an annular orifice, around a core or thread formed either of natural textile fiber or artificial silk, into a pptg. bath.

Electrical insulation from sulfite liquor. W. K. FREEMAN. U. S., 1,175,424, Mar. 14. Waste sulfite liquor after concn. and treatment with NaCl and BaCl₂ is dried with the ppt. still mixed with it and the dried product is mixed with MgO, MgC, powdered glass and a small amt. of a hard gum or resin.

Separating constituents of waste sulfite liquor. W. K. FREEMAN. U. S., 1,175,425, Mar. 14. Conc'd. waste sulfite liquor is agitated with HCl while hot and after boiling and cooling is treated with NH₄OH to ppt. various constituents and leave a soln., from which the cellulosic derivs. may subsequently be recovered, for use in making brush backs, buttons, insulators, etc.

Treating waste sulfite liquor. W. K. FREEMAN. U. S., 1,175,423, Mar. 14. Waste sulfite liquor from wood-pulp mills is heated and evapd. to conc. it, treated with NaCl to assist in coagulating it and then treated with BaCl₂ to ppt. Ca and S compounds and prepare the liquor for use as a source of cellulosic compds. for use in the manufacture of billiard balls or other molded articles.

Cement from waste sulfite liquor. W. K. FREEMAN. U. S., 1,175,425, Mar. 14. Waste sulfite liquor is treated with NaCl and BaCl₂ and the remaining liquor after sepn. of the ppt. is evaporated to dryness and pulverized. 100 parts of this powder is mixed with gum camphor 4, MgO 100 and MgCl₂ 50 parts, with or without SiO₂ or kaolin forming a dry cement which is made ready for use by the addition of H₂O. The mixt. may be used for certain purposes as a substitute for celluloid, bone or ivory.

Cement from waste sulfite liquor. W. K. FREEMAN. U. S., 1,175,426, Mar. 14. Usual ingredients of oxychloride cement are mixed with disintegrated wood or other fillers and with the pulverized residue produced by treating waste sulfite liquor with NaCl and BaCl₂ or other precipitants and evapg. without sepn. of the ppt.

Molding oxychloride-waste sulfite liquor cement. W. K. FREEMAN. U. S., 1,175,427, Mar. 14. Disintegrated wood, corn stalks or other fibrous material is mixed with MgO and with the powdered residue produced by treating waste sulfite liquor with NaCl and BaCl₂ and evapg. without sepn. of the ppt. formed, a soln. of MgCl₂ is added and the plastic mixt. is molded between hot surfaces to expel excess moisture. U. S., 1,175,428 specifies a shoe last made of a similar composition.

Sizing for paper stock. J. A. DE CEW. U. S., 1,174,697, Mar. 7. A H₂O-proofing sizing for mixing with paper stock in a beating engine is formed by permanently emulsifying rosin 50-85 and wool wax, carnauba wax or mineral wax 15-50%.

Waterproofing paper tubes. H. C. PRITHAM. U. S., 1,174,279, Mar. 7. Paper tubes for making cartridge shells are H₂O-proofed by treating them with a soln. of Chinese wood oil 3% in paraffin 97% and heating sufficiently to gelatinize the Chinese wood oil.

Apparatus for recovering pulp from waste printed paper. J. J. WEAVER, P. M. H. L. COLLIER and J. M. EGMOND. U. S., 1,175,854, Mar. 14.

Removing ink from waste paper. J. WELSH. U. S., 1,175,853, Mar. 14. Pulp from waste printed paper made wholly or in part from mechanical wood pulp is recovered by pulping and treating with waste liquor from sulfite or alkali pulp manufacture, draining and washing with fresh H₂O.

Removing metallic particles and other foreign matter from paper pulp. A. J. JEWELL and R. J. MARX. Fr., 477,995, Mar. 12, 1915. Magnetic and other impurities are removed with the aid of an electromagnetic separator, the electromagnets being disposed in a pocket of the plate which conducts the pulp to the paper machine.

Paper fiber or pulp. S. MILNE. Fr., 478,063, Mar. 17, 1915. Suitable raw material is digested in one or more digesters, then it is passed through a pressing and washing machine, again washing or filtering it, then passing all or a part of the filtered material through a refining machine, and again filtering.

Ground wood for paper manufacture. F. FRIEDSAM. Aust., 70,781, Dec. 27, 1915. Mineral filling material (kaolin, talc, blanc fixe, or the like) is added to the wood flour during its prepn. on the grinding stone.

24. EXPLOSIVES AND EXPLOSIONS.

C. E. MUNROE.

Action of explosion gases produced by projectiles. Z. ges. Schiess-Sprengstoffw. 11, 57-8(1916).—The depressing and poisoning action of the gases produced by the explosion of military explosives is discussed. O. L. THOMAS.

Primers for explosives containing liquid air. H. ASSEL. Z. ges. Schiess-Sprengstoffw. 11, 58-9(1916).—The use of primers for igniting explosives charged with liquid air has not been very successful. The momentary heat action of both the ordinary primer and of the Pt wire bridge is insufficient because of the low temp. A bridge igniter composed of explosive metal combinations surrounding a Pt wire bridge may be used. O. L. THOMAS.

Experiments at Commentry on the ignition of coal dust. M. J. TAFFANEL. Z. ges. Schiess-Sprengstoffw. 10, 263-7, 283-6(1915).—A plan of the experimental mine is given. Sixteen experiments performed under varied conditions have given valuable results on the influence of arrangement of the galleries and the spreading of the coal dust explosion. The results are compared with those obtained at Liévin on dust mixts. They have proved the effectiveness of safety zones, the weakening action of bends on the explosion and the usefulness of a new kind of explosion barrier. O. L. T.

The crystalline form of α -trinitrotoluene (ARTINI) 10. Wood flour (KRESSMANN) 18. Determination of toluene (JAMES) 21.

Explosive. A. E. CHARBONNEAUX. U. S., 1,174,546, Mar. 7. Picric acid 4, nitronaphthalene 2, NaNO_3 10 and PbO_2 1 part are used in an explosive for shells. Nitrated petroleum or nitrated turpentine may be substituted for nitronaphthalene to form an explosive for rifles.

Priming charge for explosives. W. H. BUELL. U. S., 1,174,669, Mar. 7. Priming charges are formed of Pb azide 6, nitrocellulose or a nitro-compd. 11 and Na or K azide 3 parts. On ignition, the Na or K azide leaves an alk. residue which prevents injurious action on the gun. A primer may also be formed of KClO_3 30, Sb sulfide 35 and NaN_3 35 parts. When nitrocellulose is used, the sensitiveness of the mixt. is increased by use of amyl acetate or other solvent. Cf. C. A. 10, 970.

Nitrotoluenes. R. A. CRAIG, R. ROBERTSON, R. C. FARMER and G. ROTTER. Brit., 23,181, Nov. 27, 1914. The nitrotoluenes contained in the waste acids from the production of trinitrotoluene are extd. by washing the acids with toluene or a nitrated toluene of a lower degree of nitration than the products to be extd.; if the process is carried out at a suitable temp., the toluene or nitrotoluene used for the extn. undergoes

nitration in the process; fresh HNO_3 may be added to the waste acids for this purpose. When toluene or toluene nitrated below the stage of mononitrotoluene is used as the extg. agent, emulsification of the mixt. is prevented either by adding fresh HNO_3 in amt. sufficient to yield at least mononitrotoluene, or by dilg. the acids with H_2O to a suitable degree before the toluene is added.

25. DYES AND TEXTILE CHEMISTRY.

L. A. OLNEY.

Dyeing in the last quarter of 1914 and the first quarter of 1915. E. K. HALL. *Farber-Ztg.* 26, 169-79(1915).—A review of the literature, including patents.

W. F. F.

Dye shortage in the U. S. A. K. PIETRUSKY. *Chem. Ind.* 39, 1-7(1916).—A review and discussion of development in the U. S.

F. W. SMITHER.

Manufacture of aniline oil. ANON. *India Rubber World* 53, 167(1916).—A general description including diagrams.

E. J. KELLEY.

Testing aniline oil and salt. LOUIS J. MATOS. *Dyestuffs* 18, 94-6(1915); *Textile World Record* 49, No. 5, 115-6(1915).—Aniline oil for hosiery dyeing and for padding and printing cotton goods should b. 182° , 90% distg. at this temp., d_{15} 1.027 and the oil should show no indications of PhNO_2 or hydrocarbons. Grading is done by distn. Aniline oil for black-dyeing should distil as follows for 100 cc.: below 180° 5 cc., $180-5^\circ$ 92 cc. and $185-90^\circ$ 3 cc. For oil of d. 1.027, 90 cc. should have distd. at $182-5^\circ$. Oil having higher d. is likely to contain toluidine or unchanged PhNO_2 , and should be rejected. If 10 cc. is dissolved in 10 cc. HCl and the mixt. dild. to 100 cc., the presence of PhNO_2 , etc., is indicated by turbidity. Aniline salt of satisfactory grade should be in the form of large crystals since small powdery crystals indicate that the sample was prepd. from an oil high in toluidine. The test for free acid in the salt is important. Five drops of crystal violet soln., 1 to 1000, is recommended as indicator comparing the sample with a sample of known purity. Color of aniline oil is unimportant, while discolored aniline salt should be rejected.

W. F. FARAGHER.

Relations between constitution and color of dyestuffs. J. PICCARD. *Bull. soc. vaud.* 50, 311-33(1915); *Beiblätter Ann. Physik* 39, 674; cf. *C. A.* 7, 2939, 2940.—For yellow of the second order, P. obtained *meri*-tetraphenyldiphenquinonediimine, which with its 12 benzene rings, gives the greatest depth of color yet obtained. L. W. R.

The properties of wool and a new chemical method for detecting damaged wool. KLAUS VON ALLWÖRDEN. *Z. angew. Chem.* 29, I, 77-8(1916).—Between the external plate-cells (scales) and the fiber cells (body of the fiber) there is a substance which the author names elasticum. The characteristics of the fiber are largely detd. by this substance. If all of this substance is removed, the fibers are no longer capable of being felted or finished properly and are brittle and weak. Elasticum, which is sol. in alkalis, is a carbohydrate, the osazone of which may be prepd. readily. In 8 l. of 2% NaOH there is suspended 500 g. factory-scoured wool, previously rinsed with warm distd. H_2O . After standing for 24 hrs. at a temp. of not more than 25° , practically all of the elasticum will have dissolved, together with some albuminous substances. Since the former is dialyzable, it may be sepd. from the mixt. The soln. of elasticum thus obtained is acidified with AcOH and concd. to 200 cc. AcONa and PhNHNH_2 are then added, and the mixt. is heated in boiling H_2O . Microscopic needles sep. after $1\frac{1}{2}$ -1 hr. The imperfectly purified osazone m. 188° . The reduction of Fehling soln. by elasticum is effected only after sepn. of albumin, a fact which explains previous failures to detect it. Its reducing action accounts for the reducing properties of wool. The con-

tent of elasticum detn. the value of wool, and mfg. processes should be designed to conserve it. The fiber-cells proper are more easily attacked by acids than the plate-cells and elasticum, which is insol. in acids, is able to protect mechanically the underlying fiber. This fact is of importance in carbonizing and acid-dyeing. Gravimetric detn. of elasticum should give an indication of the properties of the fibers. Optical methods, osazone detn. or Cu reduction are suggested, but none has been worked out. Cl water is a valuable reagent to show the presence of elasticum. The plate cells are not easily attacked by Cl while the fiber-cells and elasticum react readily. The swelling caused by the reaction of the latter forms globular enlargements on the fibers, the plate cells being distended. The wool fiber is placed upon a slide and covered with a few drops of H_2O . An equal vol. of Cl water is then added. The fiber should be viewed under a microscope, at a magnification of about 200. Dynamometric tests are little affected by removal of elasticum, while the wearing qualities of the fabric are greatly impaired. This conclusion was proved by an examn. of a number of uniforms which had been unsatisfactory in service. Damage developing during acid-dyeing is often the fault of the scouring rather than the dyeing. Bottoming in an alk. vat followed by topping with acid dyes is objectionable. Spots are often formed as a result of the reducing action of elasticum.

W. F. FARAGHER.

Recovering caustic from mercerizing washings. H. AUSTIN. *Textile World J.* 51, No. 17, 39(1916).—The equipment furnished by Ernest Scott and Co., Fall River, Mass., recovers NaOH in form of a soln. ready for use, at a cost of $1\frac{1}{4}$ cents for each lb. of NaOH. The percentage of recovery is from 94 to 96. The above cost includes cost of labor, fuel, chemical and an allowance for interest and depreciation. The washing is done in such a way that a strong soln. of NaOH is obtained, and this is evapd. in a multiple-effect evaporator, using either live or exhaust steam. Plants which have operated for 16 years are still run with no unusual expense for maintenance.

W. F. FARAGHER.

Bleaching colored goods. TRAWDEN. *Textile World J.* 51, No. 17, 35-6(1916).—Small pieces of the fabrics dyed with bleaching colors should be treated by the usual methods in order to det. the effect upon the dyeings. Most of the dyes are sensitive to the action of the alkalis used in boiling off, but by regulating conditions, satisfactory results may be obtained. The goods should not be allowed to lie after removal from the chemick, and fresh chemick should be used. Methods for Turkey-red, indigo-blue and indanthrene dyeings are given.

W. F. FARAGHER.

Bleaching woolen and mixed goods. BERWICK. *Textile World J.* 51, No. 17, 35(1916).—Raw wool can be bleached by the bisulfite process. For a bath of 500 gal., use 12.5 gal. $NaHSO_3$ soln. of $32^\circ Tw.$ and 5 pints of H_2SO_4 . Keep the well scoured wool under the liquor, and allow it to remain overnight. In the morning, lift the wool, allow it to drain and then wash it thoroughly. For tinting, alkali violet C A may be used. Permanganate may be used also, but is expensive. For a 400 gal. bath, use 2 lbs. H_2SO_4 and 12 oz. $KMnO_4$. Enter 100 lbs. of scoured wool, and pole for $\frac{1}{4}$ hr. Lift the stock and place into a bath containing 1.5 gal. $NaHSO_3$ soln. of $32^\circ Tw.$ Do not allow the stock to remain in the $NaHSO_3$ soln. longer than is necessary to discharge the brown discoloration. Yarn and piece goods may be bleached by the same materials, and the latter also by means of SO_2 .

W. F. FARAGHER.

Terms used in the cotton industry. W. A. G. CLARK. U. S. Bur. Foreign and Dom. Commerce, *Special Agents' Series* No. 105, 22 pp.(Sept., 1915).—C. explains briefly the correct use of common terms including the various systems of cotton-yarn numbering, designation of various types of cloth, and the translation of foreign terms; 25 conversion tables applicable to the textile industry are included. F. W. S.

Systematic examination and testing of raw silk. K. B. LAMB. *Textile World J.* 51, No. 7, 209-15 (1916).—Inspection tests for quick detn. of certain qualities are regularly employed. They require, however, much skill and experience and are open to the objections applying to all subjective tests. The following qualities of the fibers are thus detd.: Color, cleanliness, luster, "feel," condition of gum, and uniformity. The diameter and crossings with lacings of skeins are learned by inspection. Inspection also reveals defects such as knots, loops, nibs, split ends, fine ends, coarse ends, double ends, corkscrews and roughness of fibers. Defects in the fibers are best observed by winding a single strand of raw silk upon a "mirror," a piece of black cardboard, 6 × 11 in. or 3 × 6 in. A diagram for securing representative sample skeins from the bale is given. Moisture is detd. in a regulation conditioning oven, the conditioned wt. being the dry wt. plus 11%. Loss during boiling off is detd. by making a skein of 100 g. by taking parts of ten skeins drawn from different books of the bale. The test skein is conditioned, and then boiled off, in 2 consecutive soap solns. containing 25% of soap calcd. on the wt. of the test skein. The loss is found by thorough washing, followed by conditioning. Tenacity and elasticity are important properties, and are obtained regularly by means of suitable dynamometric app. Winding tests are important, as they show the number of ends an operative can keep up. The test is made by winding dry 10 skeins at an av. rate of 75 or 150 yds. per min. The number of ends and breaks per 300,000 yds. is recorded. The test is also valuable in showing the amt. of waste to be expected. Microscopic tests are very important, but until recently have received but little attention in commercial practice. Photomicrographs are very useful. Much value should be derived by using the microscope in examn. of the raw and boiled-off fibers. The effects of the different processes during manufacture are also made evident by the proper use of the microscope.

W. F. FARAGHER.

Manufacture of artificial straw. RUTHVEN. *Textile World J.* 51, No. 12, 25-6 (Feb. 19, 1916).—Two- and three-thread tussah silk is generally used for straw for millinery braids, but for the softer, more yielding straws, trams, organzines and tsatlées are used. The threads are passed through gelatin soln. and are then squeezed. Excess H₂O is removed by means of currents of cold air from fans. The dried product is then wound upon spools and is ready for use. In some cases, the straw is crimped before spooling. A crinkled straw is obtained by only partially drying the straw from the gelatin vat. Glycerol gives a softer, more brilliant product. Ribbons are made by using tsatlée silk, drying with hot rolls and using gum tragacanth. This product is soft and is used for imitation willow plumes.

W. F. FARAGHER.

Quinone vat dyes. A. SCHMIDT. U. S., 1,175,997, Mar. 21. Alkali metal salts of leuco derivatives of quinone vat dyes, e. g., a dye derived from benzoquinone and *p*-chloroaniline, are dissolved in an aq. soln. of an alkali salt of sulfonated ricinoleic acid to obtain a prepn. for dyeing which is readily sol. in H₂O.

Sulfur dyes. M. BUFF and A. THAUSS. U. S., 1,175,230, Mar. 14. Leuco-indophenols derived from Et- α -naphthylamine or tetrahydro- α -naphthylamine and *p*-aminophenol, halogenated *p*-aminophenols, *p*-amino-*o*-cresol or dichloro-*p*-aminophenol are heated with Na₂S in boiling alc. for 70-80 hrs., the alc. is distd. off and the product is washed with hot H₂O and then with a boiling soln. of Na₂S. It is a dark blue powder dyeing cotton reddish blue from a hyposulfite vat.

Yellow-red safranin dyes. R. BURCKHARDT. U. S., 1,174,820, Mar. 7. Nitrosoethyl-*o*-toluidine and *m*-aminoethyl-*p*-toluidine are condensed together by heating with alc. and HCl, forming a product which dissolves in concd. H₂SO₄ with a green color turning to blue and then to red on the addition of H₂O and giving a yellow-red on cotton when printed or dyed with tannin as mordant. Methyl-*p*-toluylenediamine or ethyl-

p-toluylenediamine with methyl- (or ethyl-) *m*-toluylenediamine give a like product.

Apparatus for dyeing duck or canvas. L. J. MATOS. U. S., 1,175,538, Mar. 14.

Apparatus for dyeing in vats. J. J. TRACY. U. S., 1,174,912, Mar. 7.

Dyeing pelts, hair, feathers. F. MERKEL. U. S., 1,175,539, Mar. 14. A soln. formed of *m*-hydroxydiphenylamine and an oxidizing agent, *e. g.*, Na perborate is used, with a mordant of Na₂Cr₂O₇ and CuSO₄.

Indigo product for dyeing and printing. M. ILJINSKY. U. S., 1,175,634, Mar. 14. A leuco compd. of an alk. earth with indigo or other vat dye is combined with hyposulfite to form a product which is almost insol. in H₂O and is suitable for dyeing or printing.

Dyeing. F. GÜNTHER. U. S., 1,176,363, Mar. 21. A blue-black color is produced on fabrics by applying a condensation product of acetone with 1,8-naphthylenediamine-4-sulfonic acid and β -naphthol and then developing with diazotized *p*-nitroaniline.

Dyeing. J. CHESTER. Brit., 23,214, Nov. 28, 1914. Textile and like materials of animal origin are dyed by means of a bath containing constituents which interact to form HNO₂, together with a metallic salt, the bath being strongly heated. According to an example, a brown shade is produced on wool by immersing it in a bath of NaNO₂, Na₂Cr₂O₇, and H₂SO₄, and boiling; CuSO₄ gives a reddish brown color.

Dyeing. E. LODGE and J. M. EVANS. Brit., 23,386, Nov. 18, 1914. In the vat dyeing process described in 29,832, 1913 (*C. A.* 9, 1695) animal fibers, fur, feathers, and artificial silk may be included with the materials specified for treatment.

Dressing textiles dyed with vat colors. CASELLA & Co. Fr., 478,045, July 11, 1914. To the dressing of dextrin or glucose are added salts which prevent running in the hot alk. bath in which the finished material is washed.

Fireproofing textile materials. T. I. J. CRAIG and WHIPP BROS. & TODD. Fr., 477,857, Mar. 2, 1915. See Brit., 16,153 (*C. A.* 10, 98).

Applying designs to textiles. DRAKE PRINTING CO., A. MCKERROW, H. WALTON and G. E. SHEARSMITH. Fr., 477,822, Feb. 26, 1915. The design is printed on a transfer surface from which it is detached by heat. This transfer film is composed of an opaque layer covered with an adherent fusible layer which does not penetrate the opaque layer.

Protective treatment of silk for loading. SCHADD & KORTLING. Fr., 478,007, Mar. 12, 1915. Before concluding the operation of charging, the silk is treated with organic compds., particularly those containing N or S or both of these, which oxidize more readily than the fibroin, and, if necessary, whose first products of oxidation have still a reducing action, which change neither the feel nor the color of the silk, and which do not form with metallic salts undesirable colored compds.

26. PAINTS, VARNISHES AND RESINS.

A. H. SABIN.

Cellon and cellon varnish. ANON. *Elektrotechn. Z.* 37, 109(1916).—Cellon is a celluloid-like material made from acetylhydrocellulose and a neutral softening material. It is made in all forms and is not inflammable. For elec. purposes it is as good as hard rubber and not as brittle. By heating to 70–80° it may be bent and formed and, by painting with cellon varnish, it may be firmly cemented together. The disruptive voltage varies from 13,200 v. to 35,000 v. for thicknesses of from 0.2 to 2.0 mm. The varnish is proof against oils, fats, petroleum, benzene, acids and alkalis and is used as a non-corrosive paint.

W. E. RUDER

Wood flour (KRESSMANN) 18.

Paint. H. HACKL and H. BUNZEL. U. S., 1,175,751, Mar. 14. Freshly pptd. hydrated FeS is subjected to atm. oxidation to produce a pigment containing $\text{Fe}(\text{OH})_2$; free S is extd. with CS_2 or other solvent, and the residual pigment is mixed with oil or other usual paint vehicles.

Paint. N. B. ARNOLD. U. S., 1,175,110, Mar. 14. ZnO 300, SiO_2 75 and linseed oil about 60 parts are mixed to form a paint for use on surfaces exposed to the weather.

Carbon pigment from coal pitch. A. C. EVANS and P. J. MITCHELL. U. S., 1,175,632, Mar. 14. Hot coal pitch is washed with dil. NaOH or KOH soln., treated with solvent naphtha and heated to 100° , the finely divided C is allowed to settle and the liquid is decanted or filtered off and distilled to recover the naphtha.

Pellicles of oil and oil-paint. G. MÜLLER-NÄEGELI. U. S., 1,175,169, Mar. 14. A coat of oil-paint or varnish is spread on strong weakly-sized absorbent paper previously treated with an alk. silicate soln. to prevent permanent adhesion of the paint or varnish and the pellicle formed is stripped off the paper and may be attached to wood, textile fabric or other material by the surface which has been rendered somewhat sticky by the saponifying action of the alk. silicate soln.

Composition for painting ships' decks. A. DENNY and D. G. ANDERSON. Fr. 477,975, Mar. 10, 1915. The essential ingredients are, a mixt. of plaster of Paris and a small amt. of portland cement, in combination with a filling such as pumice, coke-breeze, amianthus, saw-dust, etc., and a dil. soln. of NaAlO_2 . Cf. C. A. 9, 2581.

Drying oils. BATAAFSCHE PETROLEUM MAATSCHAPPIJ. Brit., 23,376, Dec. 1, 1914. Drying oils are prepd. from the distn. products of mineral oils having b. p. of 220 – 260° , by forming in them unsatd. hydrocarbons by chlorinating and then removing HCl from the chlorinated products by heating with a catalyst such as Zn or other metal or a metal chloride. Cf. C. A. 9, 2602.

Paints and varnishes. H. TERRISSE and INDESTRUCTIBLE PAINT CO. Brit. 23,054, Nov. 25, 1914. Solubilized fossil resins, esterified with glycerol or high-boiling alcs. prepd. by the process of 23,055, 1914 (following pat.) are used with appropriate solvents in the production of varnishes, paints, and coating compns. Other resins may be added. Esterified manilla resin is melted, heated to 300° , and incorporated at that temp. with linseed oil, the temp. then being raised to 310° until the desired consistence is reached. Driers are added in the usual way, and the varnish is dild. with spirit, turpentine, etc. Another example described the production of a varnish from the glyceryl ester of Congo copal in a similar manner. A paint is prepd. by grinding the varnish prepd. as above described with ZnO . Cf. 14,554, 1903, and 23,039, 1908.

Resin esters. H. TERRISSE and INDESTRUCTIBLE PAINT CO. Brit., 23,055, Nov. 25, 1914. Esters are obtained from fossil resins by first converting the resin into a product sol. in linseed or other drying oil, and then heating this product with glycerol, linalool, or other alc. of high b. p., under pressure or not. Suitable resins are Congo copal, Zanzibar or Madagascar animé, kauri, Benguela copal, pontianac, manilla, etc. The solubilizing treatment may be effected by heating the resin, preferably under pressure, with or without solvents such as phenol, cresol, naphthalene, copal oil, or resin oil, as described in 14,544, 1903, and 23,039, 1908; or the fossil resins may be fused, solubilized by heating with copal oil, preferably copal oil which has been redistd. under reduced pressure, and then esterified by heating with glycerol, etc.; the solubilizing and esterifying processes may be carried out in one operation. The glycerol or other alc. is preferably used in excess of the theoretical amt.

Artificial phenolic resin. B. B. GOLDSMITH. U. S., Reissue 14,087, Mar. 14. See original pat., 1,168,626; C. A. 10, 826.

Bactericidal phenolic condensation products. A. HEINEMANN. U. S., 1,176,056, Mar. 21. A phenolic condensation product while in a heated fluid condition is mixed with cacodylic acid or other alkyl As compd. and the mixt. is stirred and heated until uniform. The product is adapted for use in painting surfaces exposed to sea water. Cf. C. A. 9, 3370.

27. FATS, FATTY OILS AND SOAPS.

E. SCHERUBEL.

The chemistry and analyses of fats in 1914. ANON. *Mat. grasses* 9, 4440-1 (1916).—A short review of progress. E. J. KELLEY.

Study of wool fat. A. DUBOSC. *Mat. grasses* 8, 4358-60 (1915).—D. gives the following figures as a result of his expts.: d. 0.997, m. 32°, liquefies 85°, acid no. 40.65, sapon. no. 246, I no. 93.69, mol. wt. 375-385, ash traces, H₂O 0.116%, saponifiable fatty acids (oleic) 54.037%, coloring matter traces. Cf. C. A. 10, 1104. E. J. K.

The hardening of fats through catalytic addition of hydrogen. G. FREDRICH. Univ. Bonn. *Arch. Pharm.* 253, 512-73 (1915).—The principal results of the investigation are summarized as follows: It is solely an assumption of Erdmann and his co-workers that reduction of Ni oxides in oil by means of H stops with the formation of a suboxide and that such suboxide acts as an H-carrier. The existence of a Ni suboxide is entirely problematical. Equally questionable are assumptions and assertions that hydrated Ni oxides are formed, or that Ni compds. in general can act as H-carriers. It has been demonstrated with certainty, not only through elec. cond. but also with the CO test, that metallic Ni results during the hardening of fats through application of Ni oxide and other Ni compds. Thus it has been shown that reduction of Ni oxide in oil by H does not stop at a suboxide but on the contrary progresses as in an ordinary dry reduction to the metal itself. It is certain that inability on the part of Erdman and co-workers to detect metallic Ni by means of elec. cond. was in the main due to contaminations of fatty acid salts of Ni and other products contained in the samples. examd. Thus, Siegmund and Suida failed to detect electrically a content of at least 48% Ni which according to their own analyses must have been present. Erdmann's explanation of the action of Ni oxides as given in a series of tests designed to be comparative cannot be regarded as a proof, since possibility for comparison is excluded under the varied conditions obtaining in metallic Ni reduced in oil and in the dry state. It must be regarded as proved that, in hardening fat by use of Ni^{II} oxide or Ni^{III} oxide and of Ni salts, the H-carrier is in reality metallic Ni freed from its compds. by the action of H. The statement: "No hardening of fat without free metal" is justified in view of the present state of the science and exact experimentation.

W. O. E.

Hydrolysis of some of the common vegetable oils. W. F. RUDD. *J. Am. Pharm. Assoc.* 5, 170-4 (1916).—A report of the results of expts. relating to the hydrolysis of several vegetable oils with an alkali. In 1 of the series of expts. the oils were treated with an alkali, in the 2nd with an enzyme and in the 3rd with both alkali and enzyme to det. if possible whether the relative sapon. factor will convey a knowledge of their relative digestibility. The number of expts. as recorded is considered to be altogether too small to warrant drawing any general conclusions and the work is to be continued.

M. I. W.

The viscosity of oils in the Redwood and the Ostwald viscosimeters. CHARLES A. SAVILL AND ARTHUR W. COX. *J. Soc. Chem. Ind.* 35, 151-3 (1916).—As a simple method for converting values for viscosities detd. by means of any of the viscosimeters in common use, such as the Redwood, to abs. values as detd. by the Ostwald U-tube

viscosimeter, the authors propose the following: Using pure phenol at 25° as the standard, det. the const. K for a particular Ostwald instrument by substituting in the formula $K = \eta/td$ when η = abs. viscosity, t = time of flow in seconds and d = density at 25°. Having K , det. the values of η for solns. of H_2SO_4 of various strengths at a given temp. and plot a curve with values of η as ordinates and percentages of H_2SO_4 as abscissas. Any instrument for technical use may then be calibrated by comparing the values obtained with similar solns. with those plotted. H. L. OLIN.

Utilization of sulfite liquor for washing purposes. K. LÖFFL. *Seifensieder-Ztg.* 42, 431-2(1915).—This by-product of the wood-pulp industry can be used by the soldiers in the field by making it into a paste with kieselguhr or fine sand. The addition of 1 to 2% of Na_2CO_3 increases its deterative powers. By adding 2% of crude cresol to the liquor it makes an excellent agent for killing body lice, and by incorporating 10% cresol it makes a good and cheap cleanser and disinfectant for floors. E. SCHERUBEL.

Marseilles soaps. J. DAVIDSOHN. *Seifensieder-Ztg.* 42, 432-3(1915).—These soaps are green or white; the former is used in the textile industry and the latter as a household and children's soap. Analysis shows the latter to be made from 35% palm-kernel or coconut oil, 40% olive and 25% cottonseed oil. The green soap is made from green sulfonated oil with small amts. of palm-kernel, peanut, sesame and cottonseed oils. E. SCHERUBEL.

American floating soap. E. SCHUCK. *Seifensieder-Ztg.* 42, 410-2(1915).—These soaps are made on a formula of from 25 to 30% of cocoanut oil and the balance edible tallow. The kettle practice for this product consists in thorough sapon., graining and washing, followed by a strong lye boil, and then by further washing and graining and finally settling. To make the soap float air is worked into it by means of a crutch whose agitator makes 160 revolutions per min. The time necessary is from 15 to 20 mins. E. SCHERUBEL.

Casein and its use in milled soaps. E. H. D. *Seifensieder-Ztg.* 42, 472-3(1915).—This product is considered a filler, although it is said to be beneficial to the skin. It must first be put into soln. by means of alkali. A good formula for a casein soap is soap 400, borax 1, casein 35, 38° Bé. lye 2, hot H_2O 20 and cold H_2O 90 parts. E. SCHERUBEL.

Production of rosin in Prussia. W. STORANDT. *Seifensieder-Ztg.* 43, 149(1916).—Austria is now producing her own rosin and the quality is the same as that produced in France and the U. S. Prussia has taken steps to provide her own supply. Cf. C. A. 9, 2459. E. SCHERUBEL.

Calculation of yields for soaps. O. BANNINGER. *Seifensieder-Ztg.* 43, 73-4, 98-9, 121-2(1916).—Lengthy discussion of rather simple calcns. E. SCHERUBEL.

Manufacture of half boiled, filled soaps. E. H. D. *Seifensieder-Ztg.* 42, 453-4 (1915).—These soaps contain rosin, tallow and palm-kernel oil and are filled with Na_2SiO_3 soln. E. SCHERUBEL.

Sugar soaps. W. KIND. *Seifensieder-Ztg.* 43, 143-6(1916).—K.'s conclusions with regard to the use of sugar in soaps are: The value of a soap is detd. by the relation of its washing power to its degree of injuriousness. The deterative value of soap is not dependent upon its chem. analysis. If one does not consider free alkali as having deterative power it must be viewed as forming absorption combinations. The chem. deterative action of free alkali and also its injurious action upon color and fiber depend upon its hydroxyl ion concn. The non-dissociated alkali sucate has as little deterative action as raw sugar. The addition of free alkali to soap followed by neutralization with sugar is based upon false considerations. The addition of sugar to soap is a disadvantage because of lessened lathering properties and deterative powers. R. S.

Mineral-oil soaps. ANON. *Seifenfabrikant* 36, 125-7(1916).—Discussion regarding the possibility of using the alkali salts of the naphthenic acids as substitutes for soap. E. SCHERUBEL.

Japan wax in the soap industry. P. N. *Seifensieder-Ztg.* 43, 74-5(1916).—Owing to the high price of other raw materials this product is now in line as regards price and may be used to replace tallow which it resembles except that its titer is much higher, 53-37 degrees. A number of formulas are given in which Japan tallow is used to the extent of from $\frac{1}{3}$ to $\frac{2}{3}$ of the fat. E. SCHERUBEL.

Japan wax. G. J. FELS. *Seifenfabr.* 36, 141-2(1916).—This substitute consists chiefly of palmitic and Japan acids. There is also 8% of sol. fatty acids. The Japan acid is dibasic and its K salt is difficultly sol. in H_2O and alc. Its formula is $C_{20}H_{40}(COOH)_2$. There are no diglycerides in Japan wax and its high glycerol content (10-14%) may be attributed to its low fatty acids and dibasic acid. E. S.

Lubricants for metals (BLAIR) 9. The fat of nux vomica (WATT) 17.

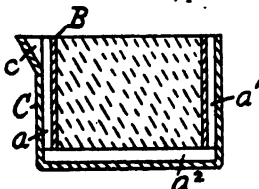
Hydrogenating oils and fats. C. ELLIS. U. S., 1,174,245, Mar. 7. Unsaturated oils and fats are hydrogenated by heating with water gas or H under pressure, using a catalyst of active charcoal coated with Pt or Ni.

Catalytic hydrogenation. H. K. MOORE. Brit., 22,980, Nov. 24, 1914. In the hydrogenation of unsaturated fats, fatty acids, fatty acid esters, hydrocarbons, etc., by passing the compound and H through a body of catalytic material, the catalyst is revived and freed from adhering oil, etc., by passing therethrough a stream of H at high velocity; the body of catalyst is preferably subjected in repeated succession to the action of H and the compound treated and to H alone at high velocity; the compound treated is preferably atomized by H under pressure.

Hydrogenating oils and fats. W. D. RICHARDSON. U. S., 1,175,905, Mar. 14. An electric arc is produced between Ni electrodes immersed in ether or other volatile liquid capable of dissolving fats to disintegrate a portion of the Ni and suspend it in the liquid. The suspension is mixed with the oil or fat to be hydrogenated and after hydrogenation is effected the volatile solvent is removed by distillation. Cf. C. A. 9, 2821.

Sulfonated stearic compound for use in emulsifying oils, waxes or fats. I. LEVINSTEIN. U. S., 1,176,378, Mar. 21. Stearic acid and a fat or fatty oil are treated with H_2SO_4 at 30-50°.

Wax, grease. J. B. HALL. Brit., 22,870, Nov. 21, 1914. A block of wax, paraffin, grease or other fusible material is formed with vertical grooves or perforations a, a^1 connected by a groove a^2 across the bottom, so that on partly melting the block, the lower melted portion may be poured off. The block is fitted into a container C which may have a spout c . The walls of the grooves a, a^1 may be lined with perforate or imperforate sheet metal, wood, or paper B .



29. LEATHER AND GLUE.

LYOYD BALDERSTON.

The importance and use of artificial tanning materials. J. PARSSLER. *Collegium* 1916, 1-4; *Chem. Ind.* 39, 15-20(1916); *J. Am. Leather Chem. Assoc.* 11, 162-3(1916).—The preparation and uses of neradol are described (cf. C. A. 7, 3853, 4092). The relatively

greater increase in the prices of vegetable tanning materials makes wider use of *neradol* advisable in Germany. L. B.

The action of salts of hydroxy acids upon chrome tanning. H. R. PROCTER AND J. A. WILSON. *J. Soc. Chem. Ind.* 35, 3, 156-9(1916).—Theoretically, chrome tanning will take place if the basicity and concn. of the Cr salt are properly regulated. In reality, certain very basic liquors fail to tan skins. Investigation has revealed that the presence of salts of many, if not all, of the hydroxy acids influences the tanning power of Cr salts. Expts. were made with Rochelle salt. If much of this salt be added to a chrome liquor, it loses its power to tan. Immediately after Rochelle salt has been added to a chrome liquor, a ppt. is given if the liquor is rendered alk., but this ppt. slowly redissolves. This is accounted for by the fact that the presence of hydroxy compds. prevents the pptn. of the metals as hydroxides. From a prepd. chrome liquor, a series of 8 solns. were prepd. varying in concn. of Rochelle salt from 50 g. per l. in soln. No. 1 to none in soln. No. 8. A piece of neutral calf skin was placed in each soln. for 24 hrs. The skins varied from bluish in No. 1 to green in No. 8. The skin in No. 1 was very full and soft, the others less so down to No. 8. All skins were tanned save No. 1 and No. 2. Upon adding 150 cc. per l. of $N Na_2CO_3$ to each liquor, No. 1 gave no ppt., No. 2 a light ppt. and all others heavy ppts. After 4 hrs. the skin in No. 2 was tanned. Two portions more (300 cc. per l. in all) of $N Na_2CO_3$ were added to No. 1. There was still no ppt. and after 48 hrs. the skin was not tanned. It was then washed and placed in fresh chrome liquor and tanned in a few hrs. The effect of the salt was upon the chrome rather than upon the skin. Apparently identical results were obtained by repeating the above expts. with neutral Na citrate, using equiv. concns. The Na salts of lactic, gallic, and salicylic acids prevent the pptn. of Cr in slightly alk. solns. As to possible sources of these compds. in chrome liquor, it is considered that they might be formed in quantities sufficient to prevent tanning by reducing the dichromate with impure sugars, or by reducing under improper conditions. Reducing dichromate at as low a temp. as possible with com. dextrin was tried. A piece of skin immersed in the resulting liquor tanned with difficulty. In order to ensure the production of a satisfactory chrome liquor by reducing dichromate with sugars, it is necessary to use reasonably pure sugar, and conditions giving satisfactory results should be closely adhered to. Although sugars are hydroxy compds., an excess of sugar, even to 20%, does not prevent tanning. This is explained in a detailed consideration of the action of Rochelle salt in forming metallic complexes. Rochelle salt has the power to strip chrome leather of its chrome, leaving it in an untanned condition. This information may be of value to manufacturers wishing to produce split leathers tanned with quebracho or mimosa bark. The skins may be chrome-tanned, then split, and then stripped of chrome, washed, and retanned as desired. Rochelle salt might be used to remove or prevent so-called salt stains, since hydroxy compds. form complexes with other metals including iron. Iron stains might be prevented by treatment with Rochelle salt before liming. For some kinds of leather, a bath in Rochelle salt might be preferable to pickling. Small amts. of Rochelle salt might produce the fullness and softness now produced through an excess of glucose. "Case-hardened" chrome leathers may be stripped and retanned. Also chrome cuttings and shavings may be stripped of chrome and made into glue stock. In stripping, the soln. must not contain a strong acid. The use of Rochelle salt for stripping might be made practical if the salt and chrome could be recovered. This may be effected to a large extent by the addition of H_2SO_4 to neutralize the equiv. of soda and reconstitute the $K H$ salt, which is very sol. and crystallizes out, so it can be sepd. and used again with a suitable addition of soda; while the chrome can be pptd. from the mother liquor as Cr hydroxide. Either crude $K H$ tartrate dissolved with soda, or a mixt. of equiv. amts. of lactic acid and Na_2CO_3 would be a cheap source of Rochelle salt. J. S. ROGERS.

Colloid chemistry and the glue industry. E. SAUER. Memmingen i/B. *Kolloid-Z.* 17, 130-5 (1915).—A brief outline of the glue-making process, followed by suggestions as to the use of colloidal chemical methods. Viscosity measurements are invaluable in controlling the process. The chemical changes in the process of glue boiling should be studied as colloidal phenomena.
H. I. MATTILL.

Shoe- and leather-blackening. J. BURSK. U. S., 1,174,308, Mar. 7. Ivory black 32, molasses 40 and neat's-foot oil 2 parts are mixed to form a blackening for leather.

Preserving fresh hides. J. H. YOCUM. U. S., 1,175,495, Mar. 14. Fresh hides are preserved, before tanning, by treatment with a mixt. of NaCl 97 and Na₂SO₃ 3%. Cf. C. A. 9, 2724.

Dressing hides and purifying tanning extracts electrolytically. B. SCHWERIN. U. S., 1,174,903, Mar. 7. Tanning ext. to be used and purified is confined between a diaphragm formed of parchment paper or other material permeable to basic substances and a leather diaphragm permeable to acids and tannin; an elec. current is passed from the anode to the cathode and through a hide which is suspended between the leather diaphragm and an anodic diaphragm of material, e. g., parchment paper, which is permeable to acids but not to tannin.

Gelatin composition as a substitute for leather and rubber. B. KEPNER. U. S., 1,174,734, Mar. 7. A woven fabric is treated with a soln. formed of glycerol 12-25, gelatin 100, French degreas or linseed oil 12-25 and tannin 6-12 parts and exposed to sunlight at a temp. of 50° or lower, treated with H₂O to render it more soft and flexible and finally while still moist is treated with oil.

Tanning apparatus. E. WILSON. U. S., 1,176,633, Mar. 21. The hides to be tanned are held in a rotating drum dipping into the vat of tanning liquor.

Tanning, impregnating. ELEKTRO-OSMOSE AKT.-GES. (GRAF SCHWERIN-GES.). Ger., 286,678, Jan. 8, 1914. Addition to 283,285 (C. A. 9, 2354). According to the principal process, the liquid containing the active substances, in which the material under treatment is immersed, is subjected, between diaphragms, to the action of the elec. current. Experience has shown that tannin exts. which, on account of the great number of non-tanning constituents contained therein, cannot be employed directly for tanning, are nevertheless applicable for elec. tanning if the osmotic tanning process is combined with an osmotic process of purifying the tannin ext. In carrying out this modified process, the app. specified in 283,285 is used, with this difference, that the chamber containing the tanning soln. is divided by means of a positive diaphragm, such as a piece of leather. All compartments are then filled, first, with H₂O, up to the chamber between cathode and the selected diaphragm, in which the tannin ext. is placed. Upon the passage of the current, all basic impurities of the ext. pass through the cathode diaphragm into the cathode chamber, while the acid impurities, which for most part are not so numerous as the basic, pass through the positive diaphragm into the subdivided H₂O-filled chamber, whence they pass through the skin and finally through the anode diaphragm into the anode chamber. When a certain preliminary purification has been effected in this manner, the tannin begins to pass through the positive diaphragm and to collect in the subdivided chamber between the positive diaphragm and the skin. The tanning process, as specified in 283,285, thereupon progresses. The tannin not used for tanning passes through the skin and collects in the chamber between the skin and anode, since it cannot pass through the anode diaphragm (weakly negative parchment paper).

Machine for working pelts, hides, and leather. L. RICHTER. Ger., 286,516, Mar. 21, 1914.

Removing glue from bone material, by steaming. O. RUF. Ger., 286,100, May 12, 1914. The bone material is removed, once or oftener, from the steamers during the extn. process, and subjected, immediately upon such removal, while still hot, to compression until the completely extd. bone material, by the last compression, assumes the form of a solid cake or briquet. The pressure is increased as the glue is removed. A suitable app. is shown.

Glue. R. BERLINER. U. S., 1,176,644, Mar. 21. Bones containing fatty matter are treated with gaseous SO_2 , freed from fat by extn. with benzine and then boiled to ext. glue.

30. RUBBER AND ALLIED SUBSTANCES.

R. T. STOKES.

Vulcanization accelerators. K. GORTLOB. *Gummi-Ztg.* 30, 303-8, 326-36(1916).—After reviewing the subject from an historical point of view, G. sets forth the virtues of "Vulkasit," a prepn. manufactured by the Bayer Co. G. claims to have shown that the prejudices of experienced rubber men, that 10% of S is necessary for proper vulcanization, are exploded. Very little is said concerning the compn. of "Vulkasit" other than that it is an org. base with a dissociation const. between 10^{-8} and 10^{-9} . E. L. D.

Process for the reclaiming of mixed cloth and rubber scrap. T. SCHOPFER. *Gummi-Ztg.* 30, 325(1916).—The waste is treated with a solvent for cellulose such as ammoniacal CuO , and devulcanized in the usual manner. The process is not new, but has not been adopted because of the difficulty of removing the solvent. E. L. D.

Reclaiming rubber waste. A. H. KING. *Mel. Chem. Eng.* 14, 309-11 (1916).—K. classifies rubber waste as (1) fabric-free, (2) fabric-bearing, (3) ebonite. The method of reclaiming differs with each class. The first method consists in softening and depolymerizing the scrap, after which the finely ground material is mixed with vaseline, tar, phenol, heavy mineral oil or rosin, and heated in steam at $300-375^\circ \text{F}$. for 6-48 hrs. In the 2nd class the fabric is separated from the rubber by one of 4 treatments, viz., (1) mechanical, (2) acid, (3) alkali, (4) solution, all of which are described in detail. E. J. K.

Analysis, purification and qualitative reaction of isoprene (OSTROMUISLENSKII) 10. New methods of obtaining divinyl, isoprene, etc. (OSTROMUISLENSKII) 10.

Diolefins (isoprene), caoutchouc. H. STERN. Fr., 477,956, July 9, 1914. Fuming H_2SO_4 is added, with cooling, to a mixt. of an aliphatic ketone with an alc. or ether, and the acid mixt. is heated. E. g., unsatd. hydrocarbons, especially C_5H_4 and its homologs, are passed through a heated mixt. of ketones and fuming H_2SO_4 containing anhydride (especially acetone and said acid). Modifications are specified.

Filler for automobile tires. F. A. HAGER. U. S. 1,174,856, Mar. 7. A mixt. formed of corn oil 24 lbs., S chloride 6 lbs., MgO 17.5 oz. and Venetian red 3 oz. is used.

Leather- and rubber-substitute for forming sheets. J. S. CAMPBELL. U. S., 1,174,967, Mar. 14. Comminuted leather 500, is mixed with an animal fat or fatty oil 30-40 parts, and heated with sufficient NaOH to effect saponification. Then hair, vegetable fiber or other fibrous material is added and the mixt. is blended with French chalk 25, CaO 10 and rubber or other vulcanizable gum 75 parts; all the ingredients are heated together, dried, rolled into sheets and vulcanized with S. Tannic acid, $\text{K}_2\text{Cr}_2\text{O}_7$, and borax may also be added in small amts.

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